The Dynamics of Natural Resource Degradation: Rural Households and Women's Strategies for Survival in Northwestern Mexico

by

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Abstract

Natural resource degradation in Mexico has taken many forms and levels of intensity. The country's rural areas have been among the most affected by this degradation. In this paper, I examine the causes and the impact of natural resource degradation upon rural communities in northwestern Mexico. I discuss the manner in which rural households and women are coping with these problems and the various survival strategies developed. I use a political ecology approach to understand the manner in which environmental degradation, poverty and survival strategies are interrelated.

About the Author

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Mexico has undergone a series of economic crises since the 1960's that has had profound, long-term effects on the country's rural areas. Strongly connected to these economic crises is an environmental crisis, which is currently causing tremendous tension and distress. The environmental crisis is reflected in the increasing degradation of the country's most valuable and important natural resources.

Among the most persistent and pressing issues are soil erosion, deforestation, contamination of watersheds, desertification, loss of biodiversity, and the destruction of coastal and marine habitats (Tello 1991; Carabias et al. 1994; INEGI 1995; Plan Nacional de Desarrollo 1995; Gómez-Pompa and Kaus 1999). Eighty percent of the land is eroded, and 31 of the nation's most important aquifers are contaminated (Carabias et al. 1994). Moreover, Mexico has one of the highest deforestation rates in Latin America, with 500 to 800 hectares of rain forest lost every year (Gómez-Pompa and Kaus 1998). It has been in rural areas where the worst damage to natural resources has occurred.

Several factors account for this deterioration in rural Mexico. Traditionally, natural resource degradation has been attributed to the growth in population during the last half of the twentieth century (INEGI 1995). However, given the rates and forms natural resource degradation has taken, it has become evident that population growth alone cannot solely account for it. Recently, scholars have pointed to the state's role in Mexico's economic development process (Carabias et al. 1994; (Gómez-Pompa and Kaus 1999). They have called attention to the policies implemented by the state that have encouraged and supported the commercial exploitation of natural resources for export. The state's reliance on income from natural resources increased even

further in order to pay for the growing national foreign debt in the 1980's. During the early 1990's, Mexico underwent a series of changes directed toward the development and implementation of a new economic model, based on market and trade liberalization and private investment. A significant feature of the new economic model was the amendment of article 27 of the Mexican Constitution, which allowed for the privatization of the *ejido* sector.[1] These changes have already impacted the nation's rural areas and the manner in which natural resources are utilized.

Mexico's new neoliberal model continues to reinforce state policies that favor the commercial exploitation of natural resources in order to generate revenues through exports to global markets. A decrease in the availability of natural resources in turn contributes to further marginalization and impoverishment of an already poor rural population. These policies contribute to the development of an increasingly impoverished rural population, and when coupled with the government's lack of sustainable natural-resource-management policies, environmental degradation in rural areas is assured (Carabias et al. 1994; (Gómez-Pompa and Kaus 1999). Thus, in rural Mexico natural resource degradation and poverty go hand in hand. In fact, the Mexican rural population continues to be among the poorest in the nation; eight in every 10 rural families are poor, and four in every 10 rural families live in extreme poverty (Carabias et al 1994).

The central question that arises is how rural households and especially women cope with decreasing natural resources and increasing poverty? My research seeks to answer this question by analyzing the manner in which natural resource degradation has affected the livelihoods of rural people in southern Sinaloa and the strategies they have developed to cope with conditions on a daily basis.

This work is informed by a political ecology approach, which is a theoretical perspective particularly useful as a framework to delineate complex relations, such as the way in which global and local processes, economic development, and state policies affect how rural communities respond to environmental change. A political ecology approach within this context will seek to explain and analyze the existing relationship among the dominant ideology guiding natural resource use and exploitation, poverty, and the survival strategies of rural populations. A number of scholars have incorporated a political ecology perspective into their analysis of human

populations and the environment in a variety of geographic settings (Schmink and Wood 1987; Sheridan 1988; Stonich 1993, 1995, Hershkovitz 1993; Bryant et al. 1993; Dedina 1995; Painter and Durham 19950; Grossman 1998; Andreatta 1998; Dodds 1998; Pezzoli 1998). Most of these studies have focused on the analysis of the causes of environmental degradation and its impact upon local human populations. A few scholars have also addressed the relationship between environmental destruction and poverty, and the survival strategies developed by local communities to deal with these threats (Sheridan 1989; Stonich 1995; Pezzoli 1998). More recently, feminist scholars have used a political ecology approach to examine the articulations between gender and the environment. This theoretical perspective has enabled these scholars to "treat gender as a critical variable in shaping resource access and control, interacting with class, caste, race, culture, and ethnicity to shape processes of ecological change, the struggle of men and women to sustain ecologically viable livelihoods, and the prospects of any community for 'sustainable development'" (Rocheleau et al. 1996:4).

Following their lead, I use political ecology to understand the way in which natural resource degradation has impacted the daily lives of households and women in two rural communities in southern Sinaloa and the survival strategies that have emerged as a result. First, I discuss the methodology used for collecting data and techniques of data acquisition. Second, I present the ethnographic context of both rural communities, focusing on how they developed in relation to broader ecological and political constraints. Third, I discuss the causes of natural resource degradation in southern Sinaloa. Finally, I examine the manner in which the deterioration of the environment has affected the lives of rural women and how they survive despite the resulting impoverishment and, decreasing availability of natural resources.

Fieldwork Methods

The research on which this paper is based was carried out in the southern region of the state of Sinaloa, Mexico. Anthropological fieldwork was first conducted in the region during January through August 1989 as part of my doctoral dissertation. At that time, a household survey in two rural communities collected basic demographic and socioeconomic data. The information from this survey revealed that rural households in this region were engaged in a great diversity of

productive and reproductive activities, many of which. were linked to their dependence on the available natural resources. Fishing and subsistence farming, as well as wage labor in agricultural and shrimp aquiculture were among the activities that provided a basis for household subsistence. This information was essential for the development of a broader study designed to investigate the dynamic, and sometimes conflictive, relationship between rural people and natural resources in southern Sinaloa.

From the summer of 1993 through the end of 1999, 1 spent each July, August, and December conducting fieldwork in the region. Based on the information from the preliminary survey, interviews, participant observation, and conversations, another survey was designed to collect more specific information about the cycle of productive activities in which rural households engaged. Interviews and conversations with rural people, academics, and government officials were crucial for gaining a broader understanding of the importance that natural resources have for the local and regional subsistence patterns and economy.

