



Forest resources in Ecuadorian Amazon communities' feeding

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Graphical Abstract



Indigenous peoples' feeding



Amazonian biodiversity



Amazon foods

Abstract

With their cosmovision, indigenous peoples in Amazon territory develop subsistence farming systems, that preserve biodiversity, which is considered to be the result between culture and control of the territory by local communities, an autonomy expression, knowledge, identity and economy factors (Escobar, 2010; Arias et al. 2018). The objective in this study was to analyze resources coming from forest for feeding Ecuadorian Amazon communities. It shows the calendar of products from plants collected for food in communities in the Ecuadorian Amazon. The seasonality of these foods and the need for conservation through agro-industrial processes is observed. It is presented the main marketable products for consumption in the Ecuadorian Amazon region. Bananas constitute the largest production, 80,710 Tm in hole the region, while in the province of Pastaza 21,320 Tm are harvested.

Keywords: Forest resources, feeding, Ecuadorian Amazon communities.

Introduction

As elements to establish sustainable local development strategies in rural communities, people had developed the Amazon agrobiodiverse systems, focused on the main promising species susceptible of adding value and that are associated to their diversified crops, income and economic quantification of the forms of exploitation of agro biodiversity (Perez et al. 2019).



Indigenous peoples around the world depend on the products of nature, which implies a diet based mainly on natural products; they occupy and use certain territories before the formation of national states, preserve their identity, have experiences of marginalization and submission but also unique characteristics and knowledge that can contribute to sustainable development and equitable; many migrate when the area's resources are depleted, until the natural environment regenerates and can be used again (Dublin & Tanaka, 2014). With their cosmovision, indigenous peoples in the Amazon region develop subsistence farming systems that conserve biodiversity, which is considered to be the result of culture and control of the territory by local communities, an expression of autonomy, knowledge, identity and economy (Escobar, 2010; Arias et al. 2018). The objective of this study was to analyze de resources of the forest in the feeding of Ecuadorian Amazon communities.

Materials and Methods

Location and geographical characteristics. The study is located in nine rural communities in the province of Pastaza, selected based on access criteria and opportunity for participation, located in the sub-basin of the Anzu River, the Llanganates Sangay ecological corridor and the community of Charapacocha, in altitudinal ranges between 340 and 1 200 meters over sea level, from the ecuadorian low jungle, to the eastern foothills at the central Andes, very humid tropical forest and subtropical humid forest life zones; rainfall ranges from 2 500 mm to 4 000 mm in the low jungle in the lower altitudinal range, to more than 6 000 mm annually in the higher zone; temperature varies between 24 to 26 °C in the low jungle and 18 to 24 °C in the high zone; relative humidity from 80 to 90%; the climate is megathermal rainy; the lower zone is in the Amazon Lowland Forest plant formation; the upper zone corresponds to the Piemontano Evergreen Forest, montane cloud forest and eastern Andes montane evergreen forest plant formation (Sierra et al. 2002).

Method. Participatory observation, community family surveys, and focus groups, are used to narrate the food culture, provision, and diet of the indigenous peoples in Pastaza, also shared through experiences, events, congresses, assemblies, and workshops in rural communities and locally representative indigenous organizations in Pastaza. Through family surveys and considering that not all families have market selling relation, a quantification of foodstuffs was established under the need criteria, how much money can people pay if need the resource or how much money can accept in a selling scenario (Barbieri et al. 2008). Information was obtained on food culture, diet and health; collection and production of food in the forest and in the cycle of the Amazon agro-biodiverse system; main promising species susceptible of adding value and associated with diversified crops and functional foods was reported.

Results and discussion

There is no quality of life without territory; the characteristics of the territory provides goods and services to the people who inhabit it, services that can be considered greater and more complex at the equatorial latitude for some ecosystems (Hamilton et al. 2016). Medical, biochemical and nutritional researchers recognize the benefits provided by the consