

Genetic diversity and agricultural strategy in 16th century and present-day Yucatecan Milpa Agriculture

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Received 2 June 1994; revised and accepted 12 October 1994

This article is an attempt to understand pre-Columbian Maya milpa agriculture by comparing historical reports with today's practices. It is also an attempt to evaluate the potential of present-day milpa agriculture by comparing it with pre-Columbian production. Structurally, today's milpa system is very similar to the pre-Columbian. Both are characterized by a high diversity of genetic resources and many agricultural and non-agricultural activities. However, in pre-Columbian times all land was dedicated to milpa farming, land was communal, settlement was dispersed, and the system was supported by the ruling class. All together this resulted in a higher productivity than today, where these conditions are absent.

Recursos Genéticos De La Milpa Tradicional Yucateca En El Siglo XVI Y Hoy. El artículo pretende conocer y evaluar el potencial del sistema agrícola milpero de los mayas precolombinos del noroeste de la Península de Yucatán. Para ello, se compararon prácticas agrícolas actuales con reportes históricos de prácticas agrícolas, escritos a pocos años de la Conquista. Además se trató de evaluar el potencial del sistema agrícola milpero actual, comparándolo con el precolombino. Estructuralmente el sistema actual es muy parecido al prehispánico. Los dos se caracterizan por una alta diversidad de recursos genéticos y muchas actividades agrícolas y no-agrícolas suplementarias. Las diferencias entre el sistema milpero de ayer y de hoy son, que en el tiempo precolombino toda la tierra era para milpa; la propiedad era comunal; el patrón de asentamiento era disperso y el sistema estaba apoyado por la clase dominante. Todo ello resultó en una mayor productividad que la que ofrece el actual sistema agrícola, en el que están ausentes las condiciones antes mencionadas.

Keywords: Maya agriculture; Mesoamerica; Yucatan; Spanish Conquest; plant domestication.

Introduction

Was the milpa system, as we know it today in the Yucatan Peninsula, able to sustain the high population reported for the pre-Columbian Maya lowland area?

This is a question that has occupied Maya archaeologists for decades (Harrison and Turner, 1978), with no satisfactory answer. However, considerations have not drawn on experiences from the present state of Yucatan, although some of the important centres of Maya civilization developed here, and continued even after the so-called 'collapse' in the southern centres. In this area – dominated by a geological karstic topography of limestone, coral and dolomite with little or shallow layers of topsoil – not many agricultural modifications have been found, in great scale, and practically no agricultural relics, compared to the more southern regions. Only in the Sierra Puuc and in the low hills south of the Sierra Puuc, the Wits, some terraces have been reported. Their use might have been

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irrigation, though on a very small scale (Schmidt, 1980; Barrera, 1987). This could explain why archaeologists have turned away from studies on agricultural development in the area. Therefore we have practically no knowledge of the exact nature of the agricultural system in the northern part of Yucatan before it was changed by the Spanish Conquest.

The *milpa* is the field that the Maya Indian of the present day cultivate for 2–3 years with various food plants, clearing a piece of forest between 1–2 ha. by the slash-and-burn method. We consider the milpa-system as a general system of production, including activities in:

- (1) Fields, referred to as 'milpa', and including the PET PACH – a small field within the field (Maya words and terms are written with uppercases. The-' marks a glottal stop. XNUK, meaning big, and XMEJEN, meaning little, are the maya words to distinguish long-term and short-term variants of plants).
- (2) House yards.
- (3) Vegetable-patches and raised plant-beds, the K'ANCH'ES within the house yards.
- (4) Cultivation of special plants in the sinkholes, KO'OP, with more humid soil
- (5) Non-agricultural activities like hunting, fishing, and beekeeping (see Table 3).

Some investigators have tried to estimate the pre-Columbian human population in Yucatan. The population density would reflect the potential of the food-productive system. Taking into consideration the amount and size of archaeological sites, at the end of the Classical period in the present state of Yucatan, Garza and Kurjack (1980) estimate that the pre-Columbian population must have been at least as high as today. Cook and Borah (1978) estimated that the Indian population around the time of the Conquest, for the three Yucatecan states, Yucatan, Quintana Roo and Campeche, was about 800 000 in 1528, when wars and introduced sicknesses had taken its toll on the population. Overall there is good evidence for the existence of a very 'efficient' indigenous pre-Columbian food-production system.

