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The Seduction of Models

Chinampa Agriculture in Mexico

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Can an agricultural technology devised by the Aztecs rescue today's small farmers from the excesses of the Green Revolution?

Fig. 1 The Great City of Tenochtitlán, 1945, by Diego Rivera.

At all levels - from peasant farmers in the Amazon Basin to concerned scientists worldwide - there is growing alarm that the pace and scale of environmental devastation threatens not only individual communities but nations, and may eventually upset the ecology of the planet. As the prospect of denuded forests, contaminated rivers, and massive rural to urban migration looms closer, Latin Americans are beginning to react: Conservation groups are forming, the media are

becoming a regular forum for environmental debates, and technicians are experimenting with alternative development schemes. But while awareness of the interlocking nature of the crisis is widening, answers have proven elusive. This is particularly evident in the search for new approaches to agriculture. The luster of the Green Revolution has faded as its social, economic, and environmental costs have mounted. Intensive reliance on expensive machinery, chemicals, and seed strains has encouraged agroindustrial monocropping, increased the concentration of landholdings and wealth in the countryside, and accelerated the exodus of small farmers to cities that are already overcrowded.

In a very real sense, chinampa agriculture has represented a self-contained and self-sustaining system that has operated for centuries as one of the most intensive and productive ever devised by man.

In a quest for small-scale alternatives that are affordable, productive, and ecologically sound, development specialists and environmentalists have formed a somewhat uneasy alliance, in the process bringing forth a new field known as "ecodevelopment" and the more specialized subdisciplines of "sustainable agriculture" and "agroecology". The urgency of the search has sparked a miniboom in the publication of articles and books on the topic, and conferences are being held all over the globe - in Nairobi, Ottawa, London, Mexico City, and Washington, DC. Yet despite a few scattered, often endlessly recycled, success stories, the truth of the matter is that no one has thus far devised much in the way of workable models.

Thus, considerable excitement results when something genuinely promising appears on the scene. This occurred in the mid-1970s, when Mexico's Instituto Nacional de Investigaciones sobre los Recursos Bi6ticos (INIREB) unveiled a plan to build chinampas in the swampy region of Veracruz and Tabasco, along the eastern coast of the country. Derived from the Nahuatl word *chinamitl*, [1] which literally means "enclosure of cane," chinampa agriculture involves the construction of raised farming beds in shallow lakes or marshes. Perfected by the inhabitants of the Valley of Mexico prior to the Spanish Conquest, chinampas had nearly vanished except in a few isolated and shrinking areas around Mexico City, the best known of them being Xochimilco's "floating gardens" that, of course, do not float.

CHINAMPAS AND THE VALLEY OF MEXICO

When the Spaniards descended into the Valley of Mexico in 1519, they viewed spread out before them the lacustrine heartland of the magnificent Mexica (Aztec) empire. The scene filled the invading force with awe. "And when we saw all those cities and villages built in the water," writes Bernal Diaz del Castillo, a 27 -year-old member of the expedition, "and other great towns

on dry land, and that straight and level causeway leading to Mexico, we were astounded. . . . Indeed, some of our soldiers asked whether it was not all a dream."

The capital city of Tenochtitlán-Tlatelolco, containing an estimated population of between 100,000 and 300,000 people spread out around the imposing array of pyramids and temples clustered at its center, occupied an island at the southern end of Lake Texcoco. The city's packed markets, replete with a staggering variety of produce streaming endlessly in by canoe along a latticework of canals, reminded the Spaniards of Venice. In fact, however, it was not the canals but the island itself that was manmade. Tenochtithlán and its sister city Tlatelolco were nothing more than a huge aggregate chinampa. Since its founding in 1325, the island-city had gradually grown as urban sprawl crept over older farming plots, which were simply built anew on the ever-expanding periphery. Further to the south, in the swampy Xochimilco-Chalco Basin, was an even greater concentration of chinampas, covering an estimated 120 square kilometers of terrain.

The indigenous people of the Valley were hit broadside by diseases against which they had no resistance, and their numbers plummeted from an estimated 1.5 million people to as few as 70,000 by the end of the 17th century.

New chinampa beds were, and still are today, built of alternating layers of aquatic weeds, bottom muck, and earth packed inside rectangular cane frames firmly rooted to the lake floor. The "artificial islands" thus formed varied in size, ranging from 30 to 100 meters in length and 3 to 8 meters in width. Ahuejote trees (a type of willow) were planted along the banks of new chinampas to provide shade, while their roots formed living fences that anchored the beds more securely to the lake bottom. The narrowness of the beds assured that the water in the surrounding canals filtered evenly through the plots at root level. Soil fertility was maintained through regular applications of swamp muck, aquatic plants, and manure. Canals one-meter to three-meters wide separated the chinampas, forming a network of islands reachable only by water.