Archival research at the *Archive Histórico de Mazatlán* and the *Archivos Municipales* in the *municipios* of El Rosario and Escuinapa provided valuable information about the history and causes of conflicts over the access to the exploitation of natural resources in the region. A questionnaire was developed to collect data on women's participation in subsistence and income-generating activities. It asked about the kinds of activities women performed at the household and community levels, the reasons women have for seeking income-generating activities, how long have they been involved in such activities, and what they use the income for. For those women with children, the questionnaire also asked about childcare arrangements.

Rural Communities in Southern Sinaloa

Southern Sinaloa is characterized by a warm subhumid climate (Schmidt 1976). The coastal area features lagoon and estuary systems, surrounded by mangrove forests. The litter falling from these trees creates a habitat for shrimp and other marine organisms that form the basis of the inshore fishing (Galindo Reyes 1988; Edwards 1978). Since pre-Columbian times, mangrove forests have also provided the region's rural people with a steady supply of wood, used to build fences on their agricultural parcels and as fuel. At present, the two most important natural

resources in southern Sinaloa are the coastal and marine life, exploited for commercial and subsistence purposes, and land, cultivated for subsistence and commercial agriculture. Both resources have played a crucial role in sustaining the various populations that have settled in the region since pre-Columbian times. The bulk of the region's fishery is for the once-abundant shrimp, which are mostly captured in lagoons and estuaries. Shrimping is both a commercial and a subsistence activity. Commercial and subsistence agriculture represent the opposite ends of a continuum and are deeply related to the class stratification existing in the region. Urban and rural elites control all aspects of commercial agricultural production whereas many campesinos cultivate their land primarily for household consumption.

The Communities

In southern Sinaloa, as in most of northwestern Mexico, there are two main types of rural communities: *ejidos* and agrarian communities. *Ejidos* emerged as the product of social movements and state agrarian reforms that have taken place since the Mexican Revolution of 1910. Agrarian communities have their origins in the pre-Columbian indigenous populations. Today, both types of communities have been incorporated into the global economy. However, rural communities are very heterogeneous and dynamic entities, not only because of the many political and economic processes from which they emerged but also because of the many transformations that are currently taking place within them. These communities also share some commonalities because of the thick networks of relationships within which their members are embedded. *Confianza* (mutual trust) and *compadrazgo* (co-god-parenthood) are two of the kinship systems that still have a strong influence in creating and preserving social relations in Mexican rural communities.

The two communities where the anthropological research was conducted are within the jurisdiction of the two southernmost *municipios* of the state of Sinaloa: El Rosario and Escuinapa (Figure 1).[2] Both still have a significant proportion of their inhabitants living in rural communities. According to INEGI (1996), 64 percent of the inhabitants of El Rosario and 24.6 percent of those of Escuinapa live in rural areas.

Although El Rosario was a *Real de Minas* [3] during the eighteenth century and was one of the most important gold and silver centers in Mexico by the beginning of the twentieth century, a series of environmental, economic, and political changes brought this period to an end. Ever since, residents of both the *municipio* and surrounding rural areas have had to engage in commercial and subsistence farming and fishing as the central productive mode.

In Escuinapa, the local economy has partially been based on commercial and subsistence fishing. Fishing has been a primary economic practice since indigenous people established it in the area during pre-Columbian times. Oyster fishing and shrimping have been traditionally associated with the people of various communities of this *municipio*, and Mexico's first fishing cooperative was established in Escuinapa around 1936. Subsistence and commercial farming and cattle production have also been important economic activities for the area's inhabitants.

The community studied within the *municipio* of El Rosario was an *ejido*, locally known as El Cerro. Formed in 1967, it had 2,370 hectares of land, divided in plots of 20 hectares each among 116 *ejidatarios*. The land was held jointly by all *ejidatarios*, but each had access to a specific parcel that they could individually cultivate. The Mexican constitution did not allow for the sale or rent of *ejido* land until 1992, following the revision of article 27. *Eijdatarios* can now legally sell, rent, or mortgage their parcels (Pezzoli 1998). Currently, all *ejidatarios* and *ejidatarias* in El Cerro own their plots, but a growing population has increased the pressure for more available land. For the most part, this growing population comprises people who are not *ejidatarios* but who came to live in the community after all of the land was distributed.

Indeed, one of the main problems facing this community is the lack of land on which to build more houses. In 1994, a group of landless people, mostly the sons and daughters of *ejidatarios*, invaded part of the land owned by a mango grower. They built their houses on this land, which the owner later sold to them.

The survey conducted in 1989 showed that this community comprised 113 households, a figure that more than doubled by 1998. In 1989, 8 percent of all households had female heads. The average household had six members. More than 40 percent of the male population was engaged in fishing, with the rest involved in farming and wage labor.

The community's most commercially valuable fishing resource is shrimp. The shrimping season lasts only three to four months, depending on availability, which is influenced by environmental and biological factors. Mexican law required that those *ejidos* involved in the commercial exploitation of shrimp be organized in a Cooperativa de Producción Pesqueras Ejidal (*ejido* fishing cooperative).[4] On the northwest coast, these cooperatives first began to appear in 1974, and one formed in El Cerro in 1978. Currently, it has 45 members, 90 percent of whom are from the community.

Members must sell all their catch to the cooperative at the price the government establishes. By joining a cooperative, a person gains secured legal access to the commercial exploitation of the shrimp. The membership can be passed on to children or other relatives at retirement or in the event of death. Those men who do not belong to a fishing cooperative still fish for shrimp, but they do so illegally and risk being caught by soldiers, who are hired by the cooperative to guard its fishing areas. If a man is caught fishing illegally, his fishing gear is confiscated, he must pay a fine, and often he may be subjected to harassment or physical violence. Many women also participate in various activities related to fishing, which will be discussed later in this article.

Wage labor in agriculture and shrimp aquaculture were also important economic activities for households in this community throughout the year. Twenty percent of the households had members who were employed as wage workers at the shrimp aquaculture farm built in this community, whereas 15 percent were employed as agricultural wage workers. Years ago, most wage laborers were landless people, but during the 1990s, *ejidatarios* have increasingly relied on wage labor as a consequence of the deterioration of land and the decreased availability of fishing resources.