Table 1. Steps in the work of the slash-and-burn milpa system: present-day and in the 16th century

Present-day milpa	16th century milpa
1 Selection of land	not described
2 Measurement	Measurement
3 Outlining	Outlining
4 Tree-cutting	Tree-cutting
5 Slashing weed in 2 years fields	Slashing weed in 2 years fields
6 Burning	Burning
7 Sowing	Sowing
8 Weeding	Weeding
9 Bending corn stalks	Bending corn stalks
10 Harvesting	Harvesting
11 Transporting	Transporting
12 Storing	Storing
13 Fallow	Fallow
14 Ceremonies	Ceremonies

Sources: Barrera and Rendon (1965); Mediz (1973); Alvarez (1980); Barrera (1980); Landa (1982); De la Garza and colleagues (1983).

Table 2. Species and varieties in the milpa in the 16th century and present-day in the village of Xocen

Period	Native		Introduced		Total	
	Species	Variety	Species	Variety	Species	Variety
16th Century	16	36	0	0	16	36
1990	16	67	12	28	28	95

A few agronomists, such as R.A. Emerson (1953) have hypothesized that the milpa system, based on slash-and-burn, was the only formula possible for the stony grounds of Yucatan. Searching for historical evidence that would support Emerson's agronomic hypothesis, we made a 'tour' through the ancient milpas. As guides, we used chronicles and descriptions from the 16th century, written shortly after the Conquest, when memories of former times were still fresh, or practices could be observed. Our escorts were the *encomenderos* who wrote the *Fifty Accounts of the Government of Yucatan: Relaciones de la Gobernacion de Yucatan*, between 1579 and 1581. De la Garza and colleagues (1983) and Bishop Landa (1982). (For *Ralaciones* written between 1579 and 1581 see the Reference section.)

We do not maintain that these sources are *scientifically* correct or true. They are short, without details and we sometimes feel that the authors did not really understand the Indian milpa system, or bothered to understand it. However, the sources are eye-witness reports, and the best information we have from the Conquest-period. But if you have a knowledge of present-day traditional milpa agriculture, you can piece together a picture of the agricultural system, valid for the time of the Conquest. Most Maya archaeologists and historians, however, do not have this view of present-day milpa agriculture, and that is why the *encomenderos'* sources have not been fully exploited to help understand the pre-Columbian Maya society. A more detailed description of the pre-Columbian milpa system, based on this information, is presented by Teran and Rasmussen (1993).

We also used information from *The Books of the Book Chilam Balam* by Barrera and Rendon (1965); the *Chilam Balam of Chumayel* (Mediz, 1973); the comparison of colonial dictionaries made by Alvarez (1980) and the editors of the *Cordemex Dictionary*, Barrera and colleagues (1980).

We compared our historical data with observations of the present-day milpas in the

Table 3. Activities related to milpa production

16th century	Actual activities
1. House-yard cultivation	House-yard cultivation
2. Household animals	Household animals
3. not existing	Cattle-raising
4. Beekeeping	Beekeeping
5. Hunting	Hunting
6. Fishing	not existing
7. Trade	Trade
8. Handicrafts	Handicrafts
9. Collection in the forest	Collection in the forest
10. Collection of salt	not existing
11. not existing	Salary work

traditional Maya village Xocen, 12 km SE of the town of Valladolid, where we did ethno-botanical and agricultural field-work (Teran and Rasmussen 1993). We came to the following conclusions about the milpa:

- (1) The pre-Columbian milpa system was basically similar to what is still found in traditional parts of the milpa area in Yucatan today. In pre-Columbian times the milpa system, where land was collectively owned, was the dominant mode of production. Today, it is subordinated by the predominantly capitalistic system which was introduced with the Conquest; and where, little by little, milpa land has been turned into sisal-plantations and cattle ranches, to the extent that today less than 25% of the area of the state of Yucatan is characterized by milpa production.
- (2) Within an ecological framework of unstable periods of rain Duch (1988), permanent attacks of insects, animals and diseases favoured by high temperatures and humidity, an agricultural strategy was developed that, yesterday as today, is based on the use and management of many species and subspecies. This strategy guaranteed some production, even in non-fertile years. Unable to change the physical environment, the ancient and present milpa-peasants, chose to adapt plants to the area.
- (3) The pre-Columbian milpa system seems, like the present-day system, to have been made up of many agricultural and non-agricultural activities. We consider the milpa as a mechanically integrated system, more than just a conglomerate of household production, consisting of many activities, as mentioned below and shown in Table 3 (Teran and Rasmussen, 1992, 1993).
- (4) The historical sources frequently refer to social conditions which favoured the milpa system, assuring surplus production. Today the governing class does not support the milpa system, and for that reason its productivity is not very high.

Similarity between the pre-Columbian and present-day milpa system

Descriptions of agricultural activities in historical sources mention practices which can be observed today, except for the selection of new land (Table 1). Possibly this activity was not registered, as it is such an obvious step, that it might easily be overlooked.

Although the ethno-historical descriptions generally are without detail, they leave no doubt that the agricultural processes were basically similar to those observed today. Among the many aspects in the descriptions, there are four elements which we think are essential to understanding milpa strategy, but that have been overlooked in other descriptions of milpa agriculture.

- (1) Cultivation in various *fields*.
- (2) Cultivation of various *species*.
- (3) Cultivation of *short-term* and *long-term varieties*.
- (4) Various *productive activities* related to the milpa.

Cultivation in various fields

Today the milperos in Xocen grow long- and intermediate-term corn (*Zea mays*L.) for 2 or 3 years before fields are abandoned. In the house yards (patios) and in small plots in the

village they also grow short-term corn. This means that a farmer can produce in as many as five fields in one season. The ethno-historical descriptions confirm this practice, but do not specify which type of corn is being grown in each field, and how old the fields are: '... they sow in many parts, because if one should fail, another will supply.' (Landa, 1982:40).

Cultivation of various species and varieties

In Xocen, we have recorded 28 species of plants in the milpa, of which 16 are natives, and 12 were introduced. The 16 native species represent 67 varieties, of which only two are introduced. Historical sources mention 16 species, as we find today, but only 36 varieties. The difference between the 36 mentioned in the 16th century and the 67 existing today, might be due to the inadequate observation by early reporters. This was the case with the legumes, of which there are two species in Yucatan: (*Phaseolus lunatus* L. and *P. vulgaris* L.) with a great number of varieties (see Table 4), but they were all classified under one common name 'beans' (*frijoles*) Alvarez (1980), De Palomar and Chi (1579).

Cultivation of (1) short-cycle varieties (2) plants associated, mixed and (3) separated from the corn

- (1) Today in Xocen we have detected seven short-term native species with 19 varieties. Historical sources mention three short-term species with six varieties. The practice of growing short-term plants permits the farmer to harvest small quantities of corn and other plants before the main harvest.
- (2) Cultivation was done by sowing plants associated with corn, just as we observe today, where several seeds are put into one hole with the corn:

... they easily make their fields because at the time of sowing they just make a little hole in the ground with a pointed stick, in which they put 5 or 6 seeds of corn, and 3 or 4 beans, and some other seeds they get from the squash ... Farfan (n.d.).
- (3) There are no historical references to plants grown between the corn, like yucca (*Manihot esculenta* Crantz), or sweet potatoes (*Ipomoea batatas* (L.) Lam.) and plants separated from corn, such as vegetables sown in small patches with good soil within the fields, called PACH PAKAL or PET PACH; a similar system operates today. It is likely, however, that these activities existed, because the names of the plants that are used in these systems today appear in the historical records.