In a very real sense, chinampa agriculture has represented a self-contained and self-sustaining system that has operated for centuries as one of the most intensive and productive ever devised by man. Until the last several decades, it demanded no significant capital inputs yet maintained extraordinarily high yields year after year. A wide variety of crops, ranging from staples such as corn and beans to vegetables and flowers for the market, were mixed with an array of fruit from small trees and bushes. Abundant aquatic life such as fish, salamanders, frogs, turtles, and all manner of fowl provided valuable sources of protein for the local diet.

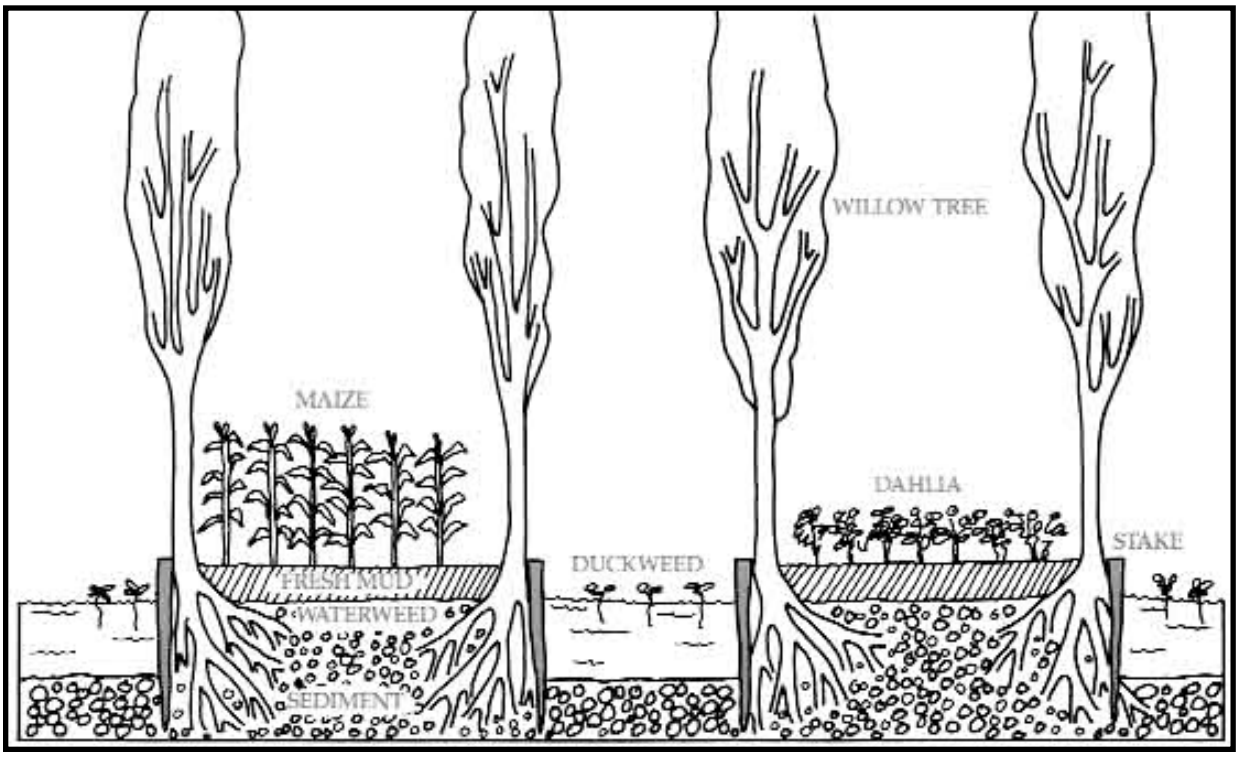

Fig. 2: Diagram shows how traditional chinampa beds are built of alternating layers of aquatic weeds, bottom-muck, and earth packed inside rectangular cane frames firmly rooted to the floor of a lake or marsh. Ahuejote trees, a type of willow, are planted along the banks of new chinampas to provide shade, while their roots anchor the beds more securely to the bottom.

The system is, however, labor intensive. Even today, the primary agricultural tool remains the digging stick; and until recently, no chemical fertilizers, insecticides, or fungicides have been used. The farming plots, which ideally yield as many as four harvests a year, need constant tending. A variety of crops are perpetually in rotation, and the interconnecting waterways must be kept clear of silt and weeds. During the 15th century, the Mexica empire could marshal all the labor it needed. A 15-kilometer causeway had been built by huge work teams to protect the chinampa beds in the southern half of the Valley from heavy concentrations of salt at the northern end of Lake Texcoco. When the empire fell to the conquistadors, the chinampa system was mortally wounded. The indigenous people of the Valley were hit broadside by diseases against which they had no resistance, and their numbers plummeted from an estimated 1.5 million people to as few as 70,000 by the end of the 17th century. Most chinampas were abandoned and neglected, and the Spaniards, having neither experience nor interest in swampland agriculture, drained large portions of the Valley's lake system to make way for livestock herds and the plow.

