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# Traditional Mesoamerican Agriculture

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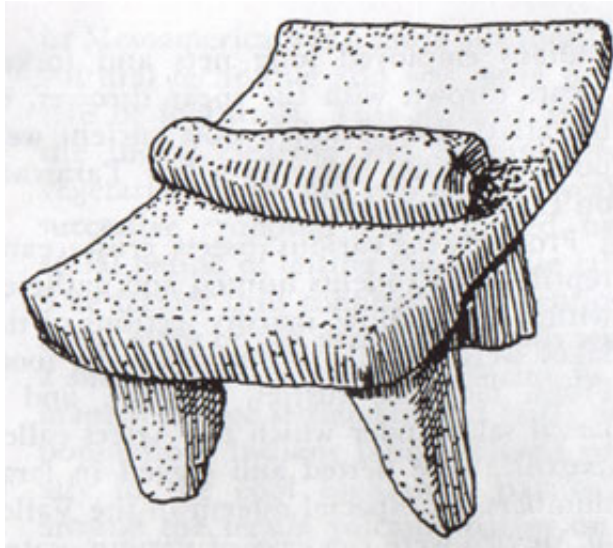
### Food and Agriculture

The dense pre-Spanish population of many parts of Mesoamerica was supported by a well-developed agriculture. A large number of domesticated plants were cultivated by farming techniques sufficiently advanced to produce a food surplus. In Mexico and northern Central America, Indians cultivated nearly 90 different species of plants. Seventy of these were native to the area; the remainder, imports from South America ([Table 8.1](#)). We have already noted that the most important food crops of Mesoamerica were maize, beans, and squash, still the basis of life for millions of Mexicans and Central Americans. This plant triad affords a fairly well-balanced diet. Maize furnishes the starch or carbohydrate element and is also rich in oil and protein; beans provide the protein component, largely taking the place of meat; and squash offers a variety of essential vitamins in its oil-rich seeds, which are roasted, and in its flowers and flesh, cooked as vegetables. Indians cultivated all three crops together in the same plot, as they do today. Through centuries of cultivation, something of a symbiotic relationship has developed among these three plants: the tall maize stalks serve as supports for the climbing bean vines, which in turn enrich the soil with nitrogen; and the squash, being a creeper, covers the ground beneath the maize and beans with its wide leaves, protecting the loose soil from undue erosion by the heavy afternoon downpours characteristic of the summer rainy season. The Indian farmers of Mexico and northern Central America made five important starch foods from maize, just as their pure- and mixed-blood descendants do today.

1. The *tortilla*, a thin, round pancake of maize dough baked on a large clay plate (*comal*), was the most common food.
2. *Tamales* were made by filling maize dough with meat, beans, or Chile peppers, wrapping in corn husks, and boiling.
3. *Pozole* was a thick soup of hominy (whole, cooked kernels of corn) with other vegetables, highly seasoned with Chile pepper. In southern Mexico, *pozol* (spelled without an e) was a watery gruel of corn meal flavored with chocolate.
4. *Atole*, perhaps the most ancient of the maize foods, was a thick, starchy gruel of boiled maize dough, flavored with Chile pepper, and drunk from a clay bowl.
5. *Pinole*, made by grinding toasted maize kernels to a coarse flour and often flavored with honey, could be carried on long trips without spoiling, and a gruel could easily be prepared from it. Pinole was the road provision for travelers, merchants, and soldiers.

Tortillas, tamales, and stole were prepared from a heavy dough (*masa*, or *nixtamal*)

made by grinding boiled maize kernels on the metate, or stone quern (Figure 8.9).



**Figure 8.9.** An Indian metate, or grinding mill, still used in most parts of Mexico and northern Central America

In addition, fresh green corn was parched as roasting ears, and dried kernels of specific varieties were either parched or popped on the *comal*.

Besides maize, the Indians of southern Mexico domesticated another grain, amaranth, a weedlike plant that yields a colorful spike of tiny seeds rich in starch and oil. In pre-Conquest times in the Mesa Central of Mexico, this grain was almost as important a food as maize. Its

significance as a ritual food presented to native gods in Aztec temples attests to its antiquity. Today only small plots of amaranth are cultivated in isolated localities in Mexico and Guatemala. Curiously, the small village of Tulyehualco, a few miles south of Mexico City, specializes in the cultivation of this tiny seed for making small cakes that are eaten only during Holy Week and Christmas.