Various productive activities related to the milpa

Nine productive activities associated with the milpa can be observed in Xocen today (see Table 3). The historical sources we have cited also mention nine, of which only fishing and salt-collection have ceased to be an integrated part of the milpa system, though they exist as separate activities. Present-day activities not recorded in the historical sources, include cattle-raising and salaried-work.

We may conclude that the diverse production of the milpa has been maintained, and experienced relatively few changes considering the passing of nearly five centuries.

Social relations/aspects that favoured high production

In the chronicles we find no data that quantify pre-Conquest production, and it would be impossible to present data that quantitatively proved a higher pre-Conquest milpa

Table 4. Native species and their varieties in the milpa of the 16th century and present-day

Scientific name (family, species, variety)	16th century maya name (with variation)	16th century Spanish name	Present-day		Present-day Spanish names	Cycle	
			Maya name (with variations)	NAME		Short	Long
1. Araceae <i>Xanthosom a yucatanense</i> Engler (S.e.a.)(A.D.a)*	1. MACAL [MAKAL] (1)~ MAAXCAL MACAL (3)	/MONO CUELLO/	1. KUKUT MAKAL	ÑAME	ñame chico	X	X
			a. mejen makal b. mai mula c. xmejen sac makal xnuk makal		ñame grande ñame rosado		X
2. Caricaceae <i>Carica papaya</i> L.	2. PUT (1) UT (3)	PAPAYA (3)	2. PUUT a. xk'an puut b. chak mamey puut	PAPAYA			
3. Convolvulaceae <i>Ipomoea batatas</i> (L.) Lam.	3. YS 6 YZ (1) IZ (3)	BATATAS (1) CAMOTE (3)	3. IS xmejen is * a. xcubana xnuk is b. chakalhaas is c. xrosado is d. sak is e. k'an is f. morado is	CAMOTE camote chico camote grande		X	X X X X X
4. Cucurbitaceae <i>Cucurbita argyro sperma</i> (S.e.a.)	4. CA (3) a. top'toop' (3)	CALABAZA/ FRUTO PEPITA GRUESA	4. XTOOP'6XXKA' ¥ a. sak xka' b. k'an xka'	PEPITA GRUESA O CA (FRUTO)			

Table 4. (Continued)

Scientific name (family, species, variety)	16th century maya name (with variation)	16th century Spanish name	Present-day Maya name (with variations)	Present-day Spanish names		Cycle	
				Spanish names	Spanish names	Short	Long
<i>C. moschata</i> (Duch.) Duch. ex. Poir.	5. KUM ó ZIC/ZIHK	CALABAZA/ FRUTO	5. SIKIL ó K'UUM ¥	PEPITA MENUDA			
	zic-il(el) {3}	PEPITA DE CALABAZA		PEPITA MENUDA O CALABAZA			
	a. peb kum/peeu kum/peu kum {3}	calabaza tempranera {3}	a. xmejen k'uum	calabaza chica			
	b. - +	(CALBAZA GRANDE)	b. xtobox c. is k'uum d. x'kalim xnuk k'uum		calabaza grande		X X X
			e. xtobox nuk k'uum f. is nuk k'uum g. xkalim nuk k'uum h. chai k'uum o kay pats i. sak xnuk k'uum j. chuj xnuk k'uum k. ara xnuk k'uum l. xkakai xnuk k'uum				X X X X
<i>C. pepo</i> L. (S.e.a.)	6. DZOL {3} ¥	CALABAZA {3}	6. TS'OL ¥	TSOL			X X X X
	a. kan dzol {3}	cal. amarilla	a. tsol redonda				
	b. yax dzol	cal. verde {3}	b. xkakai ts'ol				

Table 4. (Continued)