Gradually, most of the chinampa areas became landlocked and unserviceable. By the first decades of this century, Lake Xochimilco had shrunk to one quarter of its former size. In fact, the lake and its chinampas had survived only because numerous natural springs provided a continuous flow of fresh water. Up until 1900, a canal connected the chinampa farms directly with Mexico City's central market. Further draining dried the canal, and it was replaced by an asphalt road, forcing the local farmers, or chinamperos, to deal with market middlemen. But even with these changes, Xochimilco's “floating gardens” continued to be the major source of vegetables

and flowers for the capital city. The special flavor of the site in the 1930s was nicely captured by the German geographer Elisabeth Schilling, who wrote:

> *The artificial islands or chinampas are used for the intensive cultivation of vegetables and flowers that grow splendidly in the favorable climatic conditions of Xochimilco. As one leaves the village behind, going into the intricate network of canals, the huts made of grass and cane decrease in number. . . For a while an occasional bridge appears, after wards all that remain are tall willows along the edges of the beds, and beneath their shade, fields of vegetables and flowers. One is able to paddle for hours between islands planted with cabbages, spinach, lettuce, cucumbers, celery, jitomates, peas, corn, and on ions; or with lilies, carnations, poppies, tulips, forget-menots, alcatraces, nardos, chry san themums, pansies, and daisies. During the season when the nardos and carnations are in flower, the landscape is especially beautiful and the senses are hit with an intoxi-cating perfume.* [2]

In recent years, however, the chinampas have been steadily constricted as Mexico City has extended out and swallowed Xochimilco. The fresh-water springs that once fed the canals have been diverted for urban use, and more than two-thirds of the beds farmed in the 1930s have dried up and been covered over with houses and streets. The chinampas that remain are fertilized with low-grade sewage; and many of the canals have become stagnant and contaminated with gar-bage, domestic waste runoff, and increasingly, the insecticides and chemical fertilizers that chi-namperos are using to raise new and "improved" plant varieties. The fauna once so abundant in the area has vanished; the willows are dying off; and if the present trend continues, the livelihood of the chinamperos will soon follow suit.

TRANSPLANTING CHINAMPAS

It is not only the chinamperos who have been suffering in rural Mexico. During the 1970s, the entire agricultural sector began plunging into acute crisis. The country rapidly lost its produc-tive self-sufficiency and became heavily dependent upon imported grains to satisfy basic food needs. The Green Revolution had brought forth new strains of high-yield and drought-resistant crops, and helped to extend the agricultural frontier into regions that had formerly been wilder-ness. But at the same time, scientists at INIREB saw that this process encouraged the accelerat-ing concentration of land into large holdings farmed with modern, capital-intensive techniques. These operations required sophisticated farm machinery; heavy inputs of chemical fertilizers, insecticides, and herbicides; and infrastructure for storing and transporting produce. Several in-terlocking trends converged, driving the rural sector into a downward spiral: Peasant farmers, lacking capital, were virtually excluded from the benefits of the new technologies; biological di-versity declined as new regions were opened up for mono cropping; contamination with agro-chemicals became widespread; and soil fertility dropped as erosion took a heavy toll. At the

same time, cattle ranching was booming - expanding at a rate of almost 1,000 percent between 1960 and 1976.

Peasant farmers, increasingly feeling the pinch for land, became the objects of heavily financed colonization projects in the southern states of Veracruz, Tabasco, and Chiapas. However, the fragile tropical soils of these regions, when worked by traditional slash-and-burn farming methods, degenerated rapidly. Within a short time, production of food staples had declined precipitously, and more than half the land was converted into cattle pasture. At this crucial juncture, the INIREB scientists actively began to search for alternatives. The institute's central office is in Xalapa, Veracruz, and INIREB focused its attention on the humid tropical lowlands of this southeastern coastal state. Interestingly, the search for potential solutions for this impoverished yet water-rich region led back to the nation's heartland.

The once-flourishing chinampa system in the Valley of Mexico was literally drying up, but the model remained intact and seemed to fit the bill perfectly. It promoted biological diversity, thrived without chemical inputs, and maintained high year-round crop yields. This was no abstract conceptual theory that required exhaustive testing, but a living, functional system that had proved it could work. And beyond this, it had a romantic patina about it: In the mid-1970s, it was announced as "an old answer to the future," a phrase consciously used to suggest revitalization of a remnant of the glorious Mexica past.

Earlier this year I visited four chinampa projects in Veracruz and Tabasco as part of an IAF-sponsored assessment of ecodevelopment projects among peasant farmers in Mexico, and I discussed chinampas in other areas with scientists and technicians involved in agroecology. Ten years had passed since the idea of transplanting this pre-Hispanic technology from the high altitudes (2,250 meters above sea level) of the Valley of Mexico to the coastal marshes of the Southeast had been put into action. Given the currently intense interest in ecologically sound agricultural technologies, it seemed time for a closer look at how things were going. What follows are brief case histories tracing the evolution of two chinampa projects, one in Tabasco, the other in Veracruz.