Rural households earn income from seasonal, short-term employment with landowners who grow cash crops, such as chiles, broomcorn, or mangos, for national and international markets. Men work throughout the production process while women and children work primarily during planting and harvesting.

Since the mid-1980's, the development of a shrimp aquaculture industry has provided rural households with an additional source of wage labor. In El Cerro, a shrimp aquaculture cooperative was organized in 1985 with 40 members, but by 1989 only 26 remained. At that

time, the cooperative entered into an agreement with a private company to build a shrimp farm in the *marismas* (salt marshes) belonging to the *ejido*. The members of the cooperative were led to believe that the shrimp farm was their *patrimonio* (patrimony), and that they would receive a portion of the profits and their children would inherit the legal right to become members of the cooperative. However, in reality, the company employed the members only as guards. After a series of social and political conflicts, the company ceased operations, the shrimp farm was abandoned, and the cooperative dissolved.[5] In 1996, the *ejido* entered into a new agreement with another private company, but as before, only a few men from the community were employed and again only as guards. A shrimp hatchery recently built in a nearby *ejido* has hired men from El Cerro as wage workers, as well as employing three women from the community as cooks.

Those who own land are also engaged in seasonal, rain-fed subsistence agriculture. At the beginning of the rainy season, usually around July, people clean and plow the land, and plant it with corn, beans, and chiles. These foods form part of the staple diet of most rural households. One of the most common farming techniques in this community is intercropping. Beans and corn are often planted together at the same time (usually in July) on the same plot of land, with chiles being planted on the plot a little later (in August or September). Although subsistence farming involves all members of the household, a division of labor along gender lines makes men and boys responsible for preparing the land, whereas women and girls are usually responsible for the planting and harvesting.

Farming in general is no longer considered a productive or profitable enterprise, and most *ejidatarios* feel strongly that the land is not productive any longer because it is *cansada* (worn-out). This perception is substantiated by the fact that the land is indeed degraded by soil erosion, desertification, and salinization.

The other community, called Celaya, is an agrarian community within the jurisdiction of the *municipio* of Escuinapa. Celaya was also founded in the 1960's as a result of the expropriation of a portion of a large *hacienda*. Celaya's founders were once the *peones* of this *hacienda*. After a long struggle to gain access to land, each family was given 20 hectares to farm and an additional 40 square meters on which to build a house. By 1989, the community had 45 households, and by 1998, 65 households. Unlike the *ejido*, each household privately owns its plot. Celaya, like El

Cerro, faces a grave shortage of land, forcing new generations repeatedly to build their homes on their parents' plots.

The household survey I conducted in 1989 revealed that 5 percent of the households in Celaya were headed only by women. It also showed that 43 percent of households had between three and five members, and 49 percent had between six and eleven members. The most common economic activities for male heads of households were shrimp aquaculture, farming, and agricultural wage labor.

As in El Cerro, a shrimp aquaculture cooperative had been organized in Celaya. Two teachers who taught at the elementary school formed the cooperative in 1986. Originally, it had 37 members, but by 1989, only 24 were still active. Unlike the cooperative organized in El Cerro, the one in Celaya was solely responsible for all of the shrimp farming operations. Members were able to get a bank loan to make some minimal alterations to a natural lagoon in order to use it as a shrimp pond, and they also bought shrimp larvae to stock it. This shrimp aquaculture project operated successfully for a couple of years until internal problems among the cooperative members, coupled with the failure to continue getting needed loans, caused its dissolution in 1991 [6]

Currently, no one from this community is involved in any aspect of shrimp farming, and most men are agricultural wage laborers. Although in 1989 only 23 percent of male heads of households were agricultural wage laborers, by 1998, this figure had risen to 65 percent. This type of employment has been an important economic strategy for households in Celaya since the times in which its founding families worked at the big *hacienda*. When this research was conducted, both men and women sold their labor to smaller *haciendas* nearby, as well as to the physicians and politicians who owned mango, chile, lemon, and coconut farms close to Celaya. Agricultural wage labor on these farms followed the same pattern described for El Cerro. Men were hired to clean and prepare the land and during the planting and harvesting season. Women for the most part were hired during the harvest, except in the chile farms, where they were also hired during planting.

In 1999, the salary paid to an agricultural wage worker in Celaya was 50 pesos (US$6) for an eight-hour work day. Two jobs were available on the coconut farms. One was harvesting green

coconuts, to be sold to restaurants in Mazatlán or to be exported to Guadalajara, Sonora, or northern Sinaloa. Only men were employed for this task, since it requires climbing to the top of the palm trees to reach the coconuts. The other job consisted of gathering dried coconuts and extracting the pulp for copra. The whole family usually participated in the preparation of copra: Everyone helped to gather the dried coconuts, the men opened them with axes, the women extracted the pulp, and the children helped spread it on the floor so it could dry.

The 1989 household survey showed that 23 percent of the households in Celaya were engaged in subsistence farming. As in El Cerro, the type of farming practiced was seasonal, rain-fed agriculture. Corn, bean, squash, and watermelon were the most common crops planted and usually the whole family provided the labor. Most of what was produced was consumed within the household, but a portion was shared among neighbors, friends, and relatives. In a few cases, chiles were sold to middlemen who frequently passed through the community.

Celaya did not have an organized traditional fishing cooperative. However, most people took advantage of the fishing resources available in the lagoons surrounding the community. Most of the shrimp caught was sold within the community or to the *changueras* (women who specialize in marketing shrimp). Crabs and fish were also caught to be consumed mostly within the household.

Natural Resource Degradation in Southern Sinaloa

For more than five hundred years, Southern Sinaloa's land and fishing resources have sustained the region's *núcleos de población* (population centers). Today, rural households face the sad reality of no longer being able to depend on these resources for the daily maintenance of their families. Soil erosion, desertification, and salinization make the land unsuitable for cultivation, and overpopulation and contamination threaten the coastal and marine ecology. With time, a series of factors has contributed to the region's natural resource degradation.

The deterioration began during the colonial period, with the extraction of mineral ores and the establishment of large *haciendas*. The once profitable mining resources were depleted by the beginning of the twentieth century. The land where the mining took place; now unproductive and contaminated, remains as a silent witness to the "glorious" economic past. The formation of

large haciendas in the region also created environmental problems as large tracts of land were cleared or deforested in order to grow cash crops and grass to support a growing cattle industry.

The growth of commercial, export-oriented agriculture, fishing, and aquaculture industries has been considered to be among the primary cause of environmental degradation. Since the Green Revolution, Sinaloa's state policies have largely promoted and encouraged the development of intensive commercial agriculture (Wright 1990). The results have been mixed. If one considers only national statistics, Sinaloa is clearly one of the most productive agricultural states in Mexico, with the industry annually generating millions of dollars and many jobs. However, most of the profits remain in the hands of the agricultural companies and the local wealthy elite (Wright 1990), and most of the jobs are seasonal and low-paid wage work.

Commercial agriculture has contributed to the degradation of natural resources in two ways. One, frequently discussed in the literature, is the impact of fertilizers, pesticides, and other agrochemicals on the soil and water (Wright 1990; Carabias et al. .1994; Galindo Reyes et al. 1997). Pesticides and fertilizers end up in the estuaries and lagoons of southern Sinaloa, threatening the survival of marine animals and mangrove forests (Galindo Reyes et al. 1997). While I was conducting fieldwork in the region, fishermen reported they believed that the agricultural runoff was killing the shrimp and fish. Indeed, physical and chemical studies of the largest and most productive lagoon system in southern Sinaloa showed that water quality has deteriorated as a result of agricultural waste, which, in turn, has decreased shrimp production within the system (Galindo Reyes et al. 1997).

Commercial agriculture has also contributed to increases in soil erosion and desertification, which may affect up to 80 percent of the land in Mexico (Carabias et al., 1994). In southern Sinaloa, agro-industry's deforestation of natural areas is partially to blame for erosion and desertification, but subsistence farming and the raising of cattle and other domestic animals, such as burros, mules, and horses, has also had an impact.

In an effort to increase crop production, subsistence farmers continue to cultivate an already infertile and marginal land, sometimes without allowing fields sufficient time to lie fallow between crops. This has certainly contributed to further soil erosion in Celaya and El Cerro.

Fishing resources, once the fuel of the local economy, have reached their maximum sustainable yield. The commercial exploitation of marine resources has been an arena of conflict and contradiction ever since the first fishing cooperative was developed in the region in the 1930's. The history and consequences of these conflicts, however, are too long and complex to be adequately discussed in this article, [7] but these conflicts emerged primarily as the result of state policies that promoted, and continue to promote, the commercial exploitation of these resources, particularly shrimp, in order to generate profits from their export. Although the state of Sinaloa historically has been considered to be one of the primary shrimp producers in Mexico, since 1987, overall shrimp production has declined due to climatic change, destruction of natural habitats, increasing population, and over fishing (SEMARNAP 1997; Cruz-Torres 1999). People in rural communities whose livelihood depended on shrimp fishing have begun to accept that this resource is close to depletion. Indeed, studies conducted, by Mexican government and research institutions, such as SEMARNAP (Secretaría del Medio Ambiente, Recursos Naturales y Pesca) and the Fisheries Institute, have shown a decline in productivity during the 1990s (SEMARNAP 1997).

In an attempt to relieve the pressure on shrimp and other commercially valuable marine resources, the Mexican government launched a massive campaign promoting an aquaculture program during the 1980's. At first, the program was conceived as a development strategy directed, towards the diversification of economic activities and the generation of income in rural areas. However, since 1990, in the aftermath of neoliberal policies and subsequent changes to the Ley General de Pesca (Fishing Law), Mexican and foreign entrepreneurs have also been given legal access to participate in shrimp aquaculture. With arrival of the "private sector," shrimp farms in the coastal region of southern Sinaloa have proliferated, exacerbating the already existing social conflicts regarding the use and exploitation of coastal and marine resources.

This rapid growth is also creating a new set of environmental problems (Instituto Nacional de la Pesca 1998). According to the statistics compiled by the regional office of SEMARNAP in Mazatlán, the number of shrimp farms established in the *municipio* of Escuinapa has grown from eight in 1989 to forty-one in 1997. In the *municipio* of El Rosario, the number

grew from two in 1989 to thirteen by 1997. Currently, the *municipio* of Escuinapa has the largest number of shrimp farms in Mexico.

In Mexico, research on the environmental impact of the shrimp aquaculture industry has just begun to emerge. However, many Mexican academics and staff at government research institutions have expressed concerns regarding the potential environmental impact of the industry (Galindo Reyes et al. 1997; Flores Verdugo et al. 1997; Instituto Nacional de la Pesca 1998). Among the most important are the construction of shrimp farms, which has had a negative impact on lagoon and estuarine ecosystems, water quality, mangrove forests, and the wild stocks of shrimp.[8] These conditions are further exacerbated by impoverished households.

Most rural households are faced with the dilemma of struggling to survive on a daily basis while engaging in practices that accelerate the deterioration of the resources on which they most depend. The poaching of shrimp during the off-season is just one example of these detrimental practices.

The degradation of natural resources and its resulting poverty is, in turn, creating a social crisis in southern Sinaloa's rural communities. In recent years, alcoholism and domestic violence have increased in Celaya and El Cerro, as they have elsewhere in the region. The best estimate that I have concerning domestic violence in these two communities is that approximately 90 percent of households suffer from this malady. Alcoholism among men has increased dramatically and some farmers who were known for their high levels of productivity have lost themselves in drinking binges and placed their households at even greater economic risk.

Rural Household Survival Strategies

As natural resource degradation and poverty spread, rural households have devised coping strategies in order to provide their members with a relatively secure supply of basic resources. Studies on the impact of the Mexican economic crisis on the poor have shown that responses and strategies for coping usually emerge within the household (González de la Rocha and Escobar Latapí 1991; Benería 1992). These findings are consistent with my own in southern Sinaloa regarding the strategies developed by the rural population to deal with natural resource degradation. Collective or community efforts, although emerging in Sinaloa, are still very rare in

its rural communities.[9] Thus, it has been at the household level where people do battle with the social and economic constraints imposed by natural resource depletion.

Today, southern Sinaloa's households are able to survive through the use of a combination of strategies. In response to the degradation of land and coastal and marine resources, the declining yields of staple crops, and the economic uncertainty, households in rural southern Sinaloa have developed a diversity of approaches for subsistence and cash-earning purposes. Although it is true that the households vary to the extent to which they combine these livelihood or survival strategies, it is also true that, for the most part, a common set of combined strategies has emerged.

Since 90 percent of the households in Celaya and El Cerro lack sufficient income to meet their daily needs, most members have diversified their traditional occupations and are engaging in multiple income-generating activities. Diversification involves the expansion of alternatives from which people can choose as they weave their way through the various sectors - subsistence, formal, informal, and, at times, illegal - of their rural economy. For households this has meant occupational pluralism: the necessity of expanding their fishing to include other species besides shrimp, farming a wider variety of cash crops, such as watermelons, and alternating their traditional occupations with new economic activities, such as taking the jobs that intermittently become available in shrimp hatcheries.

Diversification also includes spreading the risks among more household members by increasing the number of wage earners within the household. Today, more household members participate in agricultural wage labor and other income generating activities than ever before. In both communities the number of people in the household and the number of income producers are closely associated. In El Cerro, for example, a significant correlation exists between the number of income producers and the number of persons in the household, so that the more members a household has, the more income producers it will have (Table 1). Twenty eight percent of the households have from one to four members and only one income producer (Table 1). When the households had five or more people, there was a tendency to have more than one income producer. However, 30 percent of the households with five or more members still had only one income producer. The developmental cycle may partly control this phenomenon since

households at a later stage of the cycle -that is, those households that have had time to produce more offspring -have more young adults available for labor use, whereas those at an earlier stage have more young children and childbearing women, who are unavailable to participate in income-generating activities. In time, however, these households will have multiple wage earners.

Households having women income producers tend to have more than five members (Table 2). Twenty-eight percent of the households with five or more members had two income producers who were, in most cases, the spouses or a parent and a daughter. Of the households with five or more members, 66 percent had three or more income producers, with women and daughters contributing significantly.

In Celaya forty-one percent of the one-to-four-member households had only one income producer, whereas 38 percent of households with five and more members also had one income producer. (Table 3). As in El Cerro the developmental cycle of the household may partly control this. Households with two or more income producers tend to have five or more members. We find in Celaya the same significant pattern as in El Cerro: The larger the household, the more income producers it will have. Only six percent of the households with 1 to four members have two income producers, whereas 82 percent of the households with five or more members have two or more income producers.

A sub-strategy employed by rural households has been to change food consumption patterns. The consumption of certain products, such as milk and meat, has decreased in times of economic hardship, and many households consumed food that could be easily and freely obtained. There was a stronger reliance on fruits and vegetables, such as mangos, chiles, coconuts, eggs, and nopales (cactuses), that were found or grown within the communities. Tortillas were usually made at home instead of being purchased at the store.

The costs associated with healthcare have also increased and households were faced with the uncertainty of what to do when someone needed medical care. In many instances, people borrow money from relatives and friends to pay for a visit to the clinic or to purchase medicines. In other cases, people go to *curanderos* (healers), who can be paid with home-grown produce, chickens, or fish, thus reducing the reliance on cash.

Migration as a household strategy has also increased in rural southern Sinaloa during the 1990's. In 1989, when I first conducted ethnographic research in the region, only 19 percent of all households in El Cerro had members who had migrated to other parts of Mexico, the border region, or the United States. In Celaya in 1989, none of the households reported having members who were migrants. Since then, migration has increased. A 1998 survey showed that 42 percent of a random sample of 38 households in El Cerro had at least one member who had migrated. In Celaya, the figure was 36 percent from a random sample of 28 households. For the most part, people migrated in search of employment, going to Mazatlán or the northern border states, such as Sonora, or to border cities, such as Tijuana or Mexicali. Many times, this was an intermediate stage in an eventual migration to the United States, where community members would seek employment in the industrial agriculture or the service sector, where they were employed as domestic, restaurant, hotel, factory, or university workers. In households with migrants, remittances to families accounted for about 10 percent of their family's income.

In sum, the survival of rural households in southern Sinaloa has been dependent on the interrelationship among many forms of labor and productivity practiced by most of the members. These forms have included household members' participation in multiple economic and subsistence activities, the presence of an increased number of income producers within any given household, strategies of borrowing from relatives and friends, national and international migration and remittances from migrants, and exchange of favors between households (e.g., taking care of children or sharing food).

The increased participation of women in cash-earning activities is emerging as one of the most important survival strategies employed by rural households. Women's participation in income generation has meant that the household, to assure its continuity and survival, must now allow some degree of internal flexibility in terms of the traditional pattern of gender division of labor. For women, this has meant the addition of another burden to their already stressed and busy lives.

The Survival Strategies of Rural Women

We are very poor here. The economic crisis is hitting us so hard that there are times in which we have nothing to eat. The fishing is gone and the land is no longer productive. Both men and women need to work in order to produce income.

Está muy pobre uno aquí. Está tan dura la crisis que hay veces que la gente no tiene ni para comer. Ya no hay pesca y la tierra no produce. Trabajamos tanto el hombre como la mujer.

(Doña Ramona, an agricultural wage worker in El Cerro)

When I conducted open interviews with women in southern Sinaloa, one of the most frequent topics of conversation was the hardships and uncertainty that permeated their daily lives. Most women in Celaya and El Cerro reported that there was great tension in their households, since everyone was struggling so hard to make ends meet. For many women, tension and despair were also the result of juggling all of their daily responsibilities within their homes while trying to engage in income-generating activities and find time for themselves. Women referred to these tasks and pressures in their daily lives as *la lucha diaria* (the daily struggle). For most rural women, their *lucha diaria* begins at sunrise and does not end until all household members are in bed. The *lucha* also consists of a woman's intermittent search for new and different ways to support her family and provision her household. As a result, many rural households have arranged or transformed their internal dynamics to create space for new emerging roles for female family members.

Women in the two communities that I studied, like the majority of their counterparts in rural Latin America, are responsible for storing, preserving, processing, and preparing food; socializing and educating children; providing medical and psychological care; performing domestic chores; managing the animal husbandry; and reproducing social networks (Deere 1987). Many women continuously move between subsistence and income-generating activities. Because of the rural population's heavy dependence on the deteriorating natural resource base

and Mexico's economic crisis, women's double days have become even longer and more demanding.

In Mexico, women's increased participation in paid work has been highlighted in several studies focusing on the strategies developed within households to deal with the economic crisis (González de la Rocha 1991; Grindle 1991; Benería 1992; Mummert 1994; Rothstein 1995; Lara Flores 1998). In rural Sinaloa there are two basic means by which women deal with such scarcity: 1) increased participation in income-generating activities; and 2) the use of exchange relations and mechanisms.

