The role of women in the conservation of the genetic resources of maize

Guatemala

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Collaboration:

Researchers:
Enma Leticia Díaz Lara and César Azurdia

Coordination and guidance:
Zoraida García, Programme Officer, Gender and Development Service
Gender and Population Division, Food and Agriculture Organization of the United Nations (FAO)

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This study finds its origins in the field of biology and anthropology; and more precisely in ethno-botany. This discipline, which examines the dynamic relationship between humans and their natural environment, allows us to study the relationship between human groups in the Department of Huehuetenango, the development of maize production through the ages (an historical study of the human-maize relationship) and in different environments (various sites within the Department of Huehuetenango). Through an understanding of this relationship one can draw conclusions as regards the role women have played in the evolution of maize and its conservation as a genetic resource.

The most revealing ethno-botanical studies are carried out in regions that are rich in culture and in plant genetic resources. These conditions exist in Guatemala. The country is located in the heart of Central America, one of the centres renowned for both the origin and the diversity of its plant species, as well as for its cultural wealth due to its legacy inherited historically from the Mayas, as represented by the different ethnic groups existing in the area. In the Department, nine different native language groups are represented, and it also offers a great deal of plant diversity, which can be observed in seven distinct life zones. Moreover, the geographical location of the country, which is a bridge between the north and the south of the American continent, gives rise to the presence of flora consisting of elements typical of the north, the south and the Caribbean, and especially of endemic species. In addition to the above, its geography, dominated as it is by mountain ranges, affords the presence of many isolated habitats; an essential requirement for the acceleration of the plant evolution process.

Human beings, in their interaction with the environment, have selected certain plant species to develop in them the process of “selection under domestication” which is guided basically by the “selection motives” that are established by the human groups involved in this process.

For a long time it has been suggested that the region of Huehuetenango was the area where maize first grew, given the presence of a number of wild sub-species and the great diversity of the maize varieties in the area. It is equally important to recognize the direct role played by the culture in the domestication of maize; or rather, the historical role of maize in the Mayan culture and what now remains of this in the human populations of the region under consideration. Knowledge of all this constitutes a basic reference on the selection motives, which, we may say, are of two types: factors of an agronomic type, such as the selection of material that can resist pests, diseases, droughts, can adapt to different environments and produce the highest yield; or factors of a culinary type, in other words, the genetic material’s adaptability to the culinary tastes and customs of the population as regards colour,
texture, sugar content, ease of peeling, etc. One cannot discard the possibility of the existence of a third set of selection criteria defined by considerations of a religious type.

Figure A
Yum Kax, Mayan god of maize

A knowledge and an understanding of the genetic diversity of the maize currently present in the region of Huehuetenango, compared to that of the past (40 years ago, for example, about which we have the information generated by Wellhausen)\(^2\) can provide us with a clear picture of the role played by women in the conservation of the genetic resources of maize. In the same way, we must consider factors of a social nature (acculturation) and economic factors (introduction of higher yield crops, improved varieties and new farming techniques) that are causing genetic erosion in the germplasm of the maize present in the Department of Huehuetenango.

Understanding the role of women in the agricultural production process enables us to interpret their influence in the evolution of maize, the great diversity of varieties they generated and how they maintain them.

\(^2\) Wellhausen et al. 1957.
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**Glossary**

**Alcaldes rezadores:** religious specialists who lead certain rites and who are responsible for praying.

**Anona:** tree of the tropical zone (Annona spp.) with edible fruits.

**Aporque:** see juleo.

**Bledo:** a species (Amaranthus spp.) which grows as a tolerated weed in maize crops, since its leaves are consumed by human populations.

**Calza:** see juleo.

**Coa:** a sharpened stake used to open the furrows where maize is sown. This tool is of pre-Hispanic origin.

**Chimán:** religious specialist who practises divination.

**Chompipe:** turkey.

**Copal:** a very aromatic resin produced by a tree of the same name (Protium copal) in tropical regions. Copal is burned and gives off a very pleasant aroma. It is also used in the preparation of varnishes.

**Doblador:** dried husk. Modified leaf that protects the maize cob.

**Doblar:** activity consisting in “folding down” or wrapping the maize plants to allow the cobs in their husks to reach full maturity and protect them from humidity, birds and rodents.

**Gallina ciega:** larva of beetle (Melolontha sp.) that attacks the roots of maize.

**Guatal:** thicket, brushwood.

**Gusano cogollero:** larva of the Heliothis which consumes the shoots of maize.

**Hierba mora:** type of weed of the Solanum nigrum complex (black nightshade) that grows among the maize plants. It is a “managed weed” since it is used as a leafy green vegetable.

**Horchata:** a drink prepared with rice.

**Incienso:** resin of burseraco trees. Gives off an aromatic smell when burned and is used in religious ceremonies.

**Jícara:** fruit of Crescentia alata used for certain drinks or for storing certain seeds.
**Jocote:** tree (*Spondias* sp.) with edible fruits.

**Juleo:** activity also referred to as *aporcar* or *calzar*, which consists in making earth mounds around each maize stalk to serve as a support.

**Landrace:** Farmer-developed varieties of crops that are adapted to local environments and uses.

**Matasano:** species of an edible fruit (*Casimiroa edulis*).

**Milpa:** maize plant or stalk. Commonly used to refer to a traditional maize field or plantation.

**Miltomate:** native species of Central America (*Physalis philadelphica*) which produces edible fruits, widely used in traditional cookery. Its name refers to a tomato-like plant that grows in maize fields.

**Morral:** woven bag with a strap to be carried on the shoulder.

**Nance:** species of edible fruits (*Byrsonima crassifolia*).

**Nixtamal:** maize cooked in ashes and lime to soften it and facilitate the making of tortillas and other dishes.

**Pataxte:** wild species of cocoa (*Theobroma bicolor*), with which chocolate can be made, though it is of a lower quality than the cultivated crop. Its husk can also be eaten raw.

**Quintal:** unit of weight, equivalent to 100 pounds.

**Rastrojo:** stubble or harvest leftovers (plants or parts of plants) which remain in the fields.

**Tapanco:** platform made of wooden boards. The space between this and the roof of the house is used to store grain.

**Tapisca:** manual harvest of maize.

**Teosinte:** graminaceous plant, (*Zea mays subsp. huehuetenangensis*), 2-3 metres tall and very luxuriant; it is considered the original parent of maize, and is good forage.

**Tortilla:** cooked pancake, patted and thinned into a round shape by hand.

**Troje:** rough country barn for the storage of maize and *doblador*.

**Zajorín:** person considered able to divine the occult.

**Zapote:** tropical tree (*Pouteria sapota*) with edible fruits, also known as mamey.

**Zompopo:** type of ant that cuts the leaves of maize.
I. Background

Both the history and the development of Guatemala are intimately linked to maize (Zea mays L.), not only as a specific crop, but also as a whole system which includes historical, linguistic, economic, social and even political components. In view of this, a number of studies have been undertaken with particular focus on aspects ranging from the technologies used in maize farming to the religious significance of maize in the daily lives of the rural populations.

The study on “El cultivo del maíz en Huehuetenango - un estudio exploratorio” (Maize farming in Huehuetenango - an exploratory study) carried out in 1993 under the auspices of FAO, constituted the first stage of the research undertaken. Enquiries were made in 31 municipalities of the Department of Huehuetenango, in each of which 8 to 15 cases were studied, producing a total of 385 cases. However, the data on the role of women in the conservation of the genetic resources of maize suggested that further study would be necessary.

It is known that women participate in various tasks related to the farming of maize; however there is not enough information on how women influence the conservation of its genetic resources. A study aimed at acquiring greater knowledge of this subject, not only as a source of basic information, is also a necessary element for the development of policies in which the fundamental role women play in practical terms for the conservation of plant genetic resources is recognised.

The second stage of the field study was carried out in six communities of the Department of Huehuetenango, chosen on the basis of the characteristics of their ecology, ethnic composition and local farming techniques. The communities selected for the study are in the municipalities of Aguacatán, Chiantí, Todos Santos, Cuchumatán, Nentón and Jacaltenango.

For this second phase of the study, a methodology was adopted that would allow both women and men to be involved in a more active and participatory way. The interviews and mini-workshops that took place were aimed at seeking information related to the origin of maize, on the classification and uses the farmers themselves make of their local maize (landraces), the customs and rites still being practised, the process of introducing improved varieties, the maize production cycle and the role of women especially in the selection of seed-grain and post-harvest tasks as predominant elements in the conservation of the genetic resources of maize.

At the end of this information-gathering phase, a “general workshop” was held in which, together with representatives of 12 communities, governmental organizations and NGOs, the results of the community consultation process were discussed and evaluated. Guidelines for action were proposed as a conclusion.

The information and conclusions presented in this study are the fruit of the two consultation exercises carried out in different Huehuetenango communities and of a thorough review of secondary sources on the subject.
II. Introduction

Guatemala is located in an area which contains one of the highest levels of plant genetic diversity in the world. Its particular geography and types of vegetation are characterised by the fact that the country has 14 life zones. In addition, the Maya population which inhabited Guatemala before the European conquest developed one of the world’s most advanced culture. The existing human wealth-botanical wealth interaction makes this country an ideal place to study genetic diversity and the evolution of crops, such as maize, but also other crops like beans, cocoa, cotton, chilli peppers, squashes, achote (Bixa orellana), manioc and sweet potatoes.

Many studies have focused on the modifications plant materials have undergone in their evolution; however little has been done in the study of the predominant role of human culture in achieving these modifications, basically through the domestication of plant resources. Many studies on the origin and evolution of crops pay insufficient attention to the action of society, and are even less concerned with the action of women within society.

Although women have been closely linked to the process of the domestication of plants, there is little documentation on the role they have played in the conservation of plant genetic resources. This is why a greater understanding of the subject is necessary, as an input in the discussion on biodiversity and the contribution the indigenous populations of Central America, and women in particular, have made in agriculture. It is the aim of this study to identify the role played by women in the conservation of the genetic resources of maize crops (Zea mays L.) in the Department of Huehuetenango.

In this work, it is assumed that the aims of social development are to enhance the value of rural areas, farming and the men and women involved in it. This is linked to the premise of not separating social dynamics from the dynamics of nature.

Another central issue here is the reassessment of the role of women in the rural world. Their roles within the family as processors of food, as managers of the home economy, as linguistic and cultural models for their children and as craftswomen who generate income for the family are traditionally not recognised as a contribution to social and economic development; furthermore, in almost all societies, the function of women as agents of social and economic exchange, and as guardians of local wisdom, is generally ignored. This raises the issue of the different ways in which, generally speaking, the role of women in society is underestimated: invisibility (they, or their work, are not considered important, or are not visible), stereotypes (the role of women is associated with submission, resignation, self-denial, etc.), their work and responsibilities are under-valued (their work is seen as a complement or help to the family economy), prejudices (lack of skills, lack of leadership, etc.), and lack of equality.

Although women take part in various farming activities, their main role in the selection of the types of maize (species and sub-species) present in the different regions illustrates the importance of their work in the conservation of the genetic resources of maize.
III. The origin of maize and its cultivation

3.1 The origin of the word maize

The origin of the word maize has taken researchers along different paths, reaching as far as remote areas such as China and Tibet. However, it is generally accepted that the word has its origin in Araguaco and the name was brought back to the Old World by Christopher Columbus who heard it for the first time in the Caribbean islands. Based on this common name, Linnaeus included the name as species epithet in the botanical classification Zea (Z. mays L.).

The word used in all the Maya languages is “ixim”. Similarly, in various native languages of Guatemala, reference is made to certain terms related to maize, such as “Gumarkaaj” (place of the canes), “Kanil” (name of a day in the calendar) which derives from the word “kan” meaning yellow, “Aj” (another name of a day) which refers to ciotle or tender maize.

3.2 How maize reached Guatemala according to the Mayas

Among the Maya peoples of Guatemala the maize deity is still worshipped today. In Huehuetenango, this figure can be male, as in the case of Santiago Chimaltenango, where it has the name of Padre Paxil³, or female, as in Colotenango, where it is called K’txu (Our Mother in Mam) or Paxil⁴. Paxil is the name of the place where maize originated according to the Popol Vuh, the sacred book of the K’ich’s, where according to one of the versions of the origins of maize from the Mam oral tradition of the municipalities of Ixtahuacán and Colotenango, the grain was brought from there by animals, and that is where the “Mother of Maize” resides⁵.

The oral tradition tells that in ancient times there was no maize, and that in those times human beings ate the roots of a plant called bxebxina (mother Maize); a plant with a very large root and a single stalk. It is also said that... “It was then that the ancients realised that the excrement of the mountain cat (wech) contained maize”.

This tale, like many others from the popular wisdom, recounts the apparent linking of the origin of maize with other pre-existent species in the region, as does the following fable. In those distant times, it is said that animals could speak. This was why the people of the region asked the mountain cat where he went to feed, and they asked him to show them this place. The mountain cat told them that someone should go with him to see the place where he fed. So the ancients sent the louse to travel on the back of the mountain cat to see where his mount went; but the louse fell off on the way and never reached the place where the maize grew. They immediately sent the flea, again on the back of the mountain cat; but the flea also fell off though it managed to jump back on and cling to the cat’s back to reach the place that was sought. Thus, when the flea returned, he was able to tell the ancients the place where the maize grew. From then on, people stopped eating the root of bxebxina. They also say that in Libertad there is always an abundance of this grain⁶.

³ Wagley, 1957.
⁴ Valladares, 1957.
⁵ Valladares, 1957.
⁶ Valladares, 1957.
The above quotation from the Popol Vuh is another demonstration of the fact that maize was a central element in Maya life and culture.

3.3 Women and maize in the oral tradition

In contrast with what is found in texts and images, women have an important role in the oral tradition of the Maya peoples, which can be seen in the different legends and folk tales. One example is the description of the meeting of Ixmucané, the grandmother, with Ixcuic, the mother of Hunahpú and Ixbalanqué.

In this story we have a glimpse of the cosmology (cosmovisión) of the peoples of Central America, and the existence of various female deities linked to nature, agriculture and in this particular case, the growing of maize. In addition, there great symbolism in the reference to
Ixquic was made pregnant by the skull of Hun-Hunahpú which hung from the calabash tree. Since she was repudiated by her father Cuchumaquic, the Lord of Xibalbá, she went to find the mother of Hun-Hunahpú. This was Ixmucané. I am your daughter-in-law, said Ixquic. But the grandmother did not accept her without conditions. Go and bring the food for those who need to be fed - she ordered - "go and harvest a large net of maize and come back at once", she said. Ixquic went to the maize field, but there was only one stalk of maize, one stalk with its single ear of grain. The girl’s heart was filled with anguish. So she invoked the guardian of the crops, the Chahal of food supplies. She also implored the help of the goddesses linked to the cult of maize: "Ixtoc, Ixanil, Ixcacau, you who cook the maize". Then she took the tuft of red hairs of the maize, without cutting the cob, and she placed them in the net as if they were corncobs. The net filled itself completely. The animals of the field took the maize to the house. Where did you get all this maize from? asked Ixmucané. You must have finished our maize field off. She went to the maize field and saw that there was the single stalk of maize with its cob. This is the proof that you are my daughter-in-law, she said. Those whom you bear are also wise, she concluded.

Another story which links women to the reproduction of maize is the Pipil tale which tells of the origin of white maize: "Thousands of years ago, according to the story, the Lord of the Pipil had a beautiful daughter with large eyes and white, sparkling teeth. She liked to admire the woods and to bathe in the river pools. One day, she was playing in the water and she heard a voice inviting her to meet a tall lad. Following the instructions, she reached a cave which she entered. Inside there was a very handsome man, the Lord of the Bats. The young woman stayed to live with him and they had a child who had the nose of his father and the large eyes as well as the white teeth of his mother. Among her people, at that time, there was a famine. A plague of rats ate the heart of the maize used for seed. When she heard of the misfortunes that had befallen her people, the young daughter of the Lord of the Pipil decided to return to her village. Her father received her bitterly, accusing her of having caused this evil. Go back to your village, said the Lord of the Bats. Let the men work the land and, when the right season comes, pull out your teeth and sow them! This was done, and when the maize fields bore fruit, the grains of the maize were as white and sparkling as the teeth of the young woman. Since then, the Pipil have white maize as a gift from the gods, in memory of the girl who sowed her teeth to save her descendents".

As can be appreciated from this story, the Pipil oral tradition also recognises the role of women in the conservation of maize. "Had it not been for the intervention of the Lord of the Pipil’s daughter, maize would not have been able to reproduce, because the seeds had been finished by the rodents". This awareness of the conservation of the genetic resource and at the same time, of the possibility of famines, appears frequently in the traditional legends.
about maize. One of the most repeated stories, told in many villages of Guatemala and Mexico, is the one concerning the participation of zompopos (ants) in the appropriation of maize by man, which is what happens during a famine. We also find the story of St. Pedro Necta, in which hunger is satiated, after recurrent shortages of maize, by means of the consumption of a plant known as “donkey’s or mule’s helmet”. The participants in this study who were asked about their knowledge of this plant said that they knew of its existence through their parents. They identified it as a plant that was found in the mountains, where their ancestors went to gather it from the ground. They used it to make tortillas or drinks to compensate for shortages of maize.

3.4 Maize in the cosmic vision of Central America

In “Tamaoanchan and Tlacocán” the cosmology is defined as a structured collection of ideological systems which emanate from different fields of activity and which return to them, explaining principles, techniques and values. It follows that, since the cosmic vision builds up through all the daily practices, the logic of these practices is translated to the cosmic vision, impregnating it. The general principles of the tradition, by being repeated over time as normative models, become archetypes. The archetype is formed by these practices being reiterated over thousands of years, forming a nucleus of perception and action in the face of the universe.

In Central America, the cultivation of maize lies at the centre of the cosmic vision, since the time when it became the basic source of sustenance for these civilisations. This shared cosmology confers unity to a wide variety of peoples which enables the cosmic vision to turn into vehicles of cohesion. Thus, the cosmic vision was important for all segments of society.

The Tzotzil people, for example, divide the year into a season for rains and a season for droughts. To these are added a drought, or dry season, called canícula (in Guatemala, in July and August). Two religious feasts are linked to this division (May 3, the feast of the Holy Cross, and November 1-2, the feast of the Dead); since May to November is the rainy season and November to May, the dry season. The cultivation of maize, which guides this division, provides more than ten subdivisions in the general classification. The year is divided into ritual periods of sowing and harvesting of 160 days respectively, with 100 surplus days. The first phase starts on February 14. It is the period of the preparation of the land, in which there are 73 distinct days for the burning of the fields and the tilling of the earth and 67 for the sowing, the sprouting and the growing of the stalks (140 days). The second phase (starting in July) of 120 days, corresponds to the flowering and maturation of the maize. In November the end of the ritual year is marked and signals the start of both the harvest and the sowing season as well as the hundred day break, in which other crops are grown. This calendar varies according to the altitude and the climate of the region among other circumstances.

The important moments of this Tzotzil agricultural calendar are the following:

- The burning of the fields. Trees and shrubs are cut and burnt as well as the grasses to prepare the land.

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8 López-Austin, 1994.
• Ritual preparation of the ground for the sowing of the grain. In the warm earth, a rite is celebrated which requires the help of a priest.

• The sowing of the maize. Sexual abstinence is observed by the owners of the maize fields. Prayers are said for the soul of the maize. The propitious moment for the sowing is related to the moon. At his time a ritual meal of maize cooked without lime is eaten.

• Tender maize shoots sprout. The new maize is blessed.

• Storage. The maize is protected by a wooden cross and by corncobs arranged in a traditional way.

• Loss of part of the grain. Losses due to animals are quantified. A rite is celebrated for the lost maize.

• Preparation of the first food from the harvest (Eating). The ritual atol (maize-flour drink) is consumed. A rite is celebrated to obtain the strength required to feed on the grain.

These beliefs are shared by other Maya cultures still present in Central America. Pacheco (1985), for example, gives a detailed description of the beliefs and religious behaviour of the Maya-Kekchi culture in the Department of Alta Verapaz, Guatemala. This author points out that maize has been the staple food of this people for thousands of years, with clear periods of abundance and scarcity. As a result, a series of rites developed which reflect the various stages of the maize production cycle and their relation to human survival.

3.5 The origin of maize and the role of Huehuetenango in its evolution

The studies carried out at the beginning of the century by Vavilov and others (Bukasov, 1981; Vavilov, 1997) showed that the genetic diversity of cultivated plants is concentrated in certain regions of the world, which they called “centres of origin and diversity”. Central America is one of the seven regions initially identified by Vavilov. Among the outstanding original crops of this region is maize, given the genetic diversity present in the area as well as the presence of wild species and subspecies related to maize, an outstanding one of which is teosinte.

The discovery of teosinte at the end of the last century attracted the attention of botanists in their attempts to establish the origins of maize. In 1939, Beadle demonstrated reliably that maize and teosinte could be freely crossed and that the hybrids obtained were completely fertile. This suggested to him that the two taxa were conspecific and that they had only recently diverged. Other scientists developed different opinions on the origin...
of maize. All these considerations omitted teosintle as a participant in the evolution of maize and proposed that it originated from a hypothetical “wild maize” (Mangelsdorf, 1974). This author based his theory on the fact that the maize cob and the teosintle cob are hugely different, which made it impossible over such a short period (about 10,000 years) for such evolutionary changes to have taken place. However, most of the scientific evidence and historical references relating to maize support the hypothesis that teosintle was an ancestor of maize.

These considerations are important if one realises that in Guatemala there are two species of teosintle currently classified as Zea mays subsp. huehuetangensis and Zea luxurians distributed in the Department of Huehuetenango and the east of Guatemala respectively. This is why Guatemala is identified as one of the possible centres of the origin of maize in Central America.

The first detailed studies of the diversity of maize in Guatemala were carried out in 1957, in which reference is made to factors that explain the evolution of maize, including the following:

- Primitive maizes included different varieties of palomero or small-grained maize whose differences were determined by different altitudes and different ecological and environmental conditions.
- The exotic maize landraces of South America established themselves on their own and became new hybrid cultivars by crossing with the old indigenous varieties.
- Through hybridisation with teosintle they came to form additional hybrid cultivars.
- Geographical and ecological isolation tended to preserve the landraces.
- The existence still today of a large indigenous population contributes to the conservation of the specific landraces of maize.

In Guatemala, 13 landraces and 12 local cultivars of maize have been identified, of which seven landraces and four subspecies are present in the Department of Huehuetenango, which indicates the importance of the area for the genetic diversity of maize. Already some years ago (1945), McBryde had made a sample collection of maize in Guatemala, the genetic material of which was analysed and it was discovered, on the basis of the nodes present in the chromosomes of material collected in an area in the Department of Huehuetenango, that these contained “almost all the node positions known in chromosomes of all the races of maize in the world”. They certified the presence of a great number of a different types of maize in a very restricted area. In this study, the authors claim that western Guatemala is where the majority of the maize types grown in Central America, North America, the lowlands of South America, North America and the West Indies actually originated.

The presence of Zea mays subsp. huehuetangensis in the Department of Huehuetenango has come to be considered the most important elements in the generation of variability in maize. It was noted that there was genetic introgression between teosintle and the maize types grown in the neighbouring area and the indigenous population recognised that hybridisation did occur. In 1937, various hybrid ears similar to teosintle were found; and then, in 1955, 45 F1 and 3 F2 maize-teosinte
hybrids were found in the vicinity of the Noyoya and San Antonio Huixtla villages.

Doebly et al. (1987) made a comparative analysis of isoenzymatic variations present in maize and teosinte using 13 enzymatic systems that codify 21 loci. This work included 56 teosinte populations represented in the geographic area of its distribution and 99 populations of maize distributed over Mexico and Guatemala. On the basis of the results, it was possible to observe that the Guatemalan teosinte distributed over the Department of Huehuetenango (Zea mays subsp. huehuetenangensis) is the one that least resembles cultivated maize materials, whereas the teosinte of eastern Guatemala (Zea luxurians) bears a greater resemblance to the Mexican Z. perennis and Z. diploperennis.

On the other hand, it was generally assumed that cultivated maize (Z. mays subsp. mays) was more related to the teosintles of Mexican origin, especially with the taxon Z. mays subsp. parviglumis var. Central Balsas which comes from the central part of Mexico. More recent studies based on morphological aspects, biochemical markers and molecular markers show clearly that the theory that maize originated from teosinte is now more generally accepted. It is therefore now being suggested that maize is in fact a domesticated form of annual Mexican teosintle Z. mays subsp. parviglumis.

However, if as some authors maintain, maize was introduced in Guatemala, evidence seems to indicate a very early introduction (at least some 4000 years ago). Time and the skill of the indigenous populations were sufficient to ensure the generation of the great morphological diversity present in this country.

3.6 Maize culture and the other agricultural activities

Due to the characteristics of the soil, the topography and the climate, the Department of Huehuetenango is mainly a forested area. However there is a considerable amount of agricultural activity which includes a wide variety of crops that depend on the eco-physical nature of the area. In the lands at low or medium altitudes with a warm and temperate climate, the crops are coffee, sugar-cane, tobacco, chillipeppers, groundnuts, cassava, annatto, tropical fruits; whereas at higher altitudes with colder climates, the crops are barley, wheat, potatoes, alfalfa, beans and leafy green vegetables and fruits. Maize is grown at all altitudes.