THE CHONTAL "RAISED BEDS" OF TABASCO

Fig. 3: Sites of contemporary chinampa projects in the humid tropical lowlands on Mexico's southeastern coast. This self-sustaining agricultural technology was perfected by the inhabitants of the Valley of Mexico prior to the Spanish Conquest. Inset shows Lake Texcoco - where chinampa agriculture was perfected - as it was in 1520.

In 1976, INIREB selected Tabasco as the site for the first chinampa experiments in the lowland tropics. The area was perceived as ideal for several reasons. First, INIREB's central office was located nearby in the contiguous state of restricted areas where a handful of Chontales grow subsistence crops on tiny par-

cels of land, but the bulk of their livelihood comes from wage labor, primarily in oil-rich Villahermosa. In 1978, the Instituto Nacional Indigenista (INI) - Mexico's official arm of assistance to its Indian peoples - joined with the state government of Tabasco to begin construction of a series of large "raised agricultural beds," or *camellones,* in the swamps bordering the Chontal villages of Tucta, La Cruz, and Olcuatitim.[3] The idea for the project was buttressed by two seemingly favorable precedents. Early reports were touting the success of an INIREB chinampa project in another part of the state, at a place called San Pedro Balancán. In addition, archaeologists had discovered the remains of what appeared to be pre-Hispanic raised agricultural beds in Tabasco, supporting the notion that such systems were ecologically appropriate. Heavy financial backing was forthcoming from the Mexican government and the World Bank.

INI's stated objectives for the project were to: (1) provide the landless Chontales with permanent employment; (2) bring about self-sufficient food production in the area; (3) ensure a constant production of vegetables for the internal market of Villahermosa; (4) strengthen indigenous cultural identity; and (5) develop a real alternative for the incorporation of swampland into productive activities.

Unstated agendas and suppositions lurked beneath each of these objectives. There was an attempt to divert the Chontales away from wage labor, which was deemed degrading, through the intensive cultivation of both cash and subsistence crops. There was a plan, modeled on Xochimilco's relationship to the markets of Mexico City, to create a vegetable production center for nearby Villahermosa. The project was supposed to strengthen the ethnic identity of the Chontales by returning them to what were imagined to be their pre-Hispanic roots. And finally, it was viewed as a pioneering scientific venture, an experiment to reclaim agricultural land in marshy areas, through the resurrection of chinampa technology. What is significant about the stated and unstated objectives is that neither set grew spontaneously out of the Chontal community.

One of the principal sites for the new project was Tucta, a Chontal village of approximately 300 families, located half an hour by car from Villahermosa. The hamlet sits on the edge of a huge openwater swamp and is boxed off on the landward side by cattle ranches owned by non-Indians. Before the project began, only 10 percent of village families were actively farming plots, which ranged from one-fifth to one-half hectare in size.

The introduction of chinampa technology here began on a grand scale. To speed up the traditional mode of construction through hand labor and the meticulous layering of organic matter and mud, INI brought in huge aquatic dredges. They clawed up mud from the swamp bottom and heaped it in piles measuring roughly 30 meters across and from 100 to 300 meters in length. The 65 raised strips of land that resulted were enormous, but the natural order of mud within them was inverted. Organic material was not integrated into the beds, and the richest soil was placed on the bottom, leaving the surface covered with sterile clay that hardened like cement when exposed to the air. Although the beds looked like chinampas, they lacked the fertility and porosity to function as chinampas. At the same time, the irregular gouging action of the dredges had left the surrounding canals with a pitted bottom ranging from one meter to five meters in depth. This made it virtually impossible for the Chontales to use dragnets for fishing around the beds.

Fig. 4: A 1961 photo of barges filled with Sunday visitors in Xochimilco, Mexico City's famed "floating gardens." The gardens, still a popular recreation spot, are the remnants of a vast system of chinampas, estimated to have covered some 120 square kilometers of the Xochimilco-Chalco Basin in the 16th century.

Compounding these difficulties, INI decided to organize the Chontales into collective work teams. According to INIREB technicians, who were brought into the project at a later stage, this particular form of organization was entirely foreign to the people of Tucta. The initial project managers apparently rationalized the decision in two ways. First, pre-Hispanic Indians were believed to have worked communally, making this the most appropriate form of labor for implementing a pre- Hispanic technology; and second, it would foster social solidarity among the Chontales. During the first season, participants were paid daily wages for their work from a fund controlled by INI; the actual rewards for working communally would be distributed only after the harvest was in and the cost of advanced wages had been deducted from profits.

Technical assistance and capital subsidies were heavy during the first year. Collaborating institutions introduced massive amounts of organic matter and fertilizers into the dense clay beds to improve the quality of the soils. Technicians worked closely with the Chontales to teach them how to grow a series of vegetables that were largely exotic to the region and totally exotic to the Chontales. Actually growing the vegetables meant that everyone involved had to overcome new and difficult challenges. Chinamperos brought in from the Valley of Mexico as advisors were unfamiliar with the volume and variety of insects they encountered in sweltering Tabasco, and were forced to resort to large quantities of chemical insecticides. The growing seasons for specific crops were also different from those in the Valley of Mexico, and adjustments had to be made. Although the farmers reportedly continued to chafe under the unfamiliar practice of working in teams, the payment of wages helped mitigate the snags and confusions, and by all accounts, the first harvest was reasonably good.

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But the real problems, according to people initially involved with the project, started when the vegetables began to ripen. Despite all of the technical expertise poured into the project, no one had researched the market situation, and no arrangements had been made for transporting and selling the highly perishable produce. With crops rotting in the resulting disarray, wholesale buyers from Villahermosa appeared on the scene and purchased whatever they wanted at cut-rate prices. The first harvest yielded an economic shambles. Disputes were soon erupting over cash and labor arrangements among program beneficiaries, and the Chontales rapidly lost interest in trying to grow garden vegetables for the urban population of Villahermosa. Several efforts were made to retool the project. One of the chief complaints of the Chontales had to do, ironically, with one of the few ways the raised beds truly resembled chinampas. Isolated from each other by water, the beds were difficult to reach from the village. This defect was corrected by adding a strip of land at one end that linked the beds together in the form of a comb. The plots became readily accessible by foot, but unfortunately, the new structure cut off the natural flow of water through the canals, reducing the accumulation of silt and weeds needed to fertilize the gardens. The project continued its slide into disorder until INIREB, which began to provide technical assistance in the early 1980s, started listening to the Chontales. Communal labor was abandoned, and the 65 raised beds were divided among individual families to conform with traditional arrangements. Intensive vegetable gardening was discontinued; according to one of the INIREB technicians now working with the Chontales, even today "when somebody mentions the word 'vegetables'; the villagers' hair stands on end." Most families grow subsistence crops such as corn, beans, and bananas, together with some fruit trees. These crops are not labor or capital intensive, and can be tended while the Chontales pursue wage labor in Villahermosa - a secure source of family income. Bit by bit, some of the more enterprising farmers are moving, cautiously and on a small scale, back into cash crops.

THE CHINAMPAS OF EL CASTILLO

In 1979, INIREB became involved in another chinampa project in the ejido of EI Castillo, in the state of Veracruz. El Castillo is a community of approximately 100 peasant families in a region dominated by undulating hills of coffee plantations. The site includes a lake with several marshy inlets that had been formed by a dam built in the 1960s. It is clear that EI Castillo was selected

as an experimental project site because of the lake, as well as the village's proximity to INIREB's central office in Xalapa, rather than community interest in chinampas. When INIREB presented its proposal during a town meeting, the only person to step forward was a teenager named Imeldo Mendez Carmona who owned property that fortuitously included one of the inlets of the lake. Imeldo took several technical courses at INIREB headquarters, and plans were made to build chinampas as part of a model integrated farm, or granja integrada, on his land. The InterAmerican Foundation, along with several other international donors, enthusiastically funded the program.

The larger "integrated" operation included pig and chicken raising, fish culture, and a biogas machine, but the chinampa system clearly constituted the showpiece. The proposal was a unique attempt to blend modern and pre-Hispanic technology, and enthusiasm among INIREB technicians and participating students ran high. Under the technical direction of a chinampero from the Valley of Mexico, four chinampa beds were built - each measuring thirty by eight meters, with three-meter-wide canals in between. Ahuejote trees were planted along the borders of the beds to form living fences. Most of the physical labor was supplied by hired peasant laborers and by students complying with thesis requirements at the Technical Agricultural School of Veracruz, located in Xalapa. Construction was completed toward the end of 1980, and by March of the following year the farm was operating full swing. In the words of one technician, the project had been designed to create “an emporium in the jungle;” a highly productive, intensively worked vegetable garden. Despite early difficulties - the growing seasons did not match those of the Valley of Mexico, and insects descended in legion - the crew forged ahead. Imeldo and four companions, assisted by INIREB technicians and the students, grew an impressive crop of cabbages, carrots, peppers, tomatoes, beans, Swiss chard, and coriander. As among the Chontales, the workers were paid wages or otherwise recompensed for their labors. However another, more disturbing similarity to the Chontal project soon materialized. No one had thought about marketing harvested produce, even though INIREB had an economist on the project team.

Fig. 5: Aerial view of camellones, or artificially raised agricultural beds, constructed in Tabasco. Although the beds look like chinampas, they lack the fertility and porosity to function as chinampas.

Confusion followed as INIREB technicians attempted, ad hoc, to make lastminute contacts with restaurants and wholesalers in Xalapa. Because local demand was minimal and production was irregular, most of the produce was either sold for next to nothing at the farm, fed to the pigs, or left to rot in the field. As all of this was happening, Imeldo drowned while swimming in the lake. Three of the villagers working on the project deserted, and Imeldo's brother was left to continue on his own, with assistance from hired workers paid by INIREB. A short time later, INIREB pulled out en-

tirely. The salary of the last peon discontinued, the free truckloads of manure stopped arriving, the technicians and the students vanished, and the farm was abandoned. In June of 1987, I stood with two INIREB technicians on the dirt road overlooking the remains of the farm. It is set in a bullrush-clotted corner of EI Castillo's lake, on the lip of a small valley that meanders out of adjoining coffee plantations. Before us were the cracked cement walls of an abandoned biogas tank and a pig pen with a collapsed, tarpaper roof. Beyond these were four indistinct, rectangular plots of grassland extending out into the bullrushes. Ten-meter-high ahuejotes stood in uneven lines along the beds, and the canals separating the beds were clogged with aquatic weeds. A horse grazed on grass near the edge of two small, overgrown fish ponds lying perpendicular to the beds. This was all that remained of El Castillo's pre- Hispanic emporium in the swamp.

The Chontal case is notable because, after a series of failures, it finally worked - but only after INIREB technicians broke free from preconceived programs and began listening to the Chontales.

THE MYTH LIVES ON

The difficulties encountered in El Castillo and among the Chontales are not exceptions: Nowhere in the country has the transfer of chinampa technology from the Valley of Mexico to the humid lowlands been successful. What, then, is to be concluded from this experience? And what can be said about the future of chinampa agriculture as an agroecological model appropriate for poor farmers in Latin America? Although the examples of chinampa technology transfer presented in this article had different outcomes, they shared several crucial defects. In both cases, the stated and unstated objectives of project managers had little fit with the interests and needs of the farmers. The two projects were designed and implemented by outside technicians without significant local participation, and both rapidly fell to pieces when “beneficiaries” failed to cooperate. In both cases, the technicians were preoccupied with the narrow technical task of implanting an agroecological model. They overlooked the wider social, economic, and political context in which the farmers lived, and therefore had no notion of how their model might adapt within that context. Among the Chontales, this situation might have been avoided if representatives from the various participating agencies had simply listened to the villagers, discovered their needs, and given them an opportunity to participate in the decisions and actions being taken. In the case of El Castillo, it is probably safe to say that the lack of local interest from the outset meant the project would never have worked, least of all as a "community" endeavor.

It might be argued that if Imeldo had lived and the various technical and economic wrinkles had been ironed out, the chinampa beds at El Castillo not only would still be functioning, but would have also served to promote the technology among other farmers in the region. However, closer examination shows this outcome to be unlikely. Too few of the necessary conditions for intensive chinampa gardening were present. The lake was too deep for chinampa construction beyond a few marshy inlets, making significant expansion virtually impossible. Vegetable gardening could not compete as a cash crop with coffee growing, a traditional activity that has low risks, comparatively minimal labor requirements (except during the harvest season), well-established market channels, and relatively high and stable prices. The abundance of land already available for subsistence crops meant that there was no need to build chinampas for that purpose either. The project at El Castillo failed completely, and little more than the lesson that community participation is essential was salvaged. Too many hidden subsidies, coupled with an absence of controlled data, rendered it valueless even as a pilot experiment.

The Chontal case is notable because, after a series of failures, it finally worked - but only after INIREB technicians broke free from preconceived programs and began listening to the Chontales. When this occurred, the project fell in line with Chontal interests and achieved harmony with local social and economic structures, as well as Tabasco's physical environment. Collective labor was stopped, and the beds were divided up among individual families - an arrangement that, incidentally, obtains in the Valley of Mexico today and was also the prevalent form of labor organization on chinampas prior to the Spanish Conquest. Subsistence crops with low labor demands took the place of exotic, intensively farmed vegetables, which solved two problems simultaneously. First, since traditional crops have much greater resistance to disease and insects

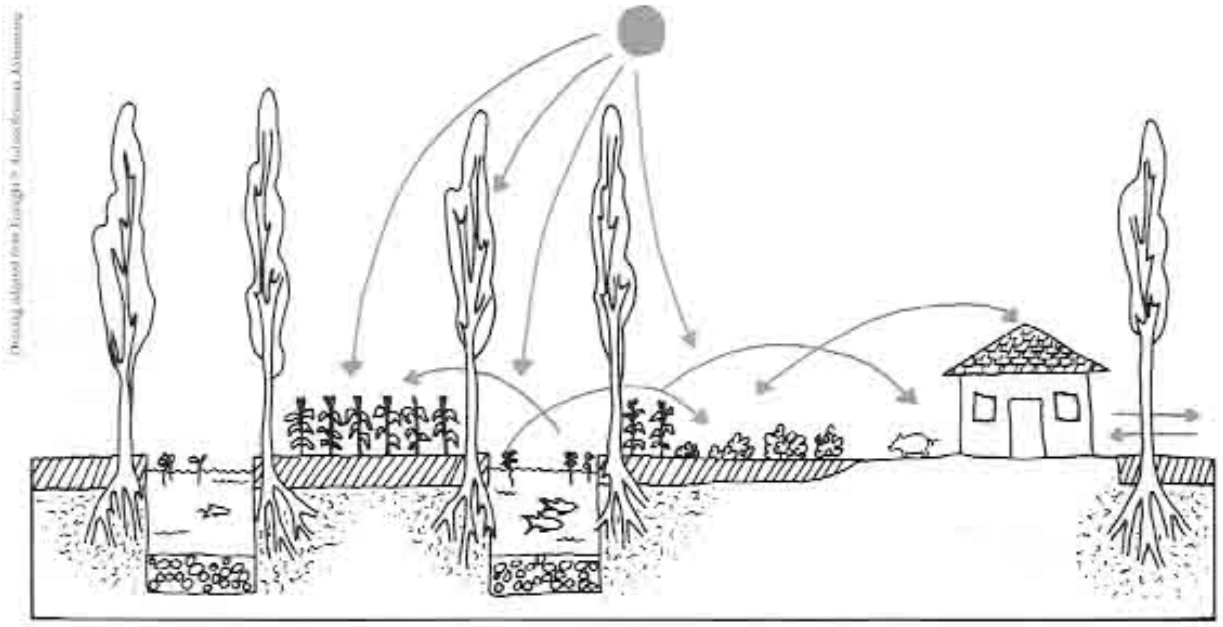

Fig. 6: Diagram of model farm, or granja integrada, such as the one built at El Castillo. The operation included pig and chicken raising, fish culture, and a biogas machine, but the chinampa system constituted the showpiece of the project - an attempt to blend modern and preHispanic technology.

than newly introduced vegetables, they require fewer chemical controls. Second, the Chontales are now free to carryon their former wage labor pursuits, and they have additional land on which to grow more of their own food.

Despite the favorable outcome, it should be noted that the Chontal project does not constitute much of a model for application in other regions. First, the cost of the construction alone - not to mention additional expenses for subsequent work to restore the integrity of the soils and for massive technical assistance - was monumental, especially when one realizes that a mere 65 families benefited. Second, the raised beds are not really chinampas. They lack the intricate layering of organic matter and swamp muck that gives traditional chinampas their fertility, and the porosity for water to filter through the beds at root level. While the chinampa model involves basic symbiotic relationships among a series of elements, the Chontal beds accommodate fairly straightforward subsistence farming. They contain no great diversity of interrelated cultigens; animals such as pigs and chickens, where present, wander about more or less at random or are kept in pens as part of INIREB experiments; fishing is still done in much the same way that prevailed before the arrival of the raised beds; there is no systematic routine of dredging aquatic weeds and muck from the canals to fertilize the plots; and the bulk of the soil restoration work thus far has been provided by government institutions. In other words, any correspondence between chinampa agriculture - as an ideal construct - and the raised beds of the Chontales of Tabasco is minimal.

Why, quite simply, has it been so difficult to move the conceptual model from the scientist's head to the peasant's field?

I recently spoke to a biologist about the failure of attempts to apply the chinampa system, and after expressing his disappointment, he added, “but I still think the model is valid.” Perhaps, but one must also question the utility of a conceptual model that has so eluded successful application in real life. Since the first chinampas were proposed in the mid-1970s, they have yet to find a comfortable niche among peasant farmers struggling to adapt their daily routines to the complex modern world. Why, quite simply, has it been so difficult to move the conceptual model from the scientist's head to the peasant's field?

In pre-Hispanic times, the chinampa system thrived in the Valley of Mexico because the social, political, economic, and environmental circumstances were favorable. In other words, the total ecological context-including the dynamics of human society as well as that of “nature” - was right. Where there were problems with salinity and periodic flooding, the Mexica state sponsored construction of hydraulic infrastructure in the form of causeways, dikes, dams, and channels for diverting spring water. The dense population of the region, the propitious climatic conditions, the shallowness of the lakes, the existence of a totalitarian state with tight harness

over its subjects - all of these shaped the environment in which the chinampa system evolved. It was not an imported model. It developed naturally over a period of centuries as an adaptive response by the people of the Valley of Mexico to meet their particular needs, reaching its apex at the time of the Spanish Conquest.