Scientific name (family, species, variety)	16th century maya name (with variation)	16th century Spanish name	Present-day Maya name (with variations)	Present-day Spanish names	Cycle	
					Short	Long
<i>Lagenaria siceraria</i> (Molina) Standley	7. -	-	7. -	CALABAZOS		
	a. chu (3)	calabazón (3)	a. sak chuj b. yaax chuj c. lek	calabazo		
	b. leec/lec (3) c. xtuch /xtuch' /tuch' (3)	calabaza (3) /cuello tieso/ calabaza de cuello delgado		lec		
5. Euphorbiaceae <i>Cnidoscolus chayamansa</i> McVaugh (S.e.a.) (A. J.a.)	8. CHAI [CHAI] (1)	COLES	8. CHAY	CHAYA		
<i>Manihot esculenta</i> Crantz	a. chay (3)	CHAYA				
	9. DSIN [TS'IN] (1)	YUCA DULCE (1)	9. TS'IIM	YUCA		
	a. dzim/dziim (3)	YUCA (3)	xmejen ts'iim a. ak'its'iim b. k'an ts'iim c. sak ts'iim xnuk d. yaax ts'iim o box ts'iim	yuca chica	X X	
6. Gramineae <i>Zea mays</i> L.	10. YXIM [IX'IIM] (1)	MAIZ/GRANO (1)	10. NAL ó XI'IM	MAIZ/ MAZORC A		X

Table 4. (Continued)

Scientific name (family, species, variety)	16th century maya name (with variation)	16th century Spanish name	Present-day Maya name (with variations)	Present-day Spanish names		Cycle	
				Short	Long	Short	Long
<i>P. vulgaris</i> L. (S.e.a.)	13. -	-	f. xnuk chak saa g. xk'an obat o xbatun h. xpix cristo i. xpuksik'a ts'uts'uy j. bacalar ib k. xmulicion i. jol xpet	FRIJOL DE LA MILPA		X	X
	a.	-	a. box bu'ul b. e'subin bu'ul c. tsama'bu'ul	FRIJOL SAMÁ			
	b. -	-					
	c. putum [3] @	frijol pequeño					
	d. ch'ac-ch'i-yan @	frijol grande [3]					
8. Palmaeae <i>Sabal</i> spp. (A.Sj)	14. JAAN [XA'AN] [1]	PALMA [1] HUANO [3]	14. XAAN 63	HUANO			
	a. xan [1 Y 3]						
9. Solanaceae <i>Capsicum annuum</i> L.	15. IC [3]	CHILE [3] chile temprano/ chile verde [3] 'chil' chile gande/mellado/ chile grande que pica mucho @ chile temprano @ [3] chile ancho/bobo chile chico [3]@	15. IK a. yaax ik o chawá ik b. dulce ik*	CHILE			
	a. yaax-ic [3]						
	b. bolol [3]						
	c. xubula [3]						
	d. u peeu-il ic [3]						
	e. ix nuc ic						
f. p'izte o p'iztec							

Table 4. (Continued)

Scientific name (family, species, variety)	16th century maya name (with variation)	16th century Spanish name	Present-day Maya name (with variations)	Present-day Spanish names		Cycle
				Short	Long	
<i>Lycopersicon esculentum</i> Mill.	16. P'AC [3] 36-	TOMATE [3]	16. P'AK a. macehual o pais p'ak b. tsum p'ak	19	24	
9 Families and 16 native species	16 Species/ 36 varieties		16 Species/ 67 varieties	19	24	

Sources: Barrera and Rendón (1965); Alvarez (1980); Landa (1982); De la Garza and colleagues (1983); Sosa and colleagues (1985).

*The identification of the species is based on Sosa and colleagues (1985). When identification in Alvarez coincides with Sosa and colleagues (1985) no indication is given; when (S.e.a.) appears, no identification is given in Alvarez. When (S.e.a.) and (A...) appear, then Alvarez differs from Sosa and colleagues and we have chosen the last identification.

~ The numbers between [] correspond to the sources: [1] *Relaciones de la Gobernación de Yucatán*; [2] Landa; [3] Alvarez and [4] *Chilam Balam*. If there is more than one Maya name we include both. What is placed between / is the literal meaning given by Alvarez. Sometimes for lack of space no number of source is given in one area, but it is the same source for both Spanish and Maya name.

* Introduced variety.

¥ X'TOOP' and SIKIL have different names for seed and fruit, whereas DZOL only has one name indicating the fruit. X'TOOP' y SIKIL are more often recognized as the name of the seeds than of the fruit, which indicated the importance of the seeds.