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16 Studies on the DNA of the chloroplast (Doebley, 1987) and mitochondrial DNA (Weissinger et al., 1983).
Maize is grown mainly with traditional technologies, since the use of improved varieties is scarce. Given the population growth in the region and the need to increase the food supply, maize farming has spread to areas that are not appropriate for agriculture due to the soil quality and steepness of the slope. As a staple food in the region, maize is the most cultivated crop (Table 1).

Data provided by a more detailed study carried out by FONOPAZ indicate that maize is grown on 94% of the lands in the region, followed by beans (85%), coffee (49%), wheat (33%), fruit trees (22%).

<table>
<thead>
<tr>
<th>Crops</th>
<th>1979</th>
<th>1984-1987</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional crops:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coffea</td>
<td>20,900</td>
<td>14,926</td>
</tr>
<tr>
<td>Bananas</td>
<td>2,800</td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>200</td>
<td>296</td>
</tr>
<tr>
<td>Non traditional crops:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garlic</td>
<td>230</td>
<td>230</td>
</tr>
<tr>
<td>Cocoa</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Apples</td>
<td>1,594</td>
<td>1,594</td>
</tr>
<tr>
<td>Staple foods:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>101,600</td>
<td>141,266</td>
</tr>
<tr>
<td>Beans</td>
<td>6,900</td>
<td>14,329</td>
</tr>
<tr>
<td>Wheat</td>
<td>4,600</td>
<td>6,717</td>
</tr>
<tr>
<td>Industrially produced:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potatoes</td>
<td>3,600</td>
<td>2,902</td>
</tr>
<tr>
<td>Bananas</td>
<td>900</td>
<td>900</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Peanuts</td>
<td>200</td>
<td>185</td>
</tr>
<tr>
<td>Onions</td>
<td></td>
<td>1,109</td>
</tr>
<tr>
<td>Yucca</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>


IV. Genetic conservation of the resource: maize

Plant genetic resources represent an under-valued source of wealth. They represent the whole history of the evolution these resources have undergone over thousands of years, through both natural selection and selection under domestication. Plant genetic resources contain the accumulation of all the genetic changes that occurred over time. The wealth referred to here is the great genetic diversity present in the germplasm of any particular species. It is thus worth considering the purpose of this “genetic variability” stored in the germplasm of a given species. Life carries on under the effects of a changing world, both from a purely physical point of view, that is to say, environmental changes (climate, vegetation, soil types, associated species, predators, etc.) and from a social viewpoint (changes in eating habits, changes in farming techniques, changes of crops, etc.). In this sense, the only way to confront these selective forces is to have ready access to genetic diversity, in other words, there can be no evolution if there is no “genetic diversity” to respond to the changes required, be they environmental or cultural. Hence the importance of preserving genetic diversity.

Maize is an important element in the culture of Guatemala due to its role in the nutrition and in the cosmic vision of the country’s rural population, especially of those peoples of Mayan descent, who actually developed the traditional farming techniques. In this sense, maize is an element of cultural cohesion and ethno-botanical balance. In order to have a better understanding
of the nature of the germplasm it is essential to conduct more thorough studies on the selection criteria that the different peoples applied, their possible access to empirical knowledge and their understanding of the hereditary mechanisms. It is not easy to elucidate the considerations used by farmers in adjusting their production practices and their selection of species to the prevailing ecological, technological, social and economic conditions, because of the cultural void in which the researchers are working.

For example, production risk and security factors in limiting and uncertain weather conditions are not taken into account when the focus is on maximum yield for commercial purposes.

The maize varieties present in Huehuetenango correspond to the needs of the population, as well as to the germplasm's capacity to adapt to the changes in the different micro-environments that exist in the Department, given its great ecological diversity and the different anthropocentric focuses specific to the different crops present in the area (sources of carbohydrates, construction materials, medicinal and fodder materials, better soil management as well as a mythologically and ceremonially important plant). This is why the preservation of the germplasm of maize is not an isolated phenomenon, but a fact linked to the preservation of the life of the communities that grow it.

The discussion of maize conservation in Huehuetenango is centred on the selection motives, in other words, those human preferences, decisions, and processes that determine which direction the genetic variation present in the maize germplasm will take. With reference to the different and changing environmental factors, local men and women farmers have a perfect knowledge of the types of maize that adapt to locations at different altitudes and in different weather conditions, and consequently they know the genetic materials that are resistant to drought, diseases, different soil types, etc. This aspect will be the focus of what follows.

A selection motive in the conservation of the genetic resources of maize in which the human factor, especially that of women, plays a direct part, are the culinary virtues of the different types of maize. In areas where traditional farming is practised, certain genetic materials have specific uses and culinary qualities, and this is what determines the priority given to their conservation. Women are the ones who are most knowledgeable in the management of these traits within local maize varieties.

An important factor in the loss of certain genetic resources was the arrival of the so-called “green revolution” which brought the introduction of high yielding varieties, which in turn implied very high costs through the erosion of genetic resources and the environmental damage it generated in the production models it introduced.

Currently, other factors continue to decimate the existing stock of maize genetic resources. The construction of new roadway and irrigation infrastructure, and the predominance of market-driven systems are factors which shatter the geographic isolation and replace the traditional practices linked to systems of exchange in kind and local consumption.

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which used to facilitate the preservation of native genetic resources that had survived even after the Spanish conquest.

As demonstrated by Hernandez and Ortega (1987) each maize variety corresponds to a different ecological and social niche. For this reason, the preservation of a maize variety is dependent on the survival of the ecological and social niche that fosters it. Where economic and social changes disturb or eliminate these ecologies and niches, much diversity may also be lost.

Map 1
Location of the Department of Huehuetenango in the Republic of Guatemala

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V. Area of the study

5.1 Geographic location and topography

The Department of Huehuetenango borders to the north with Mexico, to the east with the Department of Quiché, to the south with the Departments of Totonicapán and San Marcos, and to the west with Mexico (Map 1). The area covers about 7,403 square kilometres, which represents 6.8% of the national territory.

The topography of the Department is extremely varied, with mountains of more than three thousand metres in height and lowlands down to about three hundred metres, with climates that vary according to the different altitudes in the area. The region is drained by eight river basins towards the Gulf of Mexico and by the river Montagua which flows into the Atlantic.

The soils of Huehuetenango have been divided into 26 categories, consisting of 22 series of soil, two phases of soil and two classes of miscellaneous land. According to the classification of Simons, Tarano and Pinto (1959), the soils of the northwestern region, to which Huehuetenango belongs, were divided into five groups: mountain volcanic soils (1%), soils of the central high plateau (27%), soils of the limestone hills (60%), Petén lowland soils (11%) and the miscellaneous classes of soil (1%).

The annual rainfall in the area is about 1,000 mm, although this can vary greatly. There is a clearly defied dry season (November-April), generally referred to as summer. Even during the rainy season, there are two well known dry periods referred to as canículas. As regards humidity, the IGN (1972) for the area was 60% to 70% of atmospheric humidity.

5.2 The most important life zones

In the Department, 7 life zones are identified, in other words 50% of the life zones known in Guatemala20, which demonstrates the plant diversity which can be found in both wild plants and in cultivated plants.

The most widespread life zone is the “low mountain humid forest” which covers about 36% of the region and is distributed mainly over the southern part of the Departments of Huehuetenango and Quiché. The natural vegetation consists of evergreen oak (Quercus spp.), “sad” pine (Pinus pseudostrobus) and ocote pine (Pinus montezumae), as well as capolin cherry (Prunus capuli) and cold-land strawberry trees (Arbutus xalapensis).

Another important life zone is the “hot humid sub-tropical forest”, which covers about 24% of the region’s surface area and is distributed over the north of the Department. The typical plant species are babassu (Orbignya cohune) and breadnut trees (Brosimum alicastrum).

5.3 The linguistic component

In the territory of Huehuetenango, there are nine different peoples of Maya origin, out of a total of 21 existing in the country: Akateko, Awakateno, Chuj, Huista (Jakalteco), Q’anjob’al, Mam, Tectiteco, K’iche and Q’eqchi’. This gives a complete picture of the cultural diversity that exists in the Department.

It is an element of prime importance in

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20 De la Cruz, 1982.
the ethno-botanical study we are carrying out. Map 6 (Appendix IV) shows the distribution of the ethnic groups present in the Department of Huehuetenango.

5.4 Characteristics of the situation of women in Huehuetenango

To understand the role of women in the conservation of maize genetic resources, it is important to start with an understanding of the social, educational and economic context in which this participation was defined.

Population

Table 2 shows population data for the Department of Huehuetenango in 1980 and 1995, where we can appreciate a high concentration of population in rural areas. More than 4/5 of the population, both men and women, live in rural areas; and there is very little variation between 1995 and the situation 15 years previously, despite the migrations abroad recorded and the armed conflicts over this period.

The census of 1994 shows a predominance of local ethnic population in the region of Huehuetenango (see Table 3). The female population, both indigenous and non-indigenous, is slightly larger than the male population, which is probably due to migration and the armed conflicts which have affected the area.

Table 3

<table>
<thead>
<tr>
<th>Ethnic composition of the population 1994. Huehuetenango</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indigenous</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>Man</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: Censos de la Población 1994, INE 1996
* Excludes 32,368 inhabitants whose ethnic group was not counted by the Census

Table 4

<table>
<thead>
<tr>
<th>Female population by age groups, 1994. Huehuetenango</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>12-29</td>
</tr>
<tr>
<td>20-49</td>
</tr>
<tr>
<td>50-64</td>
</tr>
<tr>
<td>65 and over</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: Censos de la Población 1994, INE 1996
* This refers to women aged 12 or more

There is a predominance of women who receive no formal education at all, followed by those who have only been educated at Primary level. Although the lack of schooling is more evident among women over 45, the indicator is high in all age-groups. This explains why only
15 women reached university graduation after higher education courses.

### Table 5
Formal education of women by age groups, 1994. Huehuetenango

<table>
<thead>
<tr>
<th>Age</th>
<th>None</th>
<th>Primary</th>
<th>Secondary</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-14</td>
<td>21,420</td>
<td>26,038</td>
<td>1,099</td>
<td>0</td>
</tr>
<tr>
<td>15-24</td>
<td>30,162</td>
<td>27,279</td>
<td>5,620</td>
<td>191</td>
</tr>
<tr>
<td>25-34</td>
<td>24,418</td>
<td>11,003</td>
<td>2,422</td>
<td>276</td>
</tr>
<tr>
<td>25-44</td>
<td>21,523</td>
<td>5,553</td>
<td>978</td>
<td>137</td>
</tr>
<tr>
<td>45 and over</td>
<td>32,795</td>
<td>5,142</td>
<td>565</td>
<td>56</td>
</tr>
<tr>
<td>Total</td>
<td>140,928</td>
<td>85,015</td>
<td>10,668</td>
<td>662</td>
</tr>
</tbody>
</table>

Source: Census of the Population, 1994, INE 1996

#### Women's employment

The majority of women over 7 years of age were considered as a population not economically active, as shown in Table 6. Out of a total of 244,309 women, only 18,023 were considered as an economically active population (7.38%). This indicates that the participation of women is not considered as work in many cases. Moreover, the census data show that, within the work categories, out of a total of 17,804 women with jobs, 5,127 were in the group of non-remunerated family-based employment, 5,459 were self-employed and 6,918 were employed. As regards the not economically active population, it was found that of the total of 226,286 women in this group, 179,141 stated that their main activities were “home duties”, which is not classed as an economic activity; 42,032 were students and 1,326 were retired and the rest were in the ‘other’ category. These figures do not reflect the contribution women make to the economy of Huehuetenango.

However, other sources (FLASCO-1996) indicate that in the region of Huehuetenango and generally in the other rural regions of Guatemala the working day of women registered as "housewives" begins at five in the morning and ends at eight in the evening, a total of 15 hours of activity. Their main activities are the following:

- Preparation of three meals
- Gathering wood
- Milling maize by hand, or taking it to the mill
- Cleaning the house
- Care and feeding of domestic animals (chicken, pigs and others)
- Washing clothes in the local river or wash-house
- Mending or making clothes for the family
- “Helping” in farming tasks
- Making craft objects for sale
- Bringing up the children
- Fetching water
- Migrating to the coast for the coffee or sugar-cane harvests.

#### Table 6
Women of 7 years of age or more by occupation, 1994. Huehuetenango

<table>
<thead>
<tr>
<th>Category</th>
<th>No. of persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>17,748</td>
</tr>
<tr>
<td>Seeking employment (worked before)</td>
<td>56</td>
</tr>
<tr>
<td>Seeking employment, 1st time</td>
<td>219</td>
</tr>
<tr>
<td>Not economically active</td>
<td>225,262</td>
</tr>
<tr>
<td>Total</td>
<td>244,309</td>
</tr>
</tbody>
</table>

According to INE, APROFAM and CITGUA, the main indicators of the health of women in Huehuetenango are:

- Life expectancy: 66.9 years
- Age of first child-bearing: 14 years
- Average number of children of reproductive age per household: 6.9%
- Women using contraceptives: 13.2%
- Women with tetanic toxoid: 39.9%
Apart from the migration to the coast and the making of craft objects, the other activities are not remunerated and are not quantified, even in the census processes. In certain cases, the work in the craft workshops is not considered as work, because it is assumed that they do the work “in free time”. This situation is supported by the existence of the Civil Code of Guatemala, which establishes that the representation of the home is the right of the man, who in this capacity can oppose any remunerated employment outside the home on the part of the woman.