Although the chinampa system has survived into the 20th century, it has done so only as a threadbare remnant. In its final foothold in the highlands, conditions are becoming so overwhelmingly adverse that the model will soon exist only in history books. Attempts to transplant this moribund technology to other regions have failed because the necessary conditions for success have not been found there. Perhaps they no longer exist, and the time of the chinampa - like that of the steam engine - has passed. It is very possible that in contemporary Mexico the chinampa model can never function as much more than a small-scale scientific sideshow kept afloat by heavy subsidies - a characterization expressed to me on numerous occasions by both peasants and technicians. Yet the myth lives on in the literature with remarkable vigor. Articles centerfolding the chinampa system as a viable alternative continue to appear with regularity in magazines and journals such as Ambio, The Ecologist, and Discover, as well as in books and monographs. The authors of an article published in 1986 in the World Resources Institute Journal proclaimed that the modern application of chinampa technology in Tabasco and Veracruz has been " . . a concrete success. . . one of the most novel advances in agriculture for tropical humid lands throughout the world." And the following glowing description of an unspecified "project" involving chinampas in Tabasco is taken from an otherwise excellent survey of agroecology published as recently as June 1987:

. . . researchers have designed and installed production units based in part on indigenous polyculture and in part on the application of ecological knowledge. . . . each production unit consists of a forest shelter belt, a water-storage tank or reservoir, raised-earth areas for vegetable production, and areas for growing staple annual crops and fruits. In the reservoirs, fish and ducks are raised. Reservoir sediments and aquatic plants are used as fertilizer for crops and to construct chinampas. . . . Organic matter from the reservoirs and manure from pigs, chickens, and ducks (fed excess or spoiled produce) enrich the soil of the chinampas continually. . . . Traditional mixtures of crops, primarily vegetables, are cultivated intensively. With this broad array of species, some food is always available for harvest, every usable patch of ground is covered by plants, and light is more completely utilized. . . . Pest management in these production units requires no commercial chemical pesticides. The forest shelter belts probably act as reserves for numerous predators and parasite insect pests, and the high structural and species diversity of the cropping system also favors these beneficial organisms. . . . In short, [the Tabasco project] shows that eco logical principles and practical knowledge can be successfully combined to create self-renewing agricultural production systems.

Several things are interesting about this idyllic picture of agroecological harmony. First, it is presented as a system actually being practiced by Tabascan peasants. The fact of the matter is that there never has been a single project like this, either in Tabasco or anywhere else. The description quoted above was drawn from an earlier article - published in 1981, in the Dutch journal Agro-Ecosystems [5] - which was intended to be essentially theoretical. It was a thickly tex-

tured composite of features from several sites, including experimental plots, that were interwoven with a series of imagined elements from an ideal system. Although not stated explicitly in the article, according to principal author S.R. Gliessman, the purpose was to present" a variety of ecological concepts" that might be combined into an alternative production system for peasants.

What has happened here is that the chinampa model, after years of promotion in journals and through word of mouth, has managed to break free from the constraining grip of the tangible world to take on a life of its own. The curious thing about the "Tabascan case" is not that it is an exception, but rather that confusions of this sort are common, even normal. They occur repeatedly and can be found occupying prominent places throughout development literature. This appears to be especially true in the subfield of ecodevelopment, perhaps because of the desperate urgency surrounding the search for valid models. All too often, this search has been hindered by the predisposition of both scientists and funders - in their scramble after strategies to stem destruction of the planet - to promote and support models before they have been tested in the field. And more specifically in the case of the chinampa phenomenon, considerable time and money are wasted when we become blinded by the beauty of a conceptual model and lose our bearings, mistaking it for reality itself. We end up seducing ourselves.

NOTES

1. Nahuatl was the predominant language of the Valley of Mexico at the time of the Spanish Conquest, and is still spoken widely by indigenous people throughout Central Mexico.

2. "Los Jardines Flotantes de Xochimilco," by Elisabeth Schilling, in La Agricultura Chinampera, edited by Teresa Rojas Rabiela, Colección Cuadernos Universitarios, Universidad Autónoma Chapingo, Mexico City, 1983, p. 74.

3. Most of the information in this section is based on lengthy discussions with INIREB technicians and farmers; a visit to the site; and an INIREB document, "Los Camellones Chontales," by Lilia Aleman Ramos, Justino Lobato Carcamo, Pedro Gonzalez Franco, and Olivier Pierard, INIREB/Tabasco, February 1987. This paper was presented at a symposium entitled "Practicas Tradicionales y Manejo Integrado de Recursos," at the Universidad Nacional Autónoma de Mexico in June 1987.

4. To Feed the Earth: Agro-Ecology for Sustainable Development, by Michael Dover and Lee M. Talbot, World Resources Institute, Washington, nc., 1987, pp. 40-42.

5. "The Ecological Basis for the Application of Traditional Agricultural Technology in the Management of Tropical Agro- Ecosystems," by S.R. Gliessman, R. Garcia E., and M. Amador A., in Agro-Ecosystems 7, Amsterdam, 1981, pp. 173-185.

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