+ There is no mention of the long term variety, but from the explanation of a short term variety, its existence is presumed. Today there is also a long term variety.

‡ and § are not mentioned in any source, but correspond to the description given in: *Relaciones...* (De la Garza *et al.*, 1983: V II:327) and (De la Garza *et al.*, 1983: V I:239).

@ Varieties not identified.

production than today. However, ethnohistorical evidence permits us to substantiate that hypothesis. There was room for more than just auto subsistence, which is not possible today. *The Relacion from Sotuta and Tibolon* says:

The grain that is used for bread in this land, is corn, which is obtained in great quantity and with little work. . . . And they harvest beans, chilies, cotton and honey and wax and squash and other kinds of vegetables. They harvest a lot, of which they maintain themselves, and they sell great quantities, and pay their tributes. (De Magaña, 1581)

Comparing the old milpa system with the present, we are impressed with the high fertility, reflected in a relatively high population density, and a great variety of food-plants in the pre-Columbian milpa (De Palomar and Chi, 1579; Darreygosa, 1579; Tamayo, 1581; Landa, 1982).

The higher pre-Columbian production might be explained by a combination of factors:

- (1) Genetic diversity – which still exists – as an intrinsic part of the milpa.
- (2) Social conditions favourable to the milpa productive system. We shall look at some of these conditions, as recorded in the historical sources, but which no longer exist:
 - (i) Availability of land. One of the factors favourable to high production was that all land was dedicated to the milpa. A great number of our historical sources mention that there was not one piece of land left uncultivated. Today, only one-third of the State of Yucatan is dedicated to milpa production. During the last century two massive fellings of forest formerly used for milpa have occurred. During the 1800s a great part of the countryside was converted into sisal plantations. Since some 50 years ago, an increasing part of the forest has steadily been converted into extensive cattle ranches.
 - (ii) Settlement patterns. Another factor that favoured abundant production was the dispersed settlement-pattern. This pattern was changed violently when the Franciscan monks enforced their congregation politics on the Maya population, centring them around their churches and convents.

. . . the population that today is concentrated in one village, used to be divided into six or eight, and because they were scattered all over the countryside, and they cultivated everywhere, there was never a rain-shower that did not fall on some of the fields, and that was the reason why in that time there was a very abundant production. (De Palomar and Chi 1579)

- (iii) Communal land. The land was owned in common, and access to new and fertile lands helped secure a high production. Various accounts from Dzidzantun (Sanchez, n.d.), Tekal (Brizeño, n.d.), Tekanto and Tepakan (Sanchez, 1581) coincide:

The land is communal, and the only existing border-stones are the ones that divide one province from another, and for these reasons there very rarely is hunger, because people cultivated in many parts, and if the rain did not fall in one part, invariably it would fall in another; since the Spaniards have come to this land, this custom is passing as other good customs that used to exist, because in this land there is more vice today than 50 years ago. (Sanchez 1581)

- (iv) A Ruling class in favour of the milpa system. Some historical references indicate the existence of pre-Columbian systems for storing food to face years

of bad harvest, organized by the government (Gutierrez, 1579; Landa, 1982). From recent studies we know that it was not until the last years of the Colonial period that the government could organize a food-storing system to face slim years (Farriss 1984). Today the ruling class tries hard to eradicate or substitute the milpa system with other apparently more efficient agricultural systems: sisal-monoculture, now abandoned; extensive cattle-raising; and recently citrus-growing on a mono-crop basis. These systems do not encourage the poly-cultural principles of the milpa system, the only method that has passed the test of centuries. The systematic destruction and lack of support of the traditional milpa system has not eradicated it, because no better alternatives are offered to milpa peasants. But it is evident to everyone who has visited the milpa area, that there is a serious decrease of production and a general impoverishment of the milpa farmers.

Scarcity and milpa strategy

Another difference between the milpa of yesterday and today is the way it can respond to critical years of drought, hurricanes, attacks of insects or birds, mammals and plant diseases. Frequent occurrences of such disasters have been reported in the historical documents. Since there was no importation of corn and other foods, like today, critical years could have catastrophic effects for the population, as documented especially in the Chilam Balam (Barrera and Rendon, 1965). Within the traditional milpa system, however, there were means to face the crisis.

Twenty species collected in the forest in critical times have been mentioned in references (see Table 5). Six produced fruits to be eaten; the leaves of four were utilized; from four the roots, and from one the trunk. Both leaves and roots of three plants were used. Of the 20 species utilized especially in crisis, six were mixed with corn (nixtamal) to increase the dough.

Since 13 of the 20 species collected in the forest are also cultivated, it is not unlikely that their presence in the forest – which really is nothing but abandoned milpa fields – is no accident, but part of an agricultural strategy where food-sources, in the form of living plants, are stored for critical years in the forest.

Predominance of the milpa system

Critical reading of the historical documentation leaves no doubt of the prevalence of the milpa in the pre-Columbian productive system in northern Yucatan. Most sources refer to agriculture's dependence on temporal rain, and mention the limited possibilities of introducing irrigation. It is only cited in one case, for one area: the province of Chahuac-Ha, northeast of present-day Valladolid (Sarmiento *et al.*, 1579).

Another conclusion to be drawn is the decisive influence which the slash-and-burn technique had on the vegetation. The *encomendero* Nieto writes in this respect that the area is not very forested due to all the milpa fields and other activities of the Indians (Nieto 1581).

The use of some intensively cultivated plants, like cocoa and fruit trees in sink-holes and at the bottom of cenotes, was not significant. This type of intensive cultivation was very limited and located to a few areas. Therefore cocoa, which was used currency, had to be

Table 5. Food plants used in critical periods in the 16th century

Maya name	Spanish name	Scientific name	Part used	Corn mix	Cult	Silv Source
YA (YA')	Chicozapote	<i>Manilkra zapota</i> (L.) van Royen (Syn. <i>Manilkra achras</i> (Mill.) Fosberg)*	fruit		X	
HAZ (HA'AS)	Mamey	<i>Pouteria sapota</i> (Jacq.) Merr and Stearn (Syn. <i>Pouteria mammosa</i> (L.) Cronquist)*	fruit		X	R: 75
CHOCHO (CHOCH)	Zapote blanco*	<i>Pouteria glom erata</i> (Meg.) Radlk. (Syn. <i>Lucum a hypoglauca</i> Standl.)	fruit		X	R: 76
WAYAM	Uaya	<i>Talisia o liveaform is</i> (H.B.&K.) Radlk.	fruit		X	R: 76
BEC	Roble	<i>Ehretia tinifolia</i> L.	fruit		X	R: 273, 381
KULUMUY (TS'ALMUY)	Saramuyo	<i>Annona squamosa</i> L.	fruit		X	R: 76
TUK (TUK')	Cocoyol (Coyol)	<i>Acrocomia mexicana</i> Karw. ex Wart.	seed	X	X	R: 76
OX	Ramon	<i>Brosimum alicastrum</i> Swartz	seed	X	X	R: 273, LT: 199, CHB: 62,59,65 L: 129
PICHE (PICH)	Pich	<i>Enterolobium cyclocarpum</i> (Jacq.) Griseb.	seed		X	
CHICHIN CHAY (CH'IINCH'IN CHAY)	-	<i>Cnidocolus aconitifolius</i> (Mill.) I.M. Johnston	leaves		X	R: 239
CHAI (CHAY)	Chaya	<i>Cnidocolus chayam ansa</i> McVaugh	leaves		X	R: 239
ISLUCH (IXLUCH) PUT	-	-? <i>Carica papaya</i> L.	leaves leaves root	X	X	R: 273 R: 381
DSIN (TS'IN) MAKAL	Yuca Makal	<i>Manihot esculenta</i> Crantz <i>Xanthosoma yu catanense</i> Engler	root root, leaves	X X	X	LT: 196 R: 239
BATUN	-	<i>Anthurium</i> sp.	root		X	LT: 196