Other food plants cultivated aboriginally included at least two starchy tubers -- the sweet potato and the sweet variety of manioc (yuca), both of South American origin. Among the vegetables, besides several kinds of squash, were the tomato and the piquant condiment, chile pepper. High in vitamin C and an active stimulant of the salivary glands, chile enlivens the bland maize foods and adds to the human dietary requirements. Over 30 different species of fruits, most of them tropical plants of Mexican or Central American origin, were cultivated in Mesoamerica. Among the most important were pineapple; cacao, or the chocolate bean tree; avocado, or alligator pear; papaya, or melon tree; many kinds of soursops, such as the chirimoya; at least five species of sapotes; the hog plum; and many others.

Most of the American food plants that we have mentioned have now spread to many parts of the world, particularly to the tropics and subtropics of Africa and Asia, where they have revolutionized native food habits and have increased the efficiency of human diet several fold. Undoubtedly, their domesticated plants were the American Indians' greatest gift to the world.

The Mesoamerican Indians cultivated many plants for purposes other than food. Cotton and agave (the century plant) furnished fiber for weaving cloth. Several species of agave, called "maguey" in Mexico and Central America, were put to many uses. Not only do these plants produce a stout fiber in their large, fleshy leaves, but they also yield a sweet sap, which, when fermented, becomes the famous pulque of central Mexico. Since this mild intoxicant contains ascorbic acid and many kinds of vitamins, it was, and still is, an essential part of the diet of the maize-beans-squash eaters in many parts of the highlands of Central Mexico. Tobacco for smoking and copal for incense were cultivated mainly for ceremonial use, while *achiote* was raised for its red dye, which was used to color food and to paint the body. Several flowers, such as marigold and dahlia, were domesticated in central Mexico and used for decorating temples and graves.

In contrast to their wealth of agricultural plants, the Indians of Mexico and northern

Central America had only three truly domesticated animals. These were the dog, one variety of which was the short-legged, hairless, edible type; the turkey, domesticated probably in southern Mexico; and the small stingless bee, kept for its honey and wax. Two small scale insects were semidomesticated. One was the cochineal bug, which feeds on the nopal, or prickly-pear cactus, and was reared for a scarlet dye. Another scale bug, called *aje*, or *ajin*, was raised on certain trees for its wax, which was used as a base for paint, lacquer, and acid for burnishing pottery.

The Mesoamerican Indian supplemented his predominantly vegetable diet by fishing, hunting, and gathering wild animal life within his environs. It was particularly around the environment of highland lakes within the volcanic areas of central Mexico and Central America that these activities became well developed among the farming population. Lakes usually afford a great variety of food for man, the edible animal life ranging from fish and aquatic birds to insects, including their eggs and larvae. At the time of the Spanish Conquest, the highland Indians of Mexico and Guatemala appear to have hunted little large game, which may have been a reflection of the depletion of wild life after centuries of human occupation. For these people, the lake fauna had become the main source of animal food.

Fishing was an important occupation around the lakes of the Mesa Central, especially in the Valley of Mexico and the lake-studded Tarascan country. Most of the lacustrine fish resource was composed of small, sardinelike varieties, formerly caught by the thousands in nets and dried for later consumption. So important was lake fishing among the Tarascans that the Aztecs called their neighbors' area Michhuacan ("place of the fishers"), the origin of the present state name, Michoacan.

The hunting of aquatic fowl was probably as significant as lake fishing. Every year, myriads of migratory waterfowl (mainly ducks and coots) from North America nested in the reed-clogged lake shores in central Mexico. For fowling, the Indians employed long nets and forked spears thrown with the spear thrower, or the atlatl, one of man's most ancient weapons, still used today by a few Tarascans on Lake Patzcuaro.

Probably the various insects, crustaceans, reptiles, and rodents hunted and gathered within the shallow, marshy sections of the lakes were equally as important as food. Frogs, tadpoles, turtles, crayfish, and a larval salamander which the Aztecs called *axoxotl*, were netted and gilled in large numbers. Of especial esteem in the Valley of Mexico were the eggs of various waterbugs that the Indians gathered from reeds growing along the lake shores. These eggs formed the famous ahauhtle ("Aztec caviar"). Until a few years ago, villagers in the southern part of the valley gathered and ate ahauhtle. Moreover, the larvae of the salt fly as well as green algae were skimmed from the lake surface for food. Away from the lakes, Indians habitually gathered and ate as delicacies toasted grasshoppers, various ants and their larvae; the maguey grub, which feeds on the agave plant; and other insects. Although such animals are not considered proper food in Western society, they are rich in protein, niacin, riboflavin, and several minerals essential to the human diet. These seemingly weird foods helped to supply dietary deficiencies that might have occurred among a population dependent mainly on maize, beans, and squash, and, in times of drought (not infrequent on the central plateau), the lake resources served as famine food. During the past 200 years, the various activities that once centered around the lakes in central Mexico have greatly declined, owing to natural desiccation and artificial draining of the water bodies.

