Communities are exposed to increased risks related to climate change, such as landslides.
Photo: ECODESSA

Fact sheet

Species of agricultural biodiversity with food security potential

with consideration of local and traditional knowledge in the municipalities of Nahualá and Santa Catarina Ixtahuacán, Mazá river basin, department of Sololá, Guatemala.

Agriculture is the main economic activity and source of livelihoods of ten communities located in the municipalities of Nahualá and Santa Catarina Ixtahuacán in the Mazá river basin of Guatemala. The agriculture and forestry systems as developed by these small-scale farmers help to meet the basic needs of their families. They use farming practices based on traditional knowledge and experiences passed on for generations, which allows these agriculture and forestry systems to cope with changes in climate and, therefore, build their resilience.

The livelihoods of the communities of the Mazá river basin are closely linked to the agricultural biodiversity of its ecosystems. The applied techniques and production processes of the agriculture and agro-forestry systems are based on traditional and local knowledge.

The Partners for Resilience worked together with these communities to diversify and improve these livelihoods. Together they identified agricultural and agro-forestry systems, native species, as well as crop knowledge and practices of the indigenous and traditional peoples that adapt better to climate change. This knowledge can benefit more communities through the replication and dissemination of the identified species and practices.

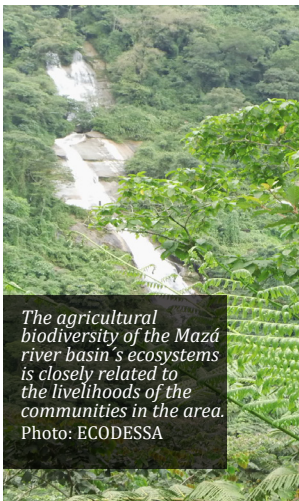
The territory of the ten communities consists mainly of human-centered areas and a natural ecosystem limited to the Pecul hill and its forested extensions. It contains the following life zones: Subtropical low montane very humid forest, subtropical low montane moist forest, and subtropical very humid warm forest. It has a wealth of biological diversity, water resources and natural landscapes, which could be used for ecotourism. However, the ecosystem is at risk. The

Characteristics of the Santa Catarina Ixtahuacán and Nahualá municipalities:

Santa Catarina Ixtahuacán	Nahualá
Of pre-Hispanic origin	Founded in the first years of the colonial period.
Located 171 kilometers from the capital	Located 160 kilometers from the capital
Size: 190 km^2	Size: 186.22 km^2
600-4,200 meters above sea level (mamsl)	700-3,200 mamsl
48,000 inhabitants	64,000 inhabitants
132.66 inhabitants per km^2	279 inhabitants per km^2
Ethnic majority: K'iche'	Ethnic majority: K'iche'
95% rural and 5% urban population.	93% rural and 6.7% urban population.
One municipal capital, 10 villages, 95 communities, and 1 hamlet.	One municipal capital, 11 villages, 91 communities, 10 cantons, and 11 hamlets.

The ten communities selected for this study are: Pasaquijuyup, Pakim, Tzamabaj, Pakib, Chuituj, Xezac-abaj, Chicorral (in the Nahualá municipality); Pasaquijuyup, Tzamabaj (municipality of Santa Catarina Ixtahuacán) and Pacanal II (located in both municipalities)

The population is mostly dedicated to subsistence farming, especially the production of *Maxán* (leaves used to wrap tamales), corn and beans. Women have little involvement in decision making, labor issues and spending of income. The communities have access to basic services and are organized in various committees (water, schools, COLRED), but lack a producers' organization.



The agricultural biodiversity of the Mazá river basin's ecosystems is closely related to the livelihoods of the communities in the area.
Photo: ECODESSA

lack of management of natural resources has caused environmental pollution and lack of access to potable water. Agricultural diversity is limited due to a lack of technology and economic sources of investment in new agriculture, horticulture and livestock projects.

Species of agricultural biodiversity with climate or microclimatic change adaptation potential

The study identified **105 vegetable species** important for food and energy production and medical use. Priority was given to those species that have adapted themselves to extreme weather conditions in the territory (temperature, humidity and precipitation), reflect genetic versatility and are able to adapt to potential changes in climate. These species are:

- Maxán *(Calathea crotalifera)*
- Alder (Aliso) *(Alnus acuminata)*
- Corn (Maíz) *(Zea mays)*
- Bean (Frijol) *(Phaseolus vulgaris)*
- Runner bean (Frijol piloy) *(Phaseolus coccineus)*
- American nightshade (Hierba mora) *(Solanum americanum)*
- Avocado *(Persea americana)*

Strategies and/or techniques used by farmers to cope with climate change, reduce disaster risk and food insecurity

The strategies used by communities rely on traditional and local knowledge. Some of them and their objectives are:

Technology/Strategy	Objective
Natural organic fertilization of Maxán and parlour palm (*Chamaedorea elegans*), using the alder tree for shadow.	To avoid groundwater contamination, loss of natural soil fertility and increased crop production costs.
Intercropping of marrow stem kale (*Brassica oleracea medullosa*) with corn.	Ensure the production of the most coveted herbaceous food in the territory.
Removal of naturally grown alder tree seedlings from plantations that intercrop with Maxán.	Reduction of nursery production costs.
Planting parlour palm seedlings.	Avoid extraction of plants from the natural forest.
Use of local seed varieties (maxán, corn, parlour palm, beans, etc.).	To obtain varieties adapted to each life zone.

Use models of the prioritized species

In the middle Mazá river basin, communities apply several models that use agricultural biodiversity. Nevertheless, the study prioritized the following models that use species with climate change adaptation potential:

Agroforestry models	Agricultural models
Name of the model: Maxán + Alder Components: • Maxán. • Alder. • Herbs: american nightshade (hierba mora). More than 85% of the economically active population produces Maxán.	**Name of the model: Corn field** Components: • Corn. • Beans. • Herbs: American nightshade (hierba mora), white herb (hierba blanca). • Herbs of spontaneous growth: Field mustard -hierba flor amarilla- (*Brassica rapa*), rapeseed –nabo- (*Brassica napus*). • Fruit trees: avocado, peach (*Prunus persica*).
Name of the model: Parlour palm + Alder Components: • Parlour palm or Kib • Alder. • Spontaneous tree species: Kanoj *(Ocotea guatemalensis)*, Chalum *(Inga spuria)*, Caspirol *(Inga fagifolia)*.	
Name of the model: Coffee + Chalum Components: • Coffee *(Coffea arabica)*. • Chalum *(Inga spuria)*. • Herbs of spontaneous growth: american nightshade (hierba mora). • Spontaneous tree species: Kanoj, Caspirol.	**Name of the model: Piloy + herbs** Components: • Piloy. • Herbs of spontaneous growth: American nightshade (hierba mora), white herb (hierba blanca), field mustard (hierba flor amarilla).

Paquip Village women.
Photo: ECODESSA

Proposals to improve the agricultural biodiversity use models practiced by farmers

The study proposes improvements to strategies and/or techniques the farmers in the region use. For example:

- Planting of live barriers with species such as elderberry or Tz´aloj (*Sambucus sp.*).
- Applying conservation tillage.
- Development of compost with corn stover, bean and others.
- Incorporating backyard fruit and vegetable species, focusing on polyculture.
- Improvement of livestock systems, for example by the introduction of native chicken breeding.

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