Income-generating Activities

In rural Sinaloa, women's increased participation in income-generating activities has been one of the most important ways in which rural households have coped with a deteriorating environmental conditions and poverty. Certainly in Celaya and El Cerro, the number of women engaged in income-generating activities grew during the 1990s. The 1989 household survey showed that only 20 percent of all women aged 14 years of age and older in El Cerro were income producers. By 1998, the figure had grown to 48 percent. In Celaya, the number of women engaged in income-generating activities during 1989 was also 20 percent of the total female population aged 14 and older, but by 1998, that figure was 37 percent.

When asked, women in both communities agreed that pressing economic needs within their households were primary in their choosing to seek income-generating activities. Women also pointed out that their husbands' income was no longer sufficient to meet the basic needs of all household's members, and they felt the responsibility of "helping" their husbands.

Like other rural women who have been able to augment their households' income by joining the agricultural wage-labor force, so too have the women in the communities studied. Indeed, the survey conducted in 1998 showed that 72 percent of all the women who were performing any kind of income-generating activity in El Cerro were doing so as *jornaleras* (agricultural wage workers). In Celaya, the survey showed that 55 percent of all women who reported that they were involved in at least one income-generating activity were also *jornaleras.* Although women's

employment as *jornaleras* is not a new nor even recent phenomenon in Mexico, the increased numbers of women who work as *jornaleras* is.

Several studies have brilliantly examined and analyzed the incorporation of rural women within the Mexican agricultural labor force (Arias 1994; González Montes 1994; Mummert 1994). For the most part, however, these studies have been conducted in the "typical" or historically traditional agricultural regions of the country. In Sinaloa, these studies have focused on the central and northern regions of the state, where large-scale, commercial agriculture for the international export of winter vegetables and fruits has developed. Studies on women and agricultural wage labor in these regions have addressed two very important processes: the proletarization of mestiza and indigenous women living in the countryside, and the feminization of Sinaloa's agriculture (Roldán 1982; Lara Flores 1998).

In southern Sinaloa, these two processes took place much later and more slowly than in the central and northern regions of the state. The development of commercial, large-scale agriculture did not begin in the municipio of El Rosario until the 1950's or in the municipio of Escuinapa until the 1980's (Confederación de Asociaciones Agrícolas del Estado de Sinaloa 1987). Jobs available to women were mostly poorly paid and seasonal and offered little or no security. In many cases, the working conditions were poor, and wage workers were exposed to pesticides or other chemicals, with detrimental consequences to their health (Wright 1990; Lara Flores 1998).

The women in Celaya and El Cerro performed wage labor, harvesting and planting crops, such as chiles, mangos, lemons, or broomcorn cultivated in nearby communities. They left around eight in the morning and returned home around three or four in the afternoon. The harvesting of these crops was organized through *cuadrillas*, which usually consisted of men and women from the same community. One individual was selected to organize the *cuadrilla* and oversee members as they worked. In southern Sinaloa, this person is called a *caporal*, and he or she acts as the mediator between the workers and the crop-owners. Five women in El Cerro and Celaya were *caporales.* They were selected because they had spent years working as *jornaleras*. They also had good relationships with the landowners and extensive knowledge about the crop and the work involved in its harvesting.

Such is the case of Margarita, a married woman and mother of four, who has organized *cuadrillas* in El Cerro for over five years. Margarita, besides being knowledgeable about the planting and harvesting of mangos and chiles, is also a very strong and charismatic leader. Some of the women who were part of Margarita's *cuadrilla* told me that they liked to work for her because she is very responsible, smart, and has a good sense of humor.

The salary paid to *jornaleras* for harvesting and planting varied, depending on the market price of the crop and the productivity of the worker. In 1998, the salary was 50 pesos or US$6 for six to eight hours of work, with the *caporal* earning an extra 50 pesos daily.

Jornaleras also extracted coconut pulp for copra. In many cases, women, husbands, and children were transported in a pickup truck to the coconut plantations, and they were paid by brokers, based on the amount of coconuts processed. In 1998, the salary was 60 pesos (US$7) per 1,000 coconuts. However, many women felt reluctant to work in the copra because they did not want to be away from their homes for long periods each day. In response, the brokers brought the dried coconuts to the families so they could extract the copra when they had the time to do so. It was a common scene to go into these communities and see the front and backyards and roofs of houses covered by dried coconuts.

Women also generate cash through the sale of goods. Women in both communities operate small grocery stores in their homes, where they sell candies, sodas, and *artículos de primera necesidad* (food items most commonly consumed) such as beans, rice, vegetables, flour, and canned food. Women also spend much time preparing food to be sold in the evenings or during special ritual celebrations, such as *posadas*, *quinceañeras*, weddings, and baptisms. This has the advantage of allowing women to spend more time at home, thus giving them some flexibility in how they allocated their time to their children and their household chores. The preparation of food was a long process that began very early in the morning, with women traveling by bus to the town's market to purchase the needed ingredients. All the women and children within a household and the women's relatives or *comadres* helped make the food. Thus, labor exchange was an important part of the broad coping strategies for survival.

The making and selling of handicrafts was another source of income for most women. In Celaya as well as in El Cerro, women spent their leisure time knitting, embroidering, and making

paper flowers. The most common craft was the *servilleta* (cloth napkin), a piece of fabric embroidered with bright-colored thread used to wrap warm tortillas. Tablecloths and pillows were also embroidered, and doilies were knitted, even though this requires more time than embroidering. Women also earned cash by making crepe paper flowers; however, they did so on a demand-only basis, for special celebrations, such as weddings, baptisms, or the Day of the Virgin of Guadalupe. Since the communities did not have marketplaces and most women found traveling to market towns too difficult, handicrafts were produced less for the formal market than to be sold locally among the households, when requested by relatives, neighbors, or friends.

Another important source of income was the legal and illegal sale of shrimp. Although women in southern Sinaloa have been selling shrimp for decades, the number of women who are doing it in rural areas grew during the 1990s as the result of the increasing scarcity of natural resources and declining incomes. This scarcity of resources and declining income is partially the result of women and men going to the estuaries and lagoons to catch shrimp, thus increasing pressure on the available resource. Women often catch shrimp during the closed season, when the lagoons and estuaries are guarded by marines soldiers hired by the fishing cooperatives. In many instances, these women have been sexually harassed, persecuted, and threatened, thus adding yet more stress and instability to their daily lives.