## Systems of Tillage

To cultivate their many domesticated plants, the Indians of Mesoamerica developed various methods of farming consonant with natural conditions and their technical knowledge. At least two general systems of tillage prevailed in Mexico and Central America before the arrival of Europeans: (1) migratory slash-burn cultivation; and (2) advanced farming, which involved (a) systematic fallowing of permanent fields and, occasionally, (b) terracing and/or irrigation. Despite the availability of numerous European agricultural practices and tools during the past 450 years, Indian farming techniques persist in various parts of Mexico and Central America.

**Table 8.1 MAJOR DOMESTICATED PLANTS CULTIVATED IN MESOAMERICA, 1500 A.D.**

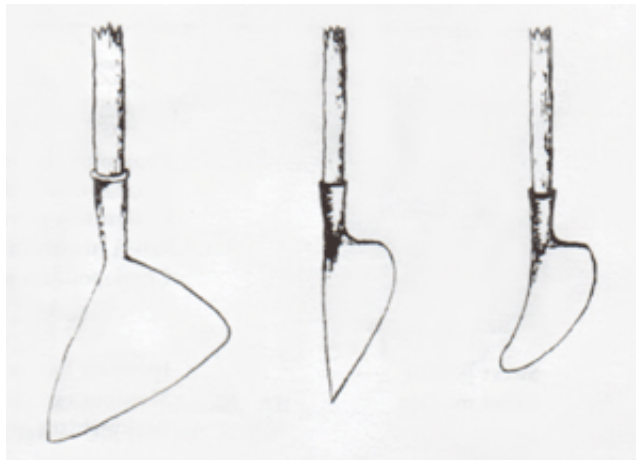
<i>Plant</i>	<i>Scientific Name</i>	<i>Place of Origin</i>
<b>SEED PLANTS</b>		
Maize	<i>Zea mays</i>	S. Mexico; Guatemala (possibly)
Beans	<i>Phaseolus</i> (4 species)	S. Mexico; Guatemala
Amaranth	<i>Amaranthus cruentus</i>	S. Mexico; Guatemala
Sunflower	<i>Helianthus annuus</i>	S.W. United States or western Mexico
Chia	<i>Salvia hispanica</i> <i>Chenopodium nuttalliae</i>	Mexico
<b>TUBER PLANTS</b>		
Sweet potato	<i>Ipomoea batatas</i>	South America
Sweet manioc	<i>Manihot esculenta</i>	South America
Jicama	<i>Pachyrrhizus erosus</i>	Mexico
<b>VEGETABLES</b>		
Tomato	<i>Lycopersicon esculentum</i>	S. Mexico; Guatemala
Husk tomato	<i>Physalis ixocarpa</i>	S. Mexico; Guatemala
Chayote	<i>Sechium edule</i>	S. Mexico; Guatemala
Squash	<i>Cucurbita</i> (4 species)	S. Mexico; Guatemala
<b>FRUITS</b>		
Cacao	<i>Theobroma cacao</i>	S. Mexico; Guatemala
Avocado	<i>Persia americana</i>	S. Mexico; Guatemala
Pineapple	<i>Ananas comosus</i>	South America
Papaya	<i>Carica papaya</i>	S. Mexico; Guatemala
Tuna cactus	<i>Opuntia</i>	Mexico
Chirimoya	<i>Annona cherimolia</i>	South America
Mamey	<i>Calocarpum mammosum</i>	S. Mexico; Guatemala
Chicosapote	<i>Achras sapote</i>	S. Mexico; Guatemala
Mexican cherry	<i>Prunus coccinea</i>	Mexico

