Traditional wetland palm uses in construction and cooking in Veracruz, Gulf of Mexico

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Palms are present in all wetland forests and provide many useful products, such as building materials and food. In order to recover the knowledge about the traditional use of wetlands palms, we studied and documented the construction of houses and the preparation of traditional recipes, by conducting interviews and participant observation in rural communities associated with wetlands in Mexico. The main findings of this study were: *Attalea liebmannii*, *Sabal mexicana* and *Roystonea dunlapiana* are used for building houses. The fruits of *Cocos nucifera* and *A. liebmannii* are used for the preparation of traditional recipes. An analysis of the cost of houses built of palms revealed that they are cheaper than those built with artificial materials. Although the respondents mentioned that the resistance of the houses built of natural materials is lower, they also mentioned other benefits associated with this type of construction (e.g. houses are cooler). Unfortunately, the traditional use of the palms is gradually disappearing due to changes in the customs of the people related to migration, as well as the depletion of these resources. It is necessary to rescue and promote the traditional use of palms, especially for native species. This may contribute to their conservation and, where relevant, palm cultivation and reforestation projects should be encouraged and implemented.

**Keywords:** Wetlands, Palms, Construction, Houses, Recipes, Mexico

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Palms are present in all wetland forests, though species composition, species richness, and density vary from one ecosystem to another.¹ ² Mexican palms provide many useful products.³ In the wetlands of the state of Veracruz, several parts of the plants are used: the fronds (thatching, basketry, building materials), stems (building material), apical bud (palm heart), and even the roots. A few species have economic potential as building materials and for their edible fruit.⁴ However, vast areas of forested wetlands have been transformed—mainly into pastures for livestock—and this is increasing as the human population density rises.⁵ ⁶ The recovery of traditional knowledge and the interest of people in some of the useful palms could provide motivation for the rehabilitation of these wetland ecosystems. In this study, the construction of houses and the preparation of traditional recipes that make use of parts of palms in rural communities associated with wetlands in the municipality of Jamapa, Veracruz, Mexico, is documented. This will aid in the rescue and help share this tradition with the locals and provide reasons to promote reforestation plans in wetlands for ecosystem conservation.

**Methodology**

**Study area**

The study was conducted from July 2009 to September 2010, in the rural and contiguous communities of El Piñonal and La Matamba in the municipality of Jamapa, located close to the wetlands in the state of Veracruz, Mexico (Fig. 1). Most of the
people in these communities are ethnically composed of mestizos, some with negroid origin, and people from other Mexican states\textsuperscript{7,8,9}. The combined population of the two communities is between 500 and 1000 people. The forested wetlands are composed of \textit{Pachira aquatica} Aubl., \textit{Tabernaemontana alba} Mill., \textit{Ficus trigonata} L., \textit{Diospyros digyna} Jacq., and the palms \textit{Sabal mexicana} Mart., \textit{Roystonea dunlapiana} P.H. Allen and \textit{Attalea liebmannii} (Becc.) Zona; marshes include \textit{Typha domingensis} Pers., \textit{Thalia geniculata} L. and \textit{Pontederia sagittata} C. Presl\textsuperscript{2} (we collected botanical samples and compared it with vouchers deposited in the Instituto de Ecología, A. C. herbarium (key XAL).

**Introduction to communities and sample selection**

We focused on families living in houses made with materials obtained from palms and contact was initially made by explaining the research project. We used the “snowball” sampling method\textsuperscript{10} in which the family that was being interviewed then recommended another family to be interviewed, and so on. Initially, we found that women had the most complete information on the uses of palms (especially for food) and both sexes had information on construction materials, therefore, interviews were conducted mostly with the women (one woman of each family, between 45 and 85 years old).

**Research methodology and techniques**

We used a qualitative research methodology which allows one to understand how people give meaning to social and natural phenomena. Open interviews with local families, as well as participant observation during the frond harvest, house construction and cooking were used\textsuperscript{11-12}. Interviews were conducted with 15 local families (usually involving one person per household in the interview = 15 people).

Information about species of palm, the parts and other plant materials used for constructing houses, how the roof is woven, and information about the quantity and durability of materials, their prices, construction methods, as well as cooking methods were documented. The construction quality and price of houses built with palms and other natural materials was contrasted with that of others built with non-plant materials to understand if they represented economic benefits. We obtained information about the cooking recipes and we documented the species used, the additional ingredients and preparation methods.

The family interviews lasted about one hour, depending on the flow of the conversation and the interest of interviewees. We used a tape recorder during the interviews, and they were stopped when the information became repetitive among families; recognized as saturation of data\textsuperscript{11}. It is important to note that although the case reported here is from one municipality, these traditional uses have also been observed in several other rural communities in Veracruz\textsuperscript{4}.