A few women sold clothes from their homes or traveled to other households within the community or communities nearby. In many cases, the clothes were purchased in the towns or in Mazatlán, Some women traveled as far as Guadalajara or Tijuana where they could get a better price. The majority of women gave credit to their customers and collected payments on a weekly basis.

A relatively small sector of women was able to find employment as domestic workers in nearby *haciendas* or in the houses of the urban elite. They generally traveled on a daily basis to these places rather than staying overnight, and their main tasks consisted of cleaning, cooking, shopping for groceries, and caring for the elderly.

Exchange Relations and Mechanisms

Many important exchange relations and mechanisms were also utilized by women. For example, managing and participating in Asociaciones Rotativas de Crédito (Rotating Credit Associations, RCAs) or *cundinas*, as they are locally known in southern Sinaloa, was an important economic exchange. These were another source of savings and investment. Generally, 10 participants contribute weekly to a pot of 200 pesos (approximately US$22), which rotates over a period of 10 weeks to each contributor. For most participants, the RCAs provided them with an opportunity to save in order to buy furniture and electric appliances, purchase needed supplies and clothing for their children for school, buy medicines and cover long-term health costs, contribute to ritual expenditures for baptisms and weddings, or buy tickets to visit other parts of Mexico. On the whole, RCAs formed within the dense network of exchange and mutual *confianza* (trust) among relatives, neighbors and friends.[10]

Similarly, women in these networks constantly exchanged their labor. Childcare, food pooling, and "borrowing" when food was unavailable were among the most important ways of meeting household daily needs. Often groups of kinswomen would jointly purchase the ingredients and together prepare a collective lunch. Childcare was a crucial device to release women to take advantage of available wage work. In addition to these economically driven activities, women would visit to exchange information on prices of goods and services, available work and level of wages paid, or medical care and the reputation of physicians. Thus, these networks were like counseling services, ranging from issues having to do with wayward husbands and sick children, to sundry other topics of mutual interest.

The key aspect of these various mechanisms and relations is that they all were embedded within existing exchange relations based on both fictive and familial kinship, close residential friendships, and a recognized community identity.

The following vignettes illustrate the complexity of strategies and the heterogeneity of the work in which women engage in order to provision their households.

Agricultural Wage Worker and Vendor: Doña Carolina was 40 years old when I met her in 1996. She lived with her husband, three sons, a daughter-in-law, and a grandson. They had one

of the best houses in the community, built of bricks, with amenities including water, toilets, and electricity. Three members of the household were working: Doña Carolina, her husband, and one son. Doña Carolina had been employed for several years on nearby mango and lemon farms belonging to a physician who lives in the urban sector of the *municipio*. Doña Carolina's job consisted primarily in organizing the *cuadrillas* for harvesting the fruits. As a result of the long term reciprocal relationships that had developed between the physician, Doña Carolina, and her husband, the husband was employed as a foreman in a ranch owned by the doctor. On the occasions when her husband brought gifts of fresh milk and meat from the hacienda, Doña Carolina sold them at her house.

Domestic worker: Marisel was a 19-year-old single mother of a four-year-old daughter. Both lived with Marisel's parents. Marisel had worked as a seasonal wage laborer in the chile farms while she was attending secondary school. Now Doña Isabelita, Marisel's mother, took care of the child and Marisel was employed as a domestic worker in one of the well-to-do houses in the town. Although Marisel did not pay her mother a fixed salary for caring for her daughter, she did help her with money whenever Doña Isabelita needed it for medicines, clothes, or bus fare to go to town. Marisel also contributed money to buy food for the entire household, and she supported the child herself.

Vendor: Sylvia was a 38-year-old married woman when I met her in 1995. She and her husband lived with three children. Her husband was a musician without a fixed job, making him one of those individuals considered to be in the informal sector. He played by demand, so his contribution to the household was inconsistent and depended on how well the music group to which he belonged did on any particular night. Sylvia spent most of her time at home taking care of the young children and doing household tasks. She also tended a small candy and soda kiosk that the Pepsi Company had lent her and placed in front of her house. At least three times a week, with her sisters' help, she made dinners, such as *tostadas*, *tacos*, and *tortas*, to be sold in the evening in front of her house. She also took advantage of special rituals and activities celebrated

within the community, such as *quinceañeras*, weddings, *posadas*, and saints' days, to sell her various offerings.

Handicraft maker: Doña Carmen was a 57-year-old married woman who lived with her husband. Their children were already married and lived in separate households but within the same compound. They all engaged in reciprocal economic exchange (borrowing and food pooling). Don Alejandro, Doña Carmen's husband, was a fisherman, a member of the fishing cooperative, and an ejidatario. Doña Carmen took care of the house and, when necessary, she took care of the grandchildren. She also generated needed household income by making and selling beautiful paper flowers arranged in crowns to decorate altars and shrines on the feast day of the Virgin of Guadalupe.

Clothes Peddler: Doña Inés had always been a very independent woman. Although her husband had land, which he cultivated, she contributed to the household economy. Most importantly, she had paid for her daughter's university education. For many years, Doña Inés had sold used clothes that had been brought from the United States to Tijuana and Guadalajara. She would travel by bus once a month to purchase her merchandise, which she resold at a higher price, not only within the community but also in nearby communities where she had an established clientele. Her success was attributed to the fact that people were not pressured to pay her immediately but could make payments whenever they had the money to do so.

As has been seen, most of the income-generating activities women pursued are within the informal sector of the local and regional economies. There are two main reasons for this trend. One is the lack of sufficient jobs available within the formal economy, and the other is the attraction of income-generating activities that would allow women time for household tasks and childcare. The few women who were working in the formal economy had earned university degrees and were employed as teachers, clerks, or nurses in town.

Among the many implications of women's increased labor participation is that it had at some level impacted upon the traditional gender division of labor within the household. As a result it

has also profoundly altered the traditional power relations between men and women and calls into question the long-term continuance of patriarchy. Another implication has been the further integration of the informal economy within the households.

Participation in these activities has also added another burden to their already busy lives. Even when these women earn cash, they still need to return home to perform household tasks and care for children. Men in rural Sinaloa do not participate in household chores and rarely help to take care of the children. Childcare facilities in these communities do not exist, and for the most part, while they work in the fields, women have had to rely on their oldest daughters, *comadres*, neighbors, and relatives for help with the children. In turn, this reliance among women has developed into a "cluster" of economic transactions that engages household in a series of reciprocal relations through which flow services, income, and goods. These relationships are also an essential part of the survival strategies of households in rural southern Sinaloa.

Concluding Remarks

Mexico, like most third world countries, has been faced with the dilemma of exploiting its natural resources for the sake of its economic development. In recent years, however, there has been recognition of the need to manage the country's natural resources in a sustainable manner. The Programa del Medio Ambiente (Environmental Program) of the Plan Nacional de Desarrollo (National Development Plan) has made it clear that better management policies are needed in order to conserve an adequate supply of natural resources for future generations. The program has also emphasized the relationship between poverty and natural resource degradation by stating that "' en la lucha contra la pobreza y el cuidado ambiental no deberfan configurar disyuntiva alguna; ambas deben potenciarse mutuamente para determinar un proyecto de futuro" ("the fight against poverty and environmental quality should not constitute a disjunction in any way; both must reinforce each other mutually in order to create a better future") (Gobierno del Estado 1996:8). Despite the efforts to develop and implement sustainable management policies, natural resource degradation and poverty continue to increase in Mexico's rural areas. As Arturo (Gómez-Pompa and Andrea Kauss eloquently and explicitly pointed out, "Mexico has not been able to slow present trends of environmental degradation and destruction. In fact, conservation in

Mexico sharply reflects the separation of national policy from the interests of rural communities, as well as the chronic neglect and submergence of indigenous and peasant populations" (1999:5982).

My work in southern Sinaloa shows that there is a relationship between the manner in which natural resources have been degraded in Mexico and the resulting poverty in rural areas. Recently, the economic restructuring of Mexico and the implementation of state policies favoring a neoliberal economy have also resulted in emphasizing commercial export production over sustainable management policies. Neoliberal policies have stimulated the growth of commercial agriculture and aquaculture in the region of southern Sinaloa and have contributed to the degradation of coastal ecosystems. From the introduction of high levels of pesticides through the increase of waste from shrimp ponds, these policies have negatively affected the fishing resources. Moreover, the creation of shrimp ponds has encroached on and destroyed mangrove forests important to the natural growth of shrimp and other marine organisms. Combined with such degradation is the further impact of over fishing by commercial oriented fishing activities that have further contributed to the depletion of the coastal and marine resource base. These conditions, when combined with Mexico's economic crises, have created extreme poverty for much of rural southern Sinaloa.

Since it is at the level of the household where these conditions strike hardest, all household members, but especially women, have to undertake and develop numerous strategies for survival. These have varied from increased participation in agricultural wage labor through the illegal sale of shrimp, to the creation of cottage industries that sell food and handicrafts.

Other important implications have resulted, such as the pooling of labor between related households, participation in Rotating Credit Associations, and sharing scarcity through the exchange of limited resources and assistance in childcare and the making of food. However, it is highly unlikely that these strategies and practices will be able to match the continuing levels of resource degradation and falling income. As I have shown, migration will be a continuing and important strategy and ultimately the choice of last resort. But even this is only a short term choice for a long term process of the continuous reduction of the ability of households to be adequately reproduced.

Notes:

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1.The term *ejido* translates literally as a community of common land holders. It is an institution created as the result of the Mexican Revolution of 1910 and the various agrarian reform processes that proceeded the revolution. One of the basic features of the *ejido* system was that the land, although distributed to the peasant population, was still legally owned by the Mexican state. Thus, peasants could not sell or rent the land. In 1992, as the result of the various neoliberal reforms undertaken by the Salinas Administration, Article 27 of the Mexican Constitution (the one that established the guidelines delineating the functions and characteristics of the *ejido*) was changed and the land was legally given to the peasants who can now sell it or rent it out.

For a complete list and explanation of the changes made to the *ejido* sector, see Cornelius and Myhre (1998). One of the changes that is currently having an environmental impact in rural areas is that *ejidos* now have complete authority to exploit their natural resources. Additionally, because *ejidos* are encouraged to engage in commercial agriculture, grazing lands are being opened even further to farming, and an increase in the use of chemical fertilizers and pesticides is underway.

2. A *municipio* is a political and geographic sub-unit within Mexican states, roughly equivalent to a U.S.A. county.

3.A colonial Spanish institution established in the most productive Mexican mining towns. They operated as important centers for the commerce of silver and other precious metals.

4. In Mexico, three types of cooperatives are legally allowed to catch or cultivate shrimp. Traditional fishing cooperatives (Cooperativas de Pesca Tradicionales), developed in the 1930's, were the first in the country. The Cooperativas Pesqueras de Producción Ejidal (*ejido* fishing cooperatives) were formed in those *ejidos* that were settled close to marine and coastal areas where shrimp was an important fishing resource. Shrimp aquaculture cooperatives, formed during the 1980's, were given access to the culture and growth of shrimp.

5. For a complete discussion of the various conflicts that emerged among the members of this shrimp aquaculture cooperative, please refer to Cruz-Torres (1996).

6. See note 5.

7. See Lobato González (1989) for a detailed discussion of the historical and social causes of these conflicts.

8. See Cruz-Torres (1999) for a complete explanation and discussion of these environmental problems.

9. In 1995, academics and other concerned citizens in Mazatlán created an Environmental Non-government Organization (ENGO) to deal with environmental problems, such as water pollution, garbage disposal, and deforestation in the *municipio*. However, its efforts have been concentrated within the urban and coastal areas of Mazatlán, and it has yet to reach out to local rural communities.

10. For a complete discussion on the role and formation of Rotating Credit Associations among Mexicans and Mexican-Americans, see Vélez-Ibáñez (1983).

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The WID Program at Michigan State University began its *Women in International Development Publication Series* in late 1981 in response to the need to disseminate the rapidly growing body of work that addressed the lives of women in Third World countries undergoing change. The series cross-cuts disciplines and brings together research, critical analyses and proposals for change. Its goals are: (1) to highlight women in development (WID) as an important area of research; (2) to contribute to the development of the field as a scholarly endeavor; and (3) to encourage new approaches to development policy and programming.

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