**Women’s access to resources**

- **Access to land**
  In the study by León and Vargas (1992) it appears that only 10% of land deeds issued by the INTA since 1954 were in the hands of women who had mainly obtained them through inheritance or widowhood. On the other hand, 88% of those interviewed indicated that they have no possibility of acquiring land, since there are no government policies for land deeds to be made out specifically to women; this is why the majority of the women interviewed (50%) thought that credit for land purchase could be the most viable solution.

However, even access to credit is very limited for the rural farmers and even more complicated if these are women. León and Vargas (1992), in their study on women, showed the various constraints women face in gaining access to the limited sources of credit. Only 16% of those interviewed had ever made a request for credit; of these, 40% received it from an NGO, 33% from a public institution, 20% from a cooperative and the rest from money-lenders. The NGOs that work in the field of credit indicated that their loan levels are low, with low interest rates and over short terms. As regards their purpose, the majority are for production, craft-work projects or marketing. There is a lack of data concerning the use of credit in maize farming.

**VI. Classes of maize specific to Huehuetenango**

The people of Huehuetenango classify maize according to criteria such as colour, period of growth, shape of the grain, geographical origin and length of the growth cycle. By colour, maize is classified as white, yellow, black, coloured (red) and pinto (grains of different colours on the same cob resulting from cross-pollination or transplants). Table 7 shows the terms used in Spanish and 5 local languages (Q’ajob’al, Chuj, Poptí [Jakalteko], Mam and Awakateko). Depending on the period of growth, summer maize is distinguished from winter maize. The shape and size of the grains serve to identify certain named varieties: pache (plump), long, dog tooth, etc. Due to geographical origin, there is a distinction between different types of maize: Comiteco (supposed to come from Comitán, Mexico), Chiapaneco (Chiapas, Mexico) and many others. Similarly, the maíz breve (quick maize) and maíz del año (maize of the year) owe their names to the time it takes to grow them.

In Huehuetenango, 47 classes of maize have been identified. Table 8 lists the different varieties of maize identified in the study with their local names and by climatic zones. It also gives the data referring to the colour and growth cycles of the maize. In accordance with the social and historical dynamics of the
Huehuetenango region, a high rate of exchange of maize seed between the different zones was recorded. For example, in the municipalities of Huista and in the north of the Department a yellow maize called Comitcoco is grown which differs from the Tehua, and both these races of maize are abundantly present in Mexican territory.

Table 7
Classification of maize by colour in Spanish and various Maya languages, Huehuetenango

<table>
<thead>
<tr>
<th>Spanish</th>
<th>Juka</th>
<th>Q'eqchi'</th>
<th>Chuj</th>
<th>Avandaro</th>
<th>Mam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>Kajst</td>
<td>Kajst</td>
<td>Kajst</td>
<td>k'akb'akim</td>
<td>och i'x</td>
</tr>
<tr>
<td>Blanco</td>
<td>ajkst</td>
<td>ajnal</td>
<td>ajnal</td>
<td>akulbutz'</td>
<td>akul i'x</td>
</tr>
<tr>
<td>Amarillo</td>
<td>k'ankst</td>
<td>k'ankst</td>
<td>k'ankst</td>
<td>k'ankbutz'</td>
<td>k'ankbutz' i'x</td>
</tr>
<tr>
<td>Negro</td>
<td>kekekst</td>
<td>kekekst</td>
<td>kekekst</td>
<td>kekekbutz'</td>
<td>kekekbutz' i'x</td>
</tr>
<tr>
<td>Pinto</td>
<td>tzibst</td>
<td>tzibst</td>
<td>tzibst</td>
<td>tzibbutz'</td>
<td>tzibbutz' i'x</td>
</tr>
</tbody>
</table>

Photo 1
Black maize used for the preparation of black tortillas, which are eaten on special occasions
By analysing the genetic variety as regards the races and sub-races of maize in the Department of Huehuetenango according to the agro-ecological zones, one observes that the cold agro-ecological zone presents a greater number of races (five) and sub-races (four), while in the temperate zone, three races are recorded, as in the hot zone. All together, it is certain that at least eight races and four sub-races of maize are present. Lastly, Huehuetenango is one of the Departments, if not the Department, that presents the greatest maize diversity in Guatemala, with 57% of the races and 33% of the sub-races recorded in the country.

The description of maize varieties can help to interpret the races of maize present in the Department which, as has already been said, is one of the elements that enables us to know the selection motives and to understand the role of women in the selection and conservation of the specific genetic material of maize in Huehuetenango.

A practical example with reference to Guatemala is given by Hernández, (1987) who mentions that in the zone of San Marcos one often finds seed almost exclusively of the leafy types, a characteristic generally linked to the concept of fertility. The fact that there are fewer nodes present in the chromosomes compared to the Quicho races is a clear indication that efforts are being made by the local human communities to preserve this type of maize free from contamination by other races and especially by teosinte.

In the hot agro-ecological zone there are 25 types of maize have been recorded on the basis of their common names and grain colour, which does not

<table>
<thead>
<tr>
<th>Colour</th>
<th>Local name</th>
<th>Growth cycle (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cold zone</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>de año</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>peche</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>redondo</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>largo</td>
<td>10</td>
</tr>
<tr>
<td>Yellow</td>
<td>redondo</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>san mereño</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>acel</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>jum-bamna</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>de año</td>
<td>10</td>
</tr>
<tr>
<td>Black</td>
<td>redondo</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>peche</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>largo</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>de año</td>
<td>10</td>
</tr>
<tr>
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<td>6</td>
</tr>
<tr>
<td></td>
<td>redondo</td>
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</tr>
<tr>
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</tr>
<tr>
<td></td>
<td>acel</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>peche</td>
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</tr>
<tr>
<td>Coloured (red)</td>
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</tr>
<tr>
<td>White stained</td>
<td>durazno</td>
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<tr>
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<td>9</td>
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<tr>
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<tr>
<td></td>
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<td>4</td>
</tr>
<tr>
<td></td>
<td>san antonio</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>sieta hojas</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>chiquigua</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>diente de perno</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>oenrigo</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td>orenta</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>largo</td>
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</tr>
<tr>
<td></td>
<td>de verano</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>tagus</td>
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</tr>
<tr>
<td>White</td>
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<tr>
<td></td>
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<tr>
<td></td>
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<td>2</td>
</tr>
<tr>
<td></td>
<td>en antonio</td>
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<tr>
<td></td>
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<td>4.5</td>
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<tr>
<td></td>
<td>comitéo</td>
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</tr>
<tr>
<td></td>
<td>guajequeño</td>
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<tr>
<td></td>
<td>chiquienza</td>
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<tr>
<td></td>
<td>oenrigo</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td>tagus</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>repote</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>san pedro</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>tuxpeño</td>
<td>6</td>
</tr>
<tr>
<td>Coloured (red)</td>
<td>quebranito</td>
<td>2</td>
</tr>
</tbody>
</table>
necessarily imply that this region provides greater genetic variety, since a single genetic material can be given different common names.

In the cold agro-ecological zone 16 common names have been recorded for the types of indigenous maize that are white, yellow, black and red. According to Wellhausen et al. (1957) the landraces of maize represented are the following:

A local variety present in the cold part of the Department is known as Otolón. There are both pure and crossed populations, both yellow and white in colour.

Quicheño ramoso is an interesting genetic material since, as its name indicates, its cob is subdivided into various branches or appendices. It is mentioned that this maize was considered as a symbol of fertility in ancient Peru; similarly, it is reported that it was used in prehistoric religious ceremonies in Guatemala, which is why it is probable that this variety was preserved in Guatemala for its religious symbolism and significance.

Photo 2
Local varieties of maize, grown by farmers who use traditional methods
Quicheño, pure and genetically crossed populations. This landrace is one of those that presents the most genetic variety in the Department of Huehuetenango, including, as it does, three sub-races: Quicheño rojo, Quicheño grueso and Quicheño ramoso. The grueso sub-race provides fasciated cobs which have no agronomic advantage over the other races. It is thought that it may be grown because it is supposed to have magical or other properties. This material presents a great number of nodes in its chromosomes which indicates a crossing with teosinte.

The Comiteco landrace with its yellow and white grain. This is somewhat surprising since, according to Wellhausen et al. (1957), when they carried out their investigation this race was distributed solely in the temperate zone of the Department of Huehuetenango, therefore it is important to note that in recent years this race of maize has been distributed in the lower regions of the Department of Huehuetenango, thus increasing its adaptability rating.

In the temperate agro-ecological zone, only six types of maize are mentioned according to their phenotype and common name, which belong to the landraces Olotón and Quicheño already listed for the cold zone. In addition, the Yellow-grained Comiteco is also present. This landrace is considered originally Guatemalan since Huehuetenango is the place where pure populations are found.

The black-grained materials listed for the cold zone could belong to the landrace Negro de Chimaltenango a cold-land sub-landrace, according to the description and distribution recorded by Wellhausen et al. (1957), although no presence of these genetic materials in the Department of Huehuetenango is indicated. However, their presence there is not surprising, since they are listed as present in the highlands of San Marcos, possibly due to recent introduction in the high areas of Huehuetenango, or simply because they were not included in Wellhausen’s collection.

San Marceño is a landrace with yellow grain, endemic in Guatemala and also contains certain populations cross-fertilised with Serrano.

Imbricado con grano blanco, which is considered one of the most primitive landraces.

Quicheño rojo is a landrace scarcely cultivated in the region and it presents some of the faciation characteristics found in the Grueso sub-race.

Tuxpeño, which is considered rare in Guatemala but is abundant in Mexico, is the most important landrace in the Gulf of Mexico. Tehua is apparently of Mexican origin and is distributed in Chiapas, especially in the area bordering with the Department of Huehuetenango. It is considered to be closely related to Comiteco which, as has been mentioned, is considered to be of Guatemalan origin.
VII. Introduction of improved varieties

1945 marks the beginning of the so-called “Green Revolution”, with the creation of the first dwarfed wheat variety, followed by other attempts with barley, maize and other crops. With the introduction of “high-yield varieties” there was an increase in world food production. Let us consider the cases of maize, rice and wheat. In Asia, in 1961 the annual production of maize was 1.2 tonnes per hectare, by 1991 the production reached about 3.2 t/ha; as regards rice, in 1961 the annual production was 1.75 t/ha, in 1991 it approached 3.6 t/ha; for wheat, the 1961 production was 0.6 t/ha and by 1991 it reached 3.2 t/ha.

However, it is important to clarify that the genetic materials known as high-yield do not always have high yields or high returns to the small farmer. They have the genetic potential to increase grain production under conditions of high nutrient and water inputs. For this reason, they could rather be called “high-response varieties”, since there is a change in the production of the biomass of plant reproductive parts (increase in harvest indexes) without basically changing the total quantity of biomass produced. As a result, there was a need to increase the use of chemical fertilizers, pesticides, herbicides and intensive irrigation systems with impacts on the ecological environment, such as changes in soil fertility, toxicity and the salinization of soils, desertification and other problems in the use and management of water resources, as well as genetic erosion.

This genetic erosion also entails changes in traditional agricultural production systems in the following ways:

(a) improved varieties need to be grown as monocultures, which does not fit in with the logic of traditional milpa farming systems. The traditional milpa is based on growing different crops in a single area (maize, beans, pumpkins, miltomate, hierba mora, bledo, chilli). The introduction of the new “high yield” varieties results in the modification of food production systems, the availability of food produce and labour in the agricultural sector. Women are particularly affected by losing access to these other resources in the milpa;

(b) improved varieties have reduced genetic base compared with the high variability present in the genetic materials farmed traditionally. This increases the household’s exposure to risk from environmental events and changes;

(c) improved varieties displace the genetic materials developed by farmers over thousands of years. Eighty of the ninety countries participating in the World Meeting on Genetic Resources held in Leipzig in 1996 reported that the above factor was the main cause of genetic erosion21.

The results obtained by consulting the local communities indicate that there was no massive adoption in the region of Huehuetenango of the improved varieties created by the ICTA, except in the area of Aguacatán, where some men and women farmers reported that they used them. According to the study, the percentage of families using them

are 8% in the western zone, 5% in the east and 5% in the remaining areas. For the identification of the indigenous varieties of maize currently present in Huehuetenango as landraces and sub-landraces it is advisable to examine the harvest to confirm their diversity.

The predominant type of agriculture in the area is subsistence farming based on traditional techniques with maize as the main crop in association with other species. A notable exception is the area around Aguacatán where garlic and onions have replaced maize. Other similar cases are found in Tzunul, Todos Santos Cuchumatán, where there is an increase in dwarf palm farming.

The types of seeds are indicative of the types of agriculture. In communities like Aguacatán, where there is a change in the crop patterns, the use of improved varieties of maize are reported, whereas, in communities with traditional farming techniques, the use of indigenous seed is maintained.

Changes of seed also bring changes in the rites and customs associated with maize farming. The tendency observed is a loss of rituals and traditional eating habits. A unique exception is found in the communities of the lower and upper reaches of the Río San Juán in Aguacatán who reported that they still practise certain rites, but that there is a tendency towards extinction.

VIII. The farming of maize

The participation of women in the conservation of the different varieties is characterised by their greater participation in decision-making, farming tasks and in the post-harvest processes depending on the type of genetic materials to be used. The type of agriculture practised in the area of the study fosters the multi-cropping or traditional system, which in turn fosters the conservation of the genetic resources of maize. In general terms it can be said that women participate actively at all levels in this system.

However, the level of involvement of women in maize farming varies greatly in the region, according to the customs of the different communities, their position within the family units and the social and economic level of the families themselves. In Aguacatán, they participate in the whole farming process due to the fact that a large number of women are in charge of the production teams (widows or wives of men who have emigrated); in other places, their participation is shared with the men and in certain places (such as Tzunul, Todos Santos Cuchumatán), their participation is more limited in the farming phase where women are specialised mainly in handicraft. However, in all cases, women work directly in the selection of the seed for the next production cycle. In most of the cases reported, women are in charge of selecting and stripping the cobs as well as specifically selecting the grain. In certain places men also participate in this activity.

All the interviews carried out confirm that the main crop in the development of the communities is maize and that it is a family responsibility, and as such, that its cultivation involves all members of the family unit. This is dependent on the social conditions of the different communities. For example, in communities where there is an intensive craftwork activity, or where there is a large production of commercial products,
such as garlic and onions, women participate less in the farming of maize than in communities where there is a high level of male migration or where there are many widows, where the farming is predominantly carried out by women. However, whether they participate directly in the actual cultivation or only in the post-harvest tasks, generally speaking the women of the region have a knowledge of the maize farming techniques and play an important part in the culture which surrounds the farming of maize through their central role in the process of selecting the grain.

The agricultural production cycle of maize varies widely. In the cold zones, the cycle is longer and there is one harvest per year, whereas in the hot and temperate zones, on the other hand, it is possible to obtain two harvests a year. In such zones two types of maize are sown: humid maize and rainy maize. The larger farms plant only a part of their land in the dry season, leaving the other parts of the land to rest before sowing in the rainy season. However, leaving land fallow for one or more years, locally known as “guatal”, is a gradually diminishing practice due to demographic pressure and the scarcity of lands.

Although all family members participate in the tasks involved in the production of maize, certain members of the family have greater responsibility assigned to them for specific tasks. Women have an important role in the production cycle of maize, but since the work in the maize field is associated with the responsibilities of the men, the work of women is only seen as a “help”.

The yield of maize varies according to factors such as altitude, soil quality, maize varieties, climate, adequate rainfall, fertilisers and pest control. According to the study, in the cold zones, the average yield is 34 quintals per hectare; in the temperate and hot zones the yields are 45 quintals per hectare and reach a maximum of 69 quintals.

According to Doña Francisca, a Mam woman from Colotenango, “If the woman knows how to handle the hoe, she can help the man; if not, she just spreads the fertiliser. She also helps when he sprays the crop, she is the one who fetches the water that is required.”

Various studies have shown that as well as participating as manual labourers, women also intervene in the decisions concerning the techniques to be use in the production processes, credit and
marketing. A study carried out as regards the participation of women as producers of food in Guatemala reveals interesting figures: women account for 31.5% of rural employment in the production of staple foods, mainly maize and beans.

The information collected clearly indicates that although women participate in nearly all the tasks related to the production of maize, as shown in Table 9, this varies according to the different regions.

Apart from the northern and southern regions, the sowing, cleaning and pest control activities are predominantly carried out by the male population; however in all regions, men and women participate in an equal manner in the harvesting activities. In the southern and the northern regions there is a high level of women’s participation in all farming activities.

As we shall see later, on the basis of these data, the emphasis of women’s contribution to the growing of maize is mainly focused on the harvest and post-harvest activities, since their role is essential in the selection of the material to be sown.

Table 9
Participation of women (W) and men (M) in the farming of maize (%)

<table>
<thead>
<tr>
<th>Activities</th>
<th>East W</th>
<th>East M</th>
<th>Centre W</th>
<th>Centre M</th>
<th>West W</th>
<th>West M</th>
<th>South W</th>
<th>South M</th>
<th>North W</th>
<th>North M</th>
</tr>
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<tbody>
<tr>
<td>Land preparation</td>
<td>0   100</td>
<td>15  85</td>
<td>0   100</td>
<td>0   100</td>
<td>23  77</td>
<td>24  66</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sowing</td>
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<td>7   39</td>
<td>0   100</td>
<td>0   100</td>
<td>20  60</td>
<td>17  58</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning</td>
<td>3   97</td>
<td>10  90</td>
<td>0   100</td>
<td>0   100</td>
<td>13  67</td>
<td>12  53</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Mounding</td>
<td>2   95</td>
<td>0   90</td>
<td>0   100</td>
<td>0   100</td>
<td>22  77</td>
<td>27  68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertilising</td>
<td>10  90</td>
<td>2   97</td>
<td>0   100</td>
<td>0   100</td>
<td>10  90</td>
<td>20  80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanitary control</td>
<td>0   100</td>
<td>0   100</td>
<td>0   100</td>
<td>0   100</td>
<td>0  100</td>
<td>0  100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dobble (folding)</td>
<td>0   100</td>
<td>0   100</td>
<td>0   100</td>
<td>0   100</td>
<td>0   100</td>
<td>0  100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvest</td>
<td>15  85</td>
<td>22  66</td>
<td>40   60</td>
<td>47  53</td>
<td>50  50</td>
<td>50  50</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*In the northern and central zones doble is practiced because they are cold zones.

Nevertheless, the times when women have a determining role in the definition of the genetic material to be preserved and reproduced are the post-harvest period and the pre-sowing period. By the process of husking the maize, the selection of the seeds and their preparation for sowing, women make an important contribution to the preservation of the genetic material. In the different ethnic groups present in the Huehuetenango area, as well as in other pre-Hispanic cultures, unwritten knowledge is passed from generation to generation through the maternal line. Independently of who does the work, certain phases of maize farming are accompanied by special ceremonies in which the permission and the protection of deities associated with the land, agriculture or maize are implored. Currently, in various municipalities of the Department, such as San Pedro Soloma, Santa Eulalia, San Juan Ixcoy, San Sebastián Coatán, San Rafael la Independencia, Todos Santos Cuchumatán, Jacaltenango, Concepción Huista, Agua Catán, San Pedro Necta, Ixtahuacán, Colotenango and San Juan Atitán special rites are

22 De León and Vargas, 1992.
celebrated in relation to maize farming, especially at the times of sowing and of the harvest.

These rites are expressions of a religious feeling in which pre-Hispanic and Christian elements are subtly amalgamated. Many families have altars in their houses where they do a vigil over the maize seed before sowing the crop.

This shows the respect for nature which endures in the indigenous families of Huehuetenango. This feeling for the earth is also expressed in the words of Rigoberta Menchú (Nobel Peace Prize):

We have the earth. Our ancestors told us: “Children, the earth is the mother of humanity, because it is she who feeds humanity.” ... Thus our parents teach us to respect the earth. We may only wound the earth when there is need. This conception means that before we sow our maize field, we must ask for permission from the earth. [The prayer says] “And we respect you, and we ask you, and [implore] that you love us as we love you.” (Burgos-Debray, 1992)

The farmers of Huehuetenango, especially those who grow indigenous maize, generally have small lots. According to the last agricultural census in 1975, 29.56% of the properties were micro-farms, lands of an area inferior to 0.69 ha. 59.48% were sub-family farms whose area ranges from 0.69 ha to 6.9 ha. The field study revealed that the average surface area on which families grow maize was 0.78 ha in the south of the Department, 0.52 ha in the western and central regions, 0.43 ha in the eastern region and 1.04 ha in the north.

The roles of women in the conservation of the genetic resources of maize

The tasks related to the farming of maize and other crops in the Department of Huehuetenango reflect a combination of recently introduced techniques with ancestral practices and rites. A few references are given below:

- Preparation of the land
  In growing maize, the preparation of the land consists of manually cleaning the soil and burning the remaining weeds. The burning or clearing is done to eradicate jarahuá (Hyparrhenia rufa (Ness) Staf.), whose roots spread widely. After the burning, the stubble and the ashes are turned into the soil. Some farmers, mainly in the central area, do this traditionally with hoes or with ox-drawn ploughs. The aim of this is to put the organic matter back into the soil and to allow the earth to retain moisture deeper down. As the earth is turned over, it is exposed to the sun and this practice contributes to pest control. If the land is near the home, they use the yard birds (poultry) to feed on the eggs, larvae and adult forms of the different pests. Both men and women participate in this activity.

- Sowing
  The complexities of the rites related to the growing of maize differ according to the various ethnic groups, religious affiliations and the economic status of each family. The blessing of the seed-grain is practised by both the Catholics and the Protestants.

In Santiago de Chimaltenango, a Mam community, during the 1930s, at the dawn of the first day of the sowing season the owner of a piece of land and his wife would celebrate the rite of the blessing of the grain.

The sowing of summer or rainy-season maize is carried out between January...
and March. The seeds are sown in the furrows formed with the tilled organic material where there is a higher concentration of humidity. In the higher and colder zones, the seed sown is at higher risk because the temperature may drop and damage the tissue of the new shoots. There are specific varieties of maize for sowing in the humid zones, which are resistant to drought and cold. In this respect, don Anselmo, a farmer from Malacacinto declared:

"There is a seed of black maize and another that is yellow. The white or yellow seed takes eight months; black and yellow seed is fast growing and takes less time to mature, five months." It is a seed for sowing in humid soils, that is tried and tested. The behaviour of other seeds is not known. The people know which seed they need. This is why maize for seed is stored after the harvest.

Taking into account the amount of land available, the farmers of the hot and temperate zones can also opt to sow rainy season maize. This is the variety that has the longest production cycle. Doña Lucía, a woman from Todos Santos, describes this sowing process as follows:

Prayer:
"My God, let my maize not disappear. Father Praxil (the Lord of Maize), let there be water puddles for your feet and dry times for your hands (rain for the roots and, subsequently, dry weather for the cobs). Do not send the rains or gales that ruin your field. Forgive me Father! Let there be no misfortune in this place (the maize field). Let there be no snakes in the fields as we work this day [...]" (Wagley, 1957)

The sowing is done preferably in a single day. If necessary, additional workers are hired to help with this task. According to Wagley (1957), the sowing of maize in Santiago Chimaltenango during the 1930s had to be done on a day that was favourable according to an esoteric calendar, interpreted by the shaman. Doña Remigia López y López, an 84-year-old woman resident in Malacatancito, remembers:

"In the olden days, when we sowed the grain, we ploughed three times with the oxen, and once the land was prepared, the people caught 'chompipes' (turkeys) and invited everyone. It was a custom to make a tortilla paste with ground cocoa, cinnamon and peppers beaten to a froth. At twelve, after the meal, it was given to all the sowers with a slice of sugar-loaf. In the afternoon they are given 'horchata' (a rice drink) and bread. It is still done today, sometimes. The morning before sowing the maize, or in the night, they put the basket of seed-grain in front of the altar of St. Isidore the Farmer and they lit candles to him."
village in Huehuetenango, they serve an appetizer in small gourds. Each culture or each community organizes rites that are specific to its own beliefs and the natural phenomena that are most frequent in its specific area which can influence the development of the crop. In Suculque, for example, before the meal, prayers are said for the germination of the seed and the crop. In other towns like Los Huistas, other rites are celebrated for the same purpose and to avoid the scourge of the wind. In view of the importance of rain for the growth of the crop, in the 1950s, in Colotenango, a Mam community, a rite was celebrated to ask for rain and ensure the growth of the plants. The “pedidas” (ceremonies to implore rain) were celebrated on the crests of the mountains surrounding the area. In these rituals the chimán, the mayor, the regidor, certain elders and their wives all participated. The chimán was the person who had to pronounce the “call” to the Lords of the Hills to ask them to send the rain. The ceremony included prayers, the sacrifice of a turkey, the offering of candles, burning incense and a dance. Nowadays, in the municipalities of Malacancito, San Gaspar Ixchil and San Sebastian Huehuetenango, they still practise rites on top of the hills to ask for rain. In these ceremonies, they burn incense, copal, turkey eggs and chilli peppers.

In the 1950s, in some communities of Colotenango they also conducted rituals to ask for rain.