**Results**

**Palms species, the number of palms or fronds used and durability**

Interviewees mentioned using \textit{A. liebmannii} and \textit{S. mexicana} for thatching houses, kitchens, chicken coops and in some cases bathrooms. The fronds of \textit{A. liebmannii} are of great economic and traditional value to people, because roofs constructed with them are durable, lasting up to 20 yrs under humid tropical conditions. A 50 m\textsuperscript{2} roof (10 m long × 5 m wide) requires up to 1000 fronds, and since 25-30 fronds are harvested from each \textit{A. liebmannii} tree, 36 palms are needed for one roof (Fig. 2 A). In contrast, an average adult individual of \textit{S. mexicana} produces 22.5 fronds (20-25 fronds per individual), therefore a total of
2,295 fronds are required (102 palms) to build a similar roof surface (Fig. 2 B). Roofs made with fronds of *S. mexicana* last 6-8 yrs.

It is noteworthy that the fronds are cut when nearly mature and an adult *Sabal* that has reached maturity (20-30 large fronds) is ready to be used. When demand is high, palms that only have 10-15 young fronds are also harvested and used for construction. In both species, all of the mature fronds are cut, usually leaving the youngest to keep the plant alive so it will continue to produce fronds. Before the fronds can be harvested from the same individual again, it is necessary to wait 1-2 yrs. For example, *S. mexicana* produces two fronds per month (24 per year) and *A. liebmannii*, one frond per month (24 every 2 yrs).

Another interesting fact is that the fronds of *S. mexicana* can be harvested when they are 4 yrs old, while *A. liebmannii* requires 6-7 yrs before it can be harvested.

The stem of *S. mexicana* is cut in half to make beams, a raw material which according to the locals is of great strength and durability. *Sabal* beams are often used to build roofs that are thatched with palm fronds. A 50 m² roof requires 6 beams obtained from 3 mature palm trees. To use the stem for beams, the palm needs to have already lost the old petioles that cover the stem, which usually occurs at 10-15 yrs of age.

Another palm species whose stem is used for construction is *R. dunlapiana*, which reaches maturity at 15 yrs old. Interviewees said its stem is an excellent building material, because it provides very hard, resistant wood. Generally, the stem is cut into sheets, which are used to build the walls of houses. To build a kitchen (6 × 4 m) two adult palms are required. This type of construction material is very durable (50 yrs) when the wood is covered with *adobe*, a mixture of soil and manure (and sometimes hay), which is then painted (Figs 2 A, C) and requires only minor repairs to stay solid.

**House construction with palm materials vs. blocks or bricks**

To build a house of palm material, other plant species are also used. For example, a house can be thatched with the fronds of *A. liebmannii* or *S. mexicana*, previously dried in the sun and supported by a bamboo frame [*Guadua amplexifolia* (Presl) R. & S]. This entire structure usually rests on beams of *S. mexicana* or *Mangifera indica* Linn. (mango) supported by notched trunks called *horcones*, which are the main support of a house. The *cocuite* tree [*Gliricidia sepium* (Jacq.) Kunth ex Walp.] or the *amarillo* tree (*Diphysa robinioides* Benth.) are usually used for the *horcones*.

The weaving pattern for thatching houses differs for the two palm species. With *A. liebmannii* the fronds are arranged one above the other horizontally, with the leaflets folded in the same direction (Fig. 2 B) and attached to a bamboo frame with henequen thread (*Agave fourcroydes* Lem), whereas in *S. mexicana* fronds are used in their natural form and arranged vertically on a frame (Fig. 2 D).

Interviewees mentioned that when they have palms growing on their land, the cost of building and making repairs decreases considerably. In contrast, a person who does not own land with palms must buy all of the materials, which greatly increases the cost of construction or repair. For example, a house with a 24 m² roof made of *S. mexicana* fronds and walls made with *R. dunlapiana* is estimated to cost $835 USD.

The construction requires about a thousand *S. mexicana* fronds ($42 USD), two *R. dunlapiana* stems for the walls ($67-84 USD per stem), four beams of *S. mexicana* or some other material (each stem costs approximately $68 USD, and generally two beams can be obtained from each stem), a bamboo frame and the posts to hold up the structure ($42 USD). Besides the materials, there is the cost of labor, which involves cutting, transportation and construction ($328 USD). A house or kitchen built with *A. liebmannii* is more expensive ($1044 USD), as the price of each frond is $0.42 USD and it takes 500 fronds ($209 USD) to roof a 24 m² area (Fig. 2 A). In addition, there is a greater investment in labor compared to when *S. mexicana* fronds are used, due to the greater height of these palms, their larger fronds and the greater difficulty in cutting and preparing the fronds.