( <i>capulin</i> )	<i>Prunus capuli</i>	Mexico
Hog plum ( <i>jocote</i> )	<i>Spondias mombin</i>	S. Mexico; Guatemala
Guava	<i>Psidium guajava</i>	S. Mexico; Guatemala
Vanilla	<i>Vanilla planifolia</i>	S. Mexico; Guatemala
FIBER PLANTS		
Agaves	Agave (5 species)	Mexico
Cotton	<i>Gossypium hirsutum</i>	S. Mexico; Guatemala
CONDIMENTS		
Chile pepper	<i>Capsicum</i> (various species)	S. Mexico; Guatemala
DYE PLANTS		
Achiote	<i>Bixa orellana</i>	South America
Indigo	<i>Indigofera suffruticosa</i>	Central America
CEREMONIAL PLANTS		
Tobacco	<i>Nicotiana</i> (2 species)	South America
Copal	<i>Protium copal</i>	S. Mexico; Guatemala
ORNAMENTALS		
Dahlia	Dahlia (4 species)	S. Mexico; Guatemala
Marigold	<i>Tagetes</i> (2 species)	Mexico
Tigerflower	<i>Tigridia pavonia</i>	S. Mexico; Guatemala

Several features were common to the two systems of cultivation. For instance, since farming was mainly for subsistence, fields were small, probably no larger than one-half to three acres in size. Moreover, the Indian farmer practiced horticulture, rather than the single-crop field agriculture characteristic of Western culture and now common in most of Latin America. The Indian gave special care to individual plants, cultivating a great variety within his small plot. Not only were maize, beans, and squash raised together; but a few tomato, chile, or amaranth plants, and perhaps one or two fruit trees were also scattered about, until his holding took on an unordered, unkempt appearance. These practices are retained today in subsistence agriculture in many parts of Mexico and Central America, particularly on hillside plots, in kitchen gardens around the house, and even in permanent, plowed fields. Again, the same farming implements were employed in the two systems of cultivation. These were: (1) the simple planting stick, or dibble, with a sharpened, fire-hardened point; and (2) in some sections of central Mexico, the *coa*, a kind of spade with a triangular-shaped blade parallel with the handle (Figure 8.10).

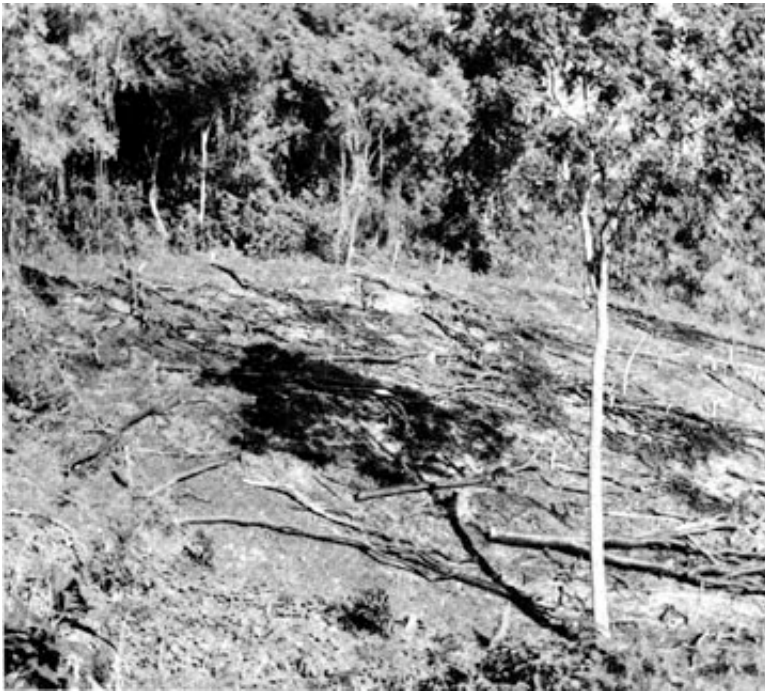
**Figure 8.10** Types of metal *coa* blades used in central Mexico

In the Tarascan area, *coas* with copper blades were used, but elsewhere they probably were wooden. Although today these aboriginal tools have been largely displaced by the European hoe and plow, they are still employed in some areas of Mexico. For instance, Indian farmers living in the Xochimilco area, only 20 miles from the center of Mexico City, still use the triangular-bladed *coa* to cultivate flowers and vegetables:



*Migratory Slash-Burn Cultivation.* Probably man's most ancient tillage system, this was the simplest and most widespread type of farming in all the Americas. Fundamentally, it is a woodland type of agriculture. It was practiced on steep, wooded slopes in the highlands, and on both slopes and level land within the lowland tropical forests. Today this relatively primitive method of cultivation still prevails in subsistence farming throughout the tropical lowlands of Mexico and Central America; and its persistence in the West Indies has been mentioned frequently in previous chapters of this book. In the highlands, however, it is now practiced only on the higher or more isolated mountain slopes where forest remains.

The system involves the clearing of small plots within the forest during the dry season and the burning of the dried branches and logs. The wood ash, rich in various minerals such as potassium and phosphorous, serves as a good fertilizer for crops. At the start of the rains, seeds and tubers are planted in holes punched into the ash-covered soil with the dibble. Yields are good the first year, but after two or three years of cultivation the soil is usually exhausted and weeds become such a problem that the plot is abandoned for perhaps 8 to 20 years, to permit the rejuvenation of the soil and the reestablishment of second-growth forest. After that time, when the decaying leaves and roots of the forest plants and microorganisms have renewed soil fertility, the same plot may be re-cleared and the cycle repeated. Meanwhile, in the surrounding forest, the farmer has cleared new plots which go through the same cycle of cropping and abandonment. Thus, the farmer is continually shifting his small cultivated fields. In central Mexico today, subsistence farmers call such slash-burn plots by the Nahuatl terms *tlacolol* or *coamil*; the Spanish terms *roza* and *desmonte* are sometimes used (Figure 8.11).<sup>(1)</sup>



**Figure 8.11** A slash-burn plot in the coastal lowlands of Veracruz State, Mexico, showing charred logs and patches of ash after burning. Maize and bean seeds will be dibbled into the ash and thin soil after the first rains.

It is readily apparent that, owing to the frequent shifting of cultivated plots, a large forested area is needed for the continued operation of the slash-burn system. Being an extensive type of cultivation, therefore, it can normally support only a low density of population. Yet with only this simple farming technique at their disposal, the lowland Mayas were able to

produce sufficient food to support a highly advanced culture.

Another attribute of present-day slash-burn cultivation in Middle America is an associated settlement pattern of either small hamlets (*rancherías*) or completely dispersed dwellings scattered on the forested mountain slopes. Archeological findings and early Spanish accounts indicate that a similar settlement pattern existed in pre-Conquest times, in the Mayan area of Yucatan and in the Totonac and Huastec regions along the Gulf coastal plain and adjacent eastern escarpment of Mexico. Then, however, settlements were usually scattered around the vicinity of ceremonial centers.

One of the most serious effects of long, continued use of the slash-burn system in a given area has been the alteration and, often, the eventual destruction of the forest cover. This has been especially true when the need for food causes the period of abandonment of the plots to be unduly shortened, preventing the complete restoration of the forest and with it, the renewal of soil productivity. One of the hypotheses presented to explain the collapse of the classical Mayan culture in southern Yucatan and northern Guatemala involves possible overcropping by the slash-burn system, which led to forest destruction, soil exhaustion, and even erosion and encroachment of a heavy grass cover. Probably the destruction of much of the oak and pine forest that once covered portions of the Mexican Mesa Central has been partly due to the overuse of slash-burn cultivation in pre-Conquest and colonial times.

*Advanced Farming: Fallow Land.* Although somewhat akin to slash-burn cultivation, the fallowing of permanent fields in Mesoamerica was a more advanced agricultural technique and was more productive of foodstuffs. This method involved the initial clearing and burning of the vegetative cover, but two or three years of successive cropping was followed by an equal period of letting the land lie fallow. The farmer thus confined his attention to a few more or less permanent fields within a small radius, a system conducive to permanent village settlement and fairly dense population. Indians followed land generally in the cool highlands, particularly around the fertile volcanic basins on the Mesa Central of Mexico and in southwestern Guatemala and Chiapas, where the population was extremely dense. They kept

mainly to the lower, gentle slopes surrounding the basins; it is doubtful that they would have been able to till the flattish basin floors, characterized by heavy soils and thick grass cover, with only the dibble and *coa*. The fertile lacustrine soils of most of the highland basins, now so important in the economy of Mexico and Guatemala, were probably seldom farmed until the Spaniards introduced the plow in the sixteenth century. Today the ancient fallow system is occasionally seen on slopes in the eastern part of the Mesa Central and in Oaxaca, Chiapas, and Guatemala.

*Advanced Farming: Irrigation, Terracing, and Land Reclamation.* A more advanced and productive system of cultivation practiced in pre-Conquest Mesoamerica involved irrigation, sometimes accompanied by terracing on hill slopes. As far as we know, Mesoamerican irrigation was extremely spotty, but the technique was, of course, utilized in areas subject to a long dry season or to frequent drought. Archeological evidence indicates that Indian farmers used canal irrigation as early as 300 B.C. in the Tehuacan Valley, in the southeastern part of the Mesa Central. Early sixteenth-century Spaniards reported the use of irrigation at various points along the southern escarpment of the Mesa Central and the upper Balsas Basin. Moreover, most of the native cacao groves along the Pacific slope from Colima in Mexico to Nicaragua were cultivated by canal irrigation. But the Valley of Mexico and its environs was the most significant center of irrigation and hydraulic engineering in Mesoamerica. The Aztecs and their neighbors commonly employed canal irrigation on the eastern side of the Valley of Mexico, as well as in the basin of Puebla to the east. Aqueducts were also constructed to bring potable water from the springs of Chapultepec on the western side of the Valley of Mexico to the center of Tenochtitlan.

Still another advanced agricultural technique occasionally practiced by the Mesoamerican farmers was directed toward soil conservation on permanently cultivated slopes. Stone retention walls, forming crude terraces (most of which are now abandoned), are found from central Mexico southward to British Honduras. A more common soil-retention device was to plant hedges of agave along the contour to hold the soil and reduce the gradient of the slope. This technique, called *bancal* or *metepantli*, is still widely practiced in east-central Mexico.

The most fascinating advanced farming technique that the Indians developed in central Mexico was the *chinampa* (sometimes called "floating gardens"), a system of land reclamation in shallow lakes and marshy areas. This ingenious system was one of the most sophisticated and productive kinds of farming practiced by the American Indian. Chinampas were artificial plots, in some cases made of long strips of aquatic vegetation cut from thick masses of floatant that had accumulated on the lake surface. These strips, sinking at first to the shallow lake bottom, were placed one above the other until the top one barely extended above the water. Then layers of rich mud scooped from the lake bottom were spread over the chinampa to form a planting surface. In other cases, chinampas were formed by digging drainage ditches in marshy areas and spreading the soil between the ditches to raise the ground above the water level. In either case, long artificial fields, 8 to 12 feet wide, more than 100 feet long, and separated one from another by narrow canals, resulted in the chinampa field pattern familiar today to most tourists who visit Xochimilco, south of Mexico City. To anchor the plots securely, native willows were planted along the edges. Such trees give the present chinampa areas their pleasant sylvan appearance (Figure 8.12).





**Figure 8.12** A chinampa plot bordered by willows and canals near Xochimilco, Valley of Mexico. The chinampa surface has been recently planted.

From two to three harvests of maize, beans, chile, flowers, and other plants could be taken annually from one plot, for the crops were started in seed beds and transplanted to the chinampa surface. Continuous natural irrigation was effected by seepage from the canals through porous chinampa material, or water could be scooped from the canals to irrigate crops. Young plants were protected from winter frosts with mats of grass. Fertilizer in the form of lake mud, rotted vegetable matter, and probably even human excrement was applied before each planting.

There is little doubt that the dense rural population and the large cities in the Valley of Mexico in pre-Conquest times were based mainly on the tremendous amount of food produced on these intensively cultivated plots. Recent studies within the valley show that in late Aztec times the chinampa area covered much of the beds of fresh-water lakes Chalco and Xochimilco and extended northward along the western edge of Lake Texcoco beyond Tenochtitlan. To prevent periodic incursion of the saline water of Lake Texcoco into the chinampa area and to regulate the lake levels, an elaborate system of dikes was constructed. Each of the causeways that connected the Aztec capital with the Mainland served both as a road and as a dike.

Chinampa agriculture continues to be practiced in the Valley of Mexico, and vestiges of the system can still be seen in low wet spots in the Basin of Puebla. But since the final desiccation of the lakes in 1900, the chinampa area in the Valley of Mexico has dwindled to a narrow strip along the south shore of former lakes Xochimilco and Chalco. Water for the canals is obtained from springs, and vegetables and flowers are still grown in the traditional manner for the Mexico City market.

1. Slash-burn cultivation is often misnamed "milpa" agriculture. In Mexico and Central America, the word "milpa" is applied to any cultivated field (but principally one in which maize is grown), regardless of the system of agriculture used.