Various testimonies obtained in this consultation confirm that such practices still go on in the communities. It is said that a few years ago, in 1987, in San Pedro Necta, where water is very scarce, it rained once or twice and everyone went out to sow, but then it did not rain again. The people brought out in procession (the image of Jesus of Nazareth), and at that moment it began to rain. “When there is a real lack of water and they do the processions, especially in Jacaltenango, there are special persons to pray, the alcaldes rezadores”. (Clara Silvestre Camposeco, 39).

• Cleaning and other tasks

Although these tasks are mainly carried out by men, in some communities women also participate. About 20 days after the maize is planted, the farmers do a first cleaning, which consists in removing the weeds that have grown around the plants. The second cleaning takes place when the stalks are knee-high. During the second cleaning the juleo or aporque is carried out, which consists of forming mounds of earth around the stalks to protect them from the wind. The fertilisation consists of adding chemical fertiliser (urea or 20/20) to the soil or organic manure (hen, sheep droppings).

The main pests which attack the maize are the gallina ciega (larva of the beetle Melolontha sp.) and the gusano cogollero (larva of the Heliotis). To control gallina ciega attacks, certain farmers plough the soil. In this way, the larvae are exposed to the heat of the sun and the attack of birds. In other cases, the general practice is to kill the adults. To do this, the farmers attract them by placing torches in barrels with water and soap.

In the temperate and hot zones, when the grain reaches maturity, it is customary to “fold” (doblar) the cane, breaking the stalk beneath the cob. The cob is thus left hanging upside-down

\[24\text{ Valladares, 1957.}\]
until the plant has dried. This practice has various functions: it diminishes the damage caused by birds, avoids the penetration of water into the cobs, which prevents fungal diseases, and it preserves the humidity the seed grain requires to germinate.

- Harvest
Maize plants frequently remain in the ground one or two months after the grain has reached maturity. This occurs especially in the case of winter-sown crops. The whole family participates in gathering the harvest, both in the cutting and in the transportation of the cobs. In addition to the family, the communities can count on the help of paid and unpaid day-labourers through the tradition of mutual assistance. This exchange of work is established through a ceremonial practice. To commit a person to participation in the tapiña (maize harvest), one sends them a ball of maize flour mixed with cocoa and other ingredients. When this is dissolved in water and heated, it produces an appetising cocoa drink.

In the northern and western regions, such as the municipalities of Jacaltenango, Concepción Huista and Barillas, the first crop of the season is taken to the church in thanksgiving for the harvest. As samples, the biggest and most perfect cobs are chosen.

- Post-harvest
In Huehuetenango, women participate actively in the tasks of stripping the grain off the cobs, the preparation of the maize for consumption, the selection of the seed for planting and the marketing of the produce. Their contribution is more important once the maize has been harvested. At this point, they take charge of the produce, make decisions, care for it and administer it. As women with a social role in a society within which maize represents the sustenance of the family and the continuity of the community, in most cases, they suggest or decide the use of certain varieties of maize and their growing seasons so as to obtain the desired results in terms of the taste, colour, texture, malleability and durability of the foods and drinks that are prepared with maize.

The selection of the more vigorous maize cobs to be used for seed can begin in the field. As the plant grows, the farmer goes through his land and by simple observation selects the largest and healthiest maize plants. This technique is equivalent to the very well-known mass selection in plant improvement. After the harvest, the cobs are carried to the home where the cobs are sorted according to their different uses, a task carried out mainly by women.

- Storage and conservation of seed for the next growing season
Some families sun-dry the cobs for 10-15 days before they store them. In the cold areas, the cobs are stored in the corridors, the kitchen or the loft of the house. In the former case, the leaves are not completely stripped from the cob, some of the leaves being left to hang the cobs from. The garlands formed in this way are hung from a cross-beam, either in the corridor or in the kitchen. The aim of the first method is to air the grain, retain its natural humidity and at the same time protect it from pests. The aim of the second method is to allow the smoke from the oven to serve as a repellent and for the proximity to the heat of the fire to contribute to the drying process. Women indicate that nixtamal grain, with which tortillas are made, gives better results when the maize is well dried.
Cobs, with or without leaves (doblador), are often stored in the loft of the house, which can be built of cypress boards and roofed with shingle or corrugated iron. The cobs are taken down according to the needs of the family, to be eaten, sold or used as seed.

In the temperate zone, the storage of maize cobs in lofts is predominant. But they also store them, with or without leaves, in trojes (barn-sheds, traditional or improved). They resemble a pen with raised floor-boards 50 cm or 1 m above the ground to protect the crop from rodents. The roof can be of corrugated zinc or tiles. The larger traditional trojes can store as many as 50 racks of cobs which is equivalent to about 75 quintals.

In the hot zone, the study data indicate that the storage of grain is done in lofts (20%), trenches (60%) and metal silos (20%). In the second case, the cobs (with or without leaves) are stored in jute or raffia sacks. The sacks are closed and piled up on wooden platforms. In the third case, the silos are made of smooth zinc sheets.

In the western and northern zones, maize cobs with or without leaves, or the shelled grains, are stored in wooden crates. In these cases, most of the families interviewed for the study use chemical substances to control the insects that damage the grain. A minority, aware of the damage caused by chemical pesticides, uses organic alternatives, such as lime, ash, dried and ground chilli and floris de muerto (Tagetes erecta L.) as repellents for the maize weevil.

• Shelling and selection of the seed-grain

As the sowing season approaches, the women undertake the shelling of the

Photo 4
The shelling of the grain is the activity in which women have a preponderant role in the selection of the genetic material to be used in the next sowing of the maize crop.
previously selected cobs. The technique means using their fingertips to remove the grains from the middle of the cob and placing them inside the tecnoma (fruit of Legenaria siceraria (Mol.) Standl.). One day before sowing, the grain is soaked to soften it and enhance germination. In some cases, the selection is made throughout the year. Women select and set aside the cobs for seed-grain as they shell the maize that is to be consumed during the year.

The shelling of maize is a work that women learn in childhood. Certain testimonies show that this task is basically carried out by women and requires special know-how and skills. The size and the quality of the grain selected as seed is determined at this moment. This know-how is transmitted by mothers and grandmothers to their daughters and grand-daughters:

"I choose the seed. When I bring the maize down (from the loft) for us to eat, I separate the grain. My son-in-law tells me to do this. I teach my daughters. To store the crop we must use insecticides. Before, there was no problem; now after three or four months, we find holes in the grain. We do not leave it in the sun."

"We women learned to shell and select the seed from our youth. In my house, and generally at night, the women would sit around the basket of maize to shell the grain. The grandmother would separate a few large cobs; these were not to be shelled inside the basket which receives the grain for making the next day's 'nixtamal' (maize paste for making tortillas and other foods). In the month of May we would put our hands in our mouths and blow on them; then we would begin shelling with our fingernails. We would always start in the middle of the cob, leaving out the tip and the base and taking care not to break the grain. The grandmother did this, telling us that we were little, that we were not grown up enough to do it and that it is something sacred." (Remigia López y López, 84, resident in Malacatancito)

The selection process also reflects a knowledge of the different varieties of maize and the environments to which they are best suited.

"When they bring the maize (the cobs) to the house, it is stored and then the leaves are removed. It is put into sacks and then it is shelled with our fingernails. We choose the cobs. The largest are chosen for seed-grain; not the smaller ones, because they might not do for the next year's crop. We must find the largest. This seed comes from the highest land, far away, which we call Rancho Viejo. It is a small maize with small grains. From this we choose the largest grain as seed. It comes from the highlands, the very coldest; it is not a rainy-season crop and does not require much fertiliser."

"This is how the seed is chosen: only from the middle (of the cob). The grains, the good plump ones, are carefully extracted with our fingernails. These grains (from the tip and the base) are not used, because they are small and would give very small plants, but they are used as food." (Doña Concepción, 65, El Rancho, Chiantla)

• Preparation of food

According to this study, most of the maize produced in Huehuetenango is consumed locally. In the rural area, where there are large extended families, with eight or more family members on average, between three and three and a half quintals of maize are consumed per month. Sometimes as much as 25 pounds are milled for one day's consumption\(^{25}\), including rations for the animals. In the villages, food mostly consists of tortillas, beans, chilli and coffee. On the other hand, in the municipal capitals, the consumption of maize is lower, because there is more food variety and this can include meat and other foods.

The women prepare maize in a wide variety of ways, but tortillas are the basic staple. They are eaten at breakfast, lunch and dinner and constitute, for the ethnic Maya populations, the most important food.

In addition to tortillas, the women of Huehuetenango prepare various dishes and drinks derived from maize. These are eaten as part of the daily diet or as special foods related to feasts or ceremonies.

• **Marketing**

Administering the distribution of produce is the women’s job. They are responsible for ensuring that the harvest should provide for all its different uses: seed, family meals and, if possible, a surplus to be sold for profit. By selling maize, women guarantee an income for the purchase of products of prime necessity. Occasionally, maize is bartered in kind for other produce (poultry, eggs, grain...) or for maize seed of other varieties that are required for the next sowing season.

By bartering (exchanging) to ensure the “quality of the seed”, the women give maize for consumption in exchange for seed-grain of a better quality. In places like Mesilla, the Tutuapeños exchange pots for maize. There are also exchanges of certain types of maize for others, or for hybrid seed.

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**Photo 5**

The selling of surplus maize in local markets is an activity exclusively reserved for women. 

“I exchanged seed with my neighbours; when they have no need for seed. Some neighbours exchange it, the best seed for sowing, and they get is not for sowing, but for eating.” *(Doña Francisca, Colotenango)*
In the different regions the post-harvest activities: shelling the grain, selecting the seed, the preparation and marketing of the maize are basically the job of the women, as can be seen in Table 10.

<table>
<thead>
<tr>
<th>Activities</th>
<th>East (W, M)</th>
<th>Centre (W, M)</th>
<th>West (W, M)</th>
<th>South (W, M)</th>
<th>North (W, M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering</td>
<td>5, 95</td>
<td>5, 95</td>
<td>0, 100</td>
<td>16, 84</td>
<td>20, 80</td>
</tr>
<tr>
<td>Stripping and shelling</td>
<td>47, 53</td>
<td>50, 50</td>
<td>65, 25</td>
<td>67, 23</td>
<td>70, 20</td>
</tr>
<tr>
<td>Storing</td>
<td>1, 99</td>
<td>2, 95</td>
<td>0, 100</td>
<td>16, 62</td>
<td>22, 77</td>
</tr>
<tr>
<td>Preparation and sale</td>
<td>100, 0</td>
<td>100, 0</td>
<td>75, 25</td>
<td>100, 0</td>
<td>62, 18</td>
</tr>
</tbody>
</table>

Direct consultations with the different communities revealed that there is a significant reduction in the “bearers of tradition”. These are of value for the explanation of the cosmology as well as for the conservation of ancestral practices and knowledge. The “bearers” are those who explain to the general population aspects that are difficult to understand or who through their practices reproduce in society the

**IX. Survival of the cosmology of pre-Columbian Central America, and the central place of maize**

Photo 6
Preparation of tortillas, an activity exclusively carried out by women
symbols and values of each ethnic identity. However, in the process of cultural homogenisation which is progressing substantially in the communities, it is significant that the farming practices of the people are tending towards uniformity, with the disappearance of traditional knowledge of the society-environment relationship.

This does not mean that there is not a specific cosmology, which in fact finds its expression in the practices of maize farming and the agricultural calendar. However, the gradual disappearance of the bearers and the introduction of modern technologies contribute to the eradication of traditional know-how and skills which are being replaced by those transmitted by mass culture basically stemming from a market logic of the utilisation of resources.

The observations made in the different locations indicate that the communities most involved in the national and international markets are the ones that least conserve their own or a diversified cosmology. This is the case of Aguacatán and Tzunul, on the one hand, and the communities of Río San Juán on the other. In the case of Aguacatán, traditional crops are being replaced by non-traditional produce such as garlic.

Map 2
Present map according to the inhabitants of Aguacatán
and onions. In Tzunul, there is a rapid spread of broccoli growing, a crop first sown there barely five years ago.

The participatory diagnosis of the three locations reveals that the main effect of the introduction of these non-traditional crops is the specialisation of certain production teams, although it was observed that a family-based economy persists. In one of the work-groups of Aguacatán, the maize field, the garlic and the onion patches were seen to be centred on the house, which reflects the survival of a family-based economy.

However, it was noted that the maize field was allotted to one house and the garlic and onion fields to another, which would indicate a specialisation of labour. The integration of these two crops adds complexity and greater vulnerability to the local production system. The growing of garlic and onions as commercial products depends strongly on the market, and they also require financing, which is not necessary in maize farming, due to the techniques applied in either case.

As regards the communities of Tzunul, Todos Santos Cuchumatán, the situation is quite dramatic. The perception of the men is that although the current map of the area shows a massive presence of maize, they nevertheless expect its complete substitution in future by broccoli.

The two pictures below show only a fragment of the complete maps (present/future), however they are good samples of the total. The men of Tuznul stated that they were harvesting all year round, because they sowed broccoli every month. They start sowing in August and finish in February, so that harvesting begins in November and ends in May. The families that grow broccoli now buy maize.

**Map 3**
Present map according to the inhabitants of Tuznul
As regards the mountainous areas in the upper reaches of the San Juan river, the majority of the participants spoke only Quiché and knew no Spanish. Nonetheless, the members of the group were aware of the natural resources at their disposal, including the diversity of the flora and fauna. As for the use of the crops, these are mostly for family consumption and to be sold in local markets, which is characteristic of a simple market economy.

Of the three groups mentioned, Aguacatán, Tzunul and San Juan, the former two showed the higher use of imported techniques, and they also revealed a greater alienation of women from agricultural work. On the other hand in the case of the communities of the San Juan river, the farmers said that the women participated with them in all the phases of the work. Similarly, it was also noted that in the indigenous families, the women’s link with the agriculture was considerably greater than in the “ladino” (mestizo or of Spanish descent) families.

Although in the consultation workshops carried out in 6 communities under this study the participants said that they did not celebrate rituals linked to any of the phases of maize farming, most of the data on traditional practices of a religious nature (Maya) come from the communities of the San Juan river. The information collected reveals that “there are zajorines (soothsayers; persons who are reputed to see what is hidden) in Tucuná” who are consulted before the people celebrate their rituals. The men who participated said that before sowing, in accordance with tradition, each activity has its “day”, which reflects a survival of the use of the Maya calendar. (Further study on this subject could throw up more
precise information on the degree to which the calendar and its auguries for each day still hold sway). In Aguacatán it was also found out that in the area under Quiché influence, there are Maya priests (Ah pop) who celebrate rituals which come from the Maya culture.

Although the participants in the workshops said that they did not celebrate traditional rites, it is evident that these practices still exist among certain groups.

Another element of note is the value of the “oral form” of knowledge-transfer. One example of this is the awareness of the plant known as “casco de mula” (mule’s helmet), which came up in one of the cases of the oral tradition with which the workshops began. Only the older participants admitted having known it. In Las Guayabitas, the older participants said that they knew this crop (Txebxiv). They remembered that their ancestors used to go and fetch it from the mountains, “they extracted it from the ground and it was larger than a potato”. By its description this plant could correspond to the species Dioscorea convolvulacea, curiously known commonly as the mother of maize and described by Williams (1981): a species from which an emergency food supply can be extracted.

Map 5
Present map of the San Juán river farms

They would remove the thick skin and then they pricked the pulp and cooked it, and it was added to the maize to make tortillas.
This information gave us confirmation that, on the one hand, the content of the oral tradition was valid, but on the other that traditional knowledge of indigenous foods was disappearing. This situation, which is foreseen as regards maize, has already occurred as regards other local crops, such as ramón or ujuhste (Brosimum alicastrum, breadnut tree), which constituted a food for the ancient Mayas, but has disappeared from the local diet. There are many species that have been preserved in the wild and that would be suitable for use in food self-sufficiency programmes.

X. Other considerations

The selection of the 6 communities for the study was made according to criteria signalling the presence of cultural-plant wealth. Thus it can be observed that in the selected communities, five languages in addition to Spanish are spoken, as an expression of the ethnic diversity present in these sites. Similarly, the biodiversity is represented by three distinct life zones. At another level, the study included both men and women, with a slightly greater number of women due to the particular circumstances in each of the sites where the workshops took place.

- Conservation of the genetic resource

It was found that in all cases, the materials used were local varieties (landraces), since many of the people could recognise the advantages of each of these materials according to their environmental adaptability, resistance to pests and diseases and culinary qualities. For example, in some areas, they prefer to plant yellow maize, because it is faster growing and more resistant to pests. In areas where the soil is poor, the sowing of black maize is preferred. All participants agreed that these materials have a more pleasant taste than the improved varieties, which is why their preference for indigenous materials remains.

Although the farmers, both men and women, are aware of the use of improved varieties, they recognise that these varieties require greater capital investment since they need more inputs and labour in the growing process. In addition, others refer to security as a factor that influences their choice of materials and said that they felt insecure planting seed that was not totally familiar.

With reference to the conservation of maize resources, they said that the introduction of horticultural crops such as garlic and onions or cauliflowers

<table>
<thead>
<tr>
<th>Place</th>
<th>Language</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aguaçoteín</td>
<td>Awalatseco</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>Aguaçoteín, Upper</td>
<td>Awalatseco</td>
<td>--</td>
<td>22</td>
</tr>
<tr>
<td>Guayabillas, Chianti</td>
<td>Spanish, Qinjob’l</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Tzulul, Todos Santos, Cuchumatán</td>
<td>Chisim</td>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td>Chenquejalbó, Mantón</td>
<td>Chuj</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Jocotanango</td>
<td>Popol</td>
<td>12</td>
<td>-</td>
</tr>
</tbody>
</table>
could eventually replace the farming of maize, especially in areas where the soil and irrigation are adequate.

The local materials are identified basically by their colour, where they have different names depending on the local languages. It was also observed that many of these materials are perfectly suited to the specific regions of the study and to some extent are unique to these areas. It was said earlier that attempts to sow genetic materials from extraneous climatic zones produced poor results.

- Conservation of local technology

The use of the most widespread indigenous genetic materials leads one to assume that the farming techniques applied in maize farming are predominantly the same as those used for centuries.

However, intensive land-use has led to the need for the additional input of inorganic fertilisers; but, due to the additional costs incurred, there is a need to develop a fertilising technique which combines both organic and inorganic methods. At the same time, the increase in pests and diseases has led to a greater need for chemical products, as opposed to organic ones, especially with regard to pest control in stored crops. In general, it may be noted that the communities are open to the knowledge and use of new technologies, but they are puzzled about their application to the resources they possess at a regional and family level, as well as about the changes they might bring to their multi-cropping system.

Photo 7
The workshops fostered direct consultation with members of different communities.
XI. Conclusions

1. The preservation of traditional practices

During the study, it was observed that the current maize farming practices in a large number of the rural sites had not changed much from those used in pre-Columbian times. The genetic diversity maintained in the grain production is the basis of the population’s food supply and at the same time of the multiple uses and practices linked to maize. Women have a central role in the traditional cosmology and through this, legitimate their access to plant genetic resources of maize, and their rights to decide how they are used and distributed. Nevertheless, it was observed that there is a gradual loss of the cosmology that formed the basis of these maize farming practices. This change, among other things, is directly influenced by the introduction of the development of a market-oriented agriculture, with a prevalence of crops destined to be sold (nationally or internationally) which displaces areas, resources and customs previously related to subsistence farming. As was observed in some of the communities, the replacement of maize by other crops deemed more remunerative in commercial terms places the genetic basis of maize, farming practices related to it and the ecosystem it belongs to at risk, thus also affecting the patterns of consumption, customs and occupation of the men and women involved.

As a result of this, generally, the rural populations' knowledge system, culture and social organisation are damaged and displaced. At the same time, this dismembering of the social fabric diminishes the possibilities of inducing development on the basis of these social groups' inner motivations.

The conservation of the wide diversity of maize genetic material, as well as constituting a central element in the Maya cosmology which has such an influence on the ecology and the culture of the area, also constitutes a central element in the food security base of the rural population in the Department of Huehuetenango and it is the staple food of a large part of the population of Guatemala and Central America.

2. Hypothesis of the invisibility of women

After studying the written historical sources regarding the work-processes of maize farming, it was found that these sources omit the role of women in the different stages and cultural practices related to the crop. However, the oral tradition does confer importance to this role and this tends to be constant through the ages. The direct consultations through mini-workshops and the general workshop carried out in the various communities of the study led to the discovery of the pre-Hispanic cultural complex surrounding maize, as well technical innovations. It was found that the oral tradition coincides with the data on women's involvement in the farming practices related to maize and in the family economy. The determinant role of women in the selection and conservation of the seeds and their knowledge of the different crop varieties provide evidence of their involvement in the management of the genetic diversity of maize and, along with this, in the farming system of which the production of this grain is an integral part.
The conservation of the traditional varieties is clearly closely linked to the survival of consumption practices and rites which explain the rational utilisation of resources in accordance with a predominantly Maya vision of the cosmos and with that of other indigenous populations.

3. The genetic resources of maize

In the Department of Huehuetenango there is a great variety of maize genetic resources due to a long process of culture-biodiversity interaction which led to the generation of nearly 57% of the landraces of maize recorded in Guatemala (8 out of 14) and of 33% of the sub-landraces present in Guatemala (4 out of 12). Moreover, the presence of teosinte is important for the increase of the genetic diversity of maize, since it represents a stock of useful genes which can be transferred by natural means of cross-breeding or by plant-improvement methods. In this respect, the choice of the Department of Huehuetenango for the study of the genetic diversity of maize proved most appropriate.

Although this study did not set out to analyse the crop’s links with the rest of the production system, the observations made in the area also led to an appreciation of the fact that the genetic diversity of maize is also associated with the production of other crops and with the diversity of production systems in general.

4. Motives of selection under domestication

The selection process of already existing varieties reflects both natural causes and preferences in the uses to be made of the grain in different contexts.

(a) Adverse environmental factors. One important factor in the evolution of maize in the Department of Huehuetenango was the selection made by the farming families of genetic materials that adapt best to adverse climatic, soil and disease factors, etc. Throughout the study, it was possible to verify that the men and women farmers of the Department have a perfect knowledge of the different genetic materials that they rely upon, to such an extent that they are able to recognise the genetic materials most suited to different agro-ecological zones in the area, their growth cycle, their resistance to pests and diseases and their soil and water requirements.

Thus the most resistant varieties are those that prevail, and although they don’t have much value or participation in the market, they continue to be the staple food of the rural communities in the Department.

(b) Culinary requirements. Another important factor in the selection of genetic materials consists of culinary characteristics such as the taste, colour and texture of grains, since it is absolutely vital that the appropriate maize should be available for each occasion and use. For instance, black maize is of special value as it produces the sweetest grain and is used in the preparation of food for special occasions. Maize produced in the cold and temperate zones is preferred for its taste, colour, development, growth cycles, resistance to pests and diseases, softness and because it produces tortillas of a better texture and keeps longer. The varieties grown
in the hot zones have other names due to their characteristics, their growth cycles and their appearance, and due to their being of lesser culinary value than those grown in the cold and temperate zones, since the tortillas made with these genetic materials are of a lower quality since they harden more easily and are more friable. Apparently, this selection motive played an important role in the evolution of maize in Huehuetenango, though no quantitative data to support this evidence were obtainable.

(c) Mystical and religious factors. The possible presence of the sub-landrace quicheño ramoso leads one to suppose that the conservation of the pure genetic materials of this landrace in the Department of Huehuetenango is proof of the presence of mystical aspects as selection motives in the evolution of maize, since this genetic material is a symbol of fertility among certain peoples of the San Marcos region.

5. General considerations regarding genetic evolution under domestication

Field observations also indicate that small and indigenous farmers, the main producers of this grain, know the effects of pollination (“un maíz pinta al otro en la dirección del viento” [one maize paints another according to the direction of the wind]) and even the effects of the pollination of a maize of one colour with the grains of another colour (xenia); and the different periods of flowering and maturation of the different varieties. Such knowledge begins to provide the key to how indigenous farmers, as observers of biological phenomena of their crops, have carried out their selection under domestication. If one examines the gene base of the characteristics selected by the farmers, one finds a high incidence of single gene characters: floury, sweet, yellow, pink grains, red grains, violet husk.

6. Genetic erosion

The results obtained in the workshops and mini-workshops indicate that the farmers of the Huehuetenango region have not adopted the improved varieties created by the national agricultural authority, ICTA, nor have they replaced their traditional varieties, except in the area of Aguacatán, where some farmers reported using these new varieties. In this sense, one can say that this factor as a cause of genetic erosion has not been determinant in the area of the study. The genetic materials present before the beginning of the so-called green revolution should still be present in the area.

In areas where it is possible to develop intensive agriculture, which includes the introduction of more marketable crops, such as onions, garlic, cabbages or coffee, maize farming is being displaced by these new crops. For this reason, in recent years, many of the farmers who have replaced maize with new crops consider maize as an unimportant crop and tend to abandon the genetic materials that they have cultivated for thousands of years, due to their poor market value.

With this substitution of crops, the gradual loss of the cosmology means that the knowledge accumulated by human populations over thousands of years is disappearing. In this way, the concept of the importance of conserving the genetic resources of maize is also
being lost. The quest for new human satisfactions, such as economic competitiveness and financial efficiency in the use of available resources, results inevitably in the loss of genetic resources and biodiversity.