On the other hand, interviewees mentioned that building a house of similar dimensions with bricks and cement can cost twice as much as a house made from plant materials. Despite the high cost of a brick house in the Jamapa communities, the tradition of building houses from palm materials has decreased greatly because brick houses are thought to be more resistant; though many people mentioned a palm house is much cooler in the hot climates in which they live. According to the interviewees, people do not build houses with palm materials anymore, and only those who already have them use palms and plant materials to repair their houses.
Rescuing the traditional palm fruits recipes of Mrs Charo and Mrs Felicitas

In addition to being useful for construction, palms produce edible fruits and seeds, and these are of great importance in the community because they are used to prepare traditional recipes for the festivities and celebrations, which bring people together. The seeds are prized for their flavour and fragrance; however, this knowledge is now only held by some of the elder women of renown within their community (Fig. 2 E, F). To help preserve these traditions, we include here some of the recipes made with palm seeds.

Royal coyol palm tortillas (made using the fruit of A. liebmannii)

Ingredients: One liter recipient filled with the endosperm from coyol fruits (endocarp previously removed and discarded, endosperm previously soaked in water), 2 ½ kg of corn dough and 1 kg sugar. The endosperm is ground and mixed with the corn dough, sugar is added to taste. Tortillas are pressed out and put on the griddle, turning regularly, until cooked through and well browned. Make 4 kg of tortillas for 16 people. The nutritional value of this recipe is 20.208 kcal in total and 1.263 kcal per person.

Royal coyol palm atole (made from the fruit of A. liebmannii)

Ingredients: One liter recipient filled with endosperm (endocarp previously removed and discarded, endosperm soaked in water), 1 kg corn dough, 1-2 L water, 2-3 L milk and brown sugar. The endosperms are soaked in water for a few hours and after grinding, they are mixed with the corn dough, beating the mixture while adding the water. The mixture is strained through a thin cloth or towel. The strained seeds and materials are given to the chickens. This water is sweetened with brown sugar to taste, adding more water or milk if desired and boiled with cinnamon. Make 10 L of atole for 40 people. The nutritional value is 13.093 kcal in total and 327 kcal per person (one cup per person).

Cocadas (made from the fruit of Cocos nucifera)

Ingredients: One coconut, 1 cup milk or ½ cup water, ½ kg sugar and pineapple chunks.
To prepare, the endosperm (coconut meat) is grated and mixed with the sugar, adding water or milk. Balls of pineapple can be added. Balls are made and allowed to stand until dry. Make 6 - 8 cocadas. The nutritional value is 3.790 kcal in total and 473 kcal per person.

Discussion
The results presented here demonstrate that palms are a valuable resource for meeting basic human needs, such as housing and food in rural communities associated with wetlands. It is observed that people roof their houses, the kitchen, the chicken coop or the bathroom with the fronds of S. mexicana and A. liebmannii. Consequently, these species have been heavily exploited to obtain raw materials. R. dunlapiana also serves to make resistant walls for houses. Other natural materials, mainly native bamboo, are also important for building houses. There are many instances of palms being used in Mexico and other tropical countries, and in several regions the genera Attalea and Sabal are prized for their fronds which are used for thatching houses. The fruits of Attalea are appreciated for their oily seeds. The oil is creamy, soft to the touch and has a slight scent of coconut. It is valued in the communities studied for preparing homemade food. Unfortunately, traditional roofs made with palm fronds are gradually being replaced by other artificial materials such as asbestos sheets, cement and other materials; a change that has also been occurring in other places where palms are traditionally used. It is noteworthy that the building materials, such as asbestos sheets, currently used to roof houses are not as cool as palm roofs. Moreover, palm homes do not contain any compounds that are harmful to health, unlike asbestos sheets and other products. In addition to losing the functional elements characteristic of traditional homes, abandoning the use of palms has consequences for social processes, family life and mutual aid. In this study, the kitchen was found to be where women spend most of their time. When a kitchen is cool, it is synonymous with strong family and community life, and enhances social capital. It is worrisome that the traditional recipes made with parts of palm trees are now only known mostly by mothers and grandmothers. Young women frequently leave their villages to study elsewhere, for work or migrate to the United States of America, thus breaking the chain along which information is transmitted from one generation to another.

Conclusion
This study shows the palm trees that are useful in building houses and in the preparation of recipes. It also gives us information on the costs, advantages and disadvantages of having a palm house and the main reasons why there has been a decrease in the use of these. We concluded that it is necessary to rescue and promote the traditional use of palms, especially for native species. This may contribute to their conservation and, where relevant, palm cultivation and reforestation projects should be encouraged and implemented. The building costs of a house made from palms decreases when people plant palms on their land and have access to them for personal use or profit from selling fronds. Creating marketing strategies based on the needs of communities and promoting environmental education programs would also be beneficial for conserving the palm trees of wetlands and preserving human traditions.

This study has a wide significance, both for the people of the communities and for us as researchers. Making this kind of research makes people feel appreciation for their customs and traditions, leading them to value more their natural resources. For us as researchers, it is of great importance, as it gives us a basis for future studies and to care for this beautiful wetland ecosystem, besides being able to create strategies for conservation and management, which involves the knowledge and needs of people.

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