Table 5. (Continued)

Maya name	Spanish name	Scientific name	Part used	Corn mix	Cult	Silv Source
CUP (KUP)	Jicama cimarrona	<i>Calopogonium coeruleum</i> (Benth.) Hemsley (Identity uncertain*)	root leaves			LT: 196 R: 239, CHB: 62,59,65 A: 184 R: 76, L:25
IX-TON-TON-CITAM	-	-?	root			
CUMHE	Bonete	<i>Jacaratia mexicana</i> A.DC.	trunk	X	X	
(K'UNCHE)						
AC CHE	-	-?	leaves			R: 148, A: 187
		20		6	13	7

The Maya names were taken from: De la Garza and colleagues (1983); and Tozzer (1978).

Maya names in parenthesis are present-day spellings of the encomendero's words, made by the authors.

The botanical identifications were found in Sosa and colleagues (1985), in Tozzer (1978), and in Alvarez (1980).

*The Spanish name and botanical identification was taken from Alvarez (1989:172).

†In the Relación de Muxupip it does not mention which part were eaten; this information was obtained from Xocen.

*Personal communication Colunga and May (1992).

A = Alvarez, C. (1980); CHB = *Chilam Balam*, Barrera and Rendon (1965); L = Landa, Fray (1982); LT = Landa, Tozzer (1978); R = *Relaciones de Yucatan*, De la Garza and colleagues (1983).

imported mainly from Honduras and Tabasco (De Palomar and Chi, 1579) In Yucatan the major part of the land was communally owned. However, the cenotes and sink-holes, where there was enough moist soil to cultivate cocoa, belonged to the nobility (Tozzer, 1978; Landa, 1982).

Conclusions

The comparison of chronicles on agriculture, written just after the Spanish Conquest, with present-day traditional milpa agriculture, leads to the following conclusions:

- (1) Milpa was the dominant productive system in the pre-Columbian era. Structurally, it was very similar to today's traditional milpa agriculture.
- (2) The basic milpa structure, yesterday as well as today, was characterized by a high diversity of genetic resources and a broad spectrum of agricultural and non-agricultural activities. This was part of a general strategy to secure production, even in critical years. This gave the system, operating within the ecological limits of the area, great power of resistance. It had a relatively high production, which led to the high human population density, reported in historical sources and archaeological research.
- (3) The essential difference between present-day and pre-Colonial milpa can be explained by different social relations in the production. In the pre-Conquest society all land was dedicated to milpa, and since it was communal there was better access to new, fertile land. Logically the ruling class supported the milpa system, which was then the only system, and this invariable resulted in higher production. The milpa of today, though structurally similar, is only a vague shadow of yesterday's well-functioning system. This is true even under the best of conditions, like in Xocen. This is due to the fact that the governing class, since the Conquest, have done all they could, to eradicate the 'inefficient' milpa system, and to substitute it with an 'efficient' type of mono-crop cultivation.
- (4) Milpa has maintained its basic structure since pre-Columbian days. It has been able to adapt to changes forced upon it, or to new conditions favourable to it. The diversity of the genetic resources in the milpa fields – in the strict sense – has been augmented. However, there may have been losses of native varieties that were not reported in the chronicles. In relation to pre-conquest productive activities 11 have been maintained in Xocen today; two – salt-collecting and fishery – have disappeared, while two new activities have been added: cattle-raising and salary-work.
- (5) Today there is a general crisis in rural areas, like Yucatan, with deteriorating social relations, and incapacity to produce sufficient food. By comparing the pre-Columbian with the present-day milpa system we conclude that the ancient system was efficient and capable of maintaining a high population, even in time of crisis. We have observed that it is structurally similar to the present-day system. As one among many means to solve these problems, we think that it is time to reconsider the potentiality of the milpa system, as a food-producing system. We do not argue that we should just be going back to the 'good old days', but only that the basic principles, genetic diversity and integrated productive activities should be re-incorporated into the modern development plans of Yucatan. Such a step should be accompanied by the selection and adaptation of modern agronomic science to the traditional milpa.

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