7. On the role of women in the evolution and conservation of maize

To understand the role of women in the conservation of the traditional varieties of maize, one needs to distinguish between the different activities that include decision-making on the choice of the genetic materials to be used. Clearly, the type of agriculture practised in the study-area favours the multi-cropping or traditional system, which, as we have already discussed, fosters the conservation of the genetic resources of maize. In addition, we demonstrated that maize is primordial in the diet of the Huehuetenango populations, since it is consumed in many different ways; and lastly, it was shown that women participate actively in the agricultural process of growing maize, especially in the post-harvest activities. But who makes the decisions as regards the type of agriculture to practise, the types of maize to use in accordance with the culinary requirements and in general, who controls the motives for selection, men or women, or both? A partial answer is provided by the demonstration that in most cases women are in charge of shelling the grain from the cobs already selected for seed in the following crop cycle. In this way the grain is shelled and selected by the women. This manual harvest technique represents an intensive phase of artificial selection which allows them to maintain the characteristics of local varieties, as well as giving these “women farmers” the opportunity to recognize and propagate attractive mutations or new hybrids.

On the basis of this investigation, however, the answer to the initial question regarding “the role of women in the conservation of the genetic resources of maize”, one can say that women play a crucial role on the basis of their determinant participation in the seed selection process, both as material to be sown and as grain to be used as food for its culinary properties. Of course, further investigation will be necessary to quantify the specific importance of women’s contribution, in the present and in the past, to the conservation of the genetic resources currently present in the Department of Huehuetenango. In addition a combination of social, cultural, economic and environmental changes are eroding the central role of women and resource decision-makers and thus have the potential of increasing the erosion of useful genetic diversity in maize.

XII. Recommendations

1. Maize as a genetic resource

- To gain a better knowledge of the maize varieties still prevalent, it is suggested that collections of genetic materials be carried out in the Department of Huehuetenango, for a more thorough identification of the landraces present, comparing them with the information given by Wellhausen et al. (1957) and verifying whether the genetic resource has been preserved over a period of 40 years.
To diminish the risk of losses of existing genetic material, it is important to develop maize germplasm conservation mechanisms both in situ, strengthening the role of rural communities in the conservation of biodiversity, and ex situ, by establishing a germplasm bank. Both of these measures are considered the basis of a maize improvement programme founded on the local culture and needs.

- In the same way, it is also necessary to determine the areas where teosinte is still present, also planning a study of the possibilities of its conservation in situ, as has been done in the biosphere reserve of the Sierra de Manantlán in Mexico, where Mexican teosinte is preserved (Benz, 1988).

2. Maize as a crop

- It is fundamental that the national authority for agricultural technology improvement and transfer (ICTA) be able to increase its programmes for the improvement of maize on the basis of the genetic diversity present in the Department of Huehuetenango and the active participation of the men and women who farm the region, who have specific knowledge of the crops they need and of the cultivation practices of this grain.

- In recent years there has been an increase in the practice of selecting seed material with the participation of the populations directly involved in growing the crop. This has required the application of methods that imply the following stages:

  ➤ Identification of the farmers’ needs as regards the specific crop.
  ➤ Quest for the genetic material that responds to the farmers’ needs.
  ➤ Field trials with the farmers to verify their acceptability.
  ➤ Wide distribution to the farmers of the genetic materials they prefer.

- The technology improvement programmes of the various institutions (government, universities, NGOs) should deepen and broaden their studies of maize farming, on aspects related to associating maize with other crops, organic fertilisation, agro-forestry systems, etc. all of which could improve its profitability by taking into account the essential aspects of the conservation of the genetic diversity of maize and consequently of the local farming systems and the populations’ food security.

3. Recognising the participation of women in the farming and conservation of maize

- Both the governmental and the non-governmental organisations operating in the Department of Huehuetenango could include in their programmes activities that include supporting and strengthening the role of women in the whole production process of maize farming, so that they may introduce innovations in the way they intervene in the farming, conservation and use of maize.

- Although we have been able in this study to determine the responsibility of women in the process of seed selection, through which they influence the preservation of the genetic material and prevalently the
conservation of certain specific varieties, it appears appropriate to deepen and broaden our understanding of the different motives for the domestication and selection of the different varieties of maize. To do this, it is important to carry out a quantitative study of the different uses of maize and how these relate to the genetic materials present in the area of the study, as well as of the roles and responsibilities of the men and women farmers in deciding which materials are used and conserved. The stage of shelling the maize cobs selected for seed constitutes only one of the selection mechanisms. It is of interest to combine this with a knowledge of the other motives of selection linked to the evolutionary process under domestication.
Annex I
The communities of the study

Selection of the communities

The criteria used to select the communities to be studied were:

- Ease of access (roads and paths in good condition).
- Institutional presence of governmental or non-governmental organisations which facilitate the work with the different groups and provide both contacts and interpretation facilities in local languages.
- Traditional zone of maize production.
- Communities that could serve as centres for communication and the spread of information to other neighbouring communities.
- Social and agricultural conditions suited to the objectives of the study.

On the basis of the application of these criteria, the following sites were selected:

- **Aguacatán I**: Aguacatán, Aguacatán Centro, La Barranca, Río Blanco, La Vega and Río San Juán.
- **Aguacatán II**: Chexbajo, Cruz Chex, Chex Centro, Las Majadas Centro, Las Majadas Tucuña, Tucuña and Ojo de Agua.
- **Chiantla**: Las Guayabitas, La Cruz la Labor (Canton), Las Cruces 2, El Manzanal and San José Las Guayabitas.
- **Todos Santos Cuchumatán**
- **Nentón**: Chanquejel.
- **Jicaltenango**

Community study workshops

In each of these selected communities, meetings with the different community groups were organised around which investigations, reflections and discussions were held on the different subjects of the study. This work was coordinated in a process of observation, in which informal direct interviews provided the basis for a general workshop where the communities were presented with the main findings and analyses derived from the work of information gathering. All this information, together with the findings of the secondary revision of the study constitute the basis of this report.

In each of the selected sites, work groups were formed by gender so as to facilitate the participatory process and thus record the different perceptions in the matter. In both work groups the same consultation and discussion methods were implemented so as to ensure that information on the same subjects was collected accurately. In a second phase, the groups were brought together to analyse and evaluate the results.

As a starting point, each sub-group (male-female) was given the following question: “What is the participation of women in the farming of maize?” To answer this they started with identifying specific data on the activities and tasks, their timing and who (men or women) participate in them.

The “Present map/Future map” technique was applied to detect the needs of the participants. This technique consists in obtaining a physical description of the current conditions in the community, (infrastructure, education, social and economic situation). This was particularly useful due to the language differences in dealing with some groups. A similar description of ideal future conditions, also prepared by the
community, constituted the basis for the identification of areas in need of attention.

The "General Workshop"
The general workshop was carried out with representatives of each of the six communities where the mini-workshops took place, representatives of the governmental, non-governmental and international organizations.

The general workshop's aim was to present in a consolidated way all the information discussed in the community workshops, with the participation of representatives of the communities themselves and of the development institutions present in the Department, both governmental and non-governmental. This activity was to seek validation of the information and to discuss possible recommendations that derived from the analysis of the situation on the basis of three fundamental aspects.

The methodology used in running the workshop was:

1. To present the results of all the mini-workshops held previously. Analysing the differences and similarities in the findings from the various communities.

2. To form three integrated discussion groups with participants from all the institutions and communities involved and discuss the following subjects:
   (a) The role of women in the conservation and farming of maize.
   (b) The conservation of maize as a genetic resource.
   (c) Consideration for and importance of local technologies.

3. To present the results of the group discussions on the information examined and the actions proposed, both by the communities and by the institutions involved.
Annex II
Teosinte: the possible origin of maize

In addition to the variability of the landraces present in Huehuetenango, it is necessary to provide some information on the closest wild relative of maize present in the area, namely, teosinte.

At this time, two species of teosinte are present in Guatemala: *Zea luxurians*, which is distributed in eastern Guatemala (Departments of Jutiapa, Jalapa and Chiquimula), and *Zea mays* subsp. *huehuetenangensis*, which is endemic in the Department of Huehuetenango, that gave the sub-species its name. This taxon is not widely distributed in the whole Department since it is found in the areas of the municipalities of Santa Ana Huista, San Antonio Huista, Jacaltenango and Nentón (Iltis et al., 1986). Its capacity to hybridise with cultivated maize was amply demonstrated by Wilkes (1977). It is therefore not surprising that Huehuetenango, precisely the region where teosinte is found, has been considered the possible centre of origin of maize in Central America. In some ways, the important role teosinte has played in the evolution of maize is recognised, however no effort to date has been made to know and preserve the genetic diversity of the Huehuetenango teosinte; this problem is worsened by the fact that the taxon grows wild on the fringes of cultivated areas and roadsides, and as was shown by Azurdia, et al. (1986), this resource is highly affected by the process of genetic erosion.
Annex III
Women's testimonies

(a) On the shelling and selection of the seed-grain...

As the new sowing season approaches, the women undertake the task of carefully shelling the previously selected seed-grains, using their fingertips and taking only the grains from the middle of the cobs. They place them inside the tecomate (fruit of Lagenaria siceraria (Mol.) Standl.). One day before sowing, the grain is soaked to soften it and enhance germination. Some of the women select and set aside the cobs for seed-grain as they shell the maize that is to be consumed during the year. They learn how to shell the maize since their childhood. This know-how is transmitted by mothers or grandmothers to their daughters or grand-daughters.

“I choose the seed. When I bring the maize down (from the loft) for us to eat, I separate the grain. My son-in-law tells me to do this. I teach my daughters. To store the crop we must use insecticides. Before, there was no problem; now after three or four months, we find holes in the grain. We do not leave it in the sun.”

(Quoted from Remigia López y López, 84, resident in Malacatancito)

“When they bring the maize (the cobs) to the house, it is stored and then the leaves are removed. It is put into sacks and then it is shelled with our fingernails. We choose the cobs. The largest are chosen for seed-grain; not the smaller ones, because they might not do for the next year’s crop. We must find the largest.

“This seed comes from the highest land, far away, which we call Rancho Viejo. It is a small maize with small grains. From this we choose the largest grain as seed. It comes from the highlands, the very coldest; it is not a rainy-season crop and does not require much fertiliser.”

(b) On the preparation of food...

The women prepare maize in a wide variety of ways, but tortillas are “our daily bread”. They are eaten at breakfast, lunch and dinner and constitute, for the ethnic Maya populations, the most important food.
Administering the produce is the women’s job. This implies that they must calculate and ensure that the harvest is sufficient to provide for all its different uses: seed, family meals and, if possible, a surplus to be sold for profit.

There is an exchange of maize between neighbours. In places like Mesilla, the Tutuapeños exchange clay pots for maize.

At times neighbours exchange one type of maize for another. This can also be for seed-grain. “I exchanged seed with my neighbours; when they have no need for seed. Some neighbours exchange it, the best seed for sowing, and what they get is not for sowing, but for eating.” (Doña Francisca, Colotenango)

<table>
<thead>
<tr>
<th>Food</th>
<th>Beverages</th>
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<tbody>
<tr>
<td>Elotes boiled or roasted</td>
<td>Cocoa and maize drink</td>
</tr>
<tr>
<td>Tortillas of elote</td>
<td>White elote</td>
</tr>
<tr>
<td>Soup of tortilla</td>
<td>Elotes of tortilla</td>
</tr>
<tr>
<td>Frijoles of beans</td>
<td>Elotes domino</td>
</tr>
<tr>
<td>Raitado of compowder</td>
<td>Elotes of powdered maize</td>
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<tr>
<td>Salpórte</td>
<td>Elotes of elote with suchiles</td>
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<tr>
<td>Enchiladas</td>
<td>Pail</td>
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<tr>
<td>Chileques</td>
<td>Soft drinks of compowder</td>
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<tr>
<td>Tintura of chile</td>
<td>Rosel</td>
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<tr>
<td>Boshbolas</td>
<td>Corn silk infusion</td>
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<td>Chuchitos</td>
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<tr>
<td>Tam elote (diuretic)</td>
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<tr>
<td>Tam elote with pumpkin flower</td>
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<td>Tam elote with whole beans</td>
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<td>Tam elote with ground beans</td>
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<td>Tam elote of cambray</td>
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<td>Tam elote of guisquita tips</td>
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<td>Tam elote of toru</td>
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Table 12
Food and beverages made of maize in Huehuetenango

The role of women in the conservation of the genetic resources of maize
Photo 9
Post-harvest processing and selection of the maize to be used for the next sowing. The different classes of maize are shown. The maize for human consumption is spread on the ground, while the maize for sowing is arranged in bunches.
Annex IV

Map 6
Distribution of the different local languages in the Department of Huehuetenango

AKATEKO
AWAKATECO
CASTELLANO
CHUJ
KICHÉ

MAM
POPTI’
Q’ANJO B’AL
Q’EQ CHI’
TECTITEKO
The role of women in the conservation of the genetic resources of maize

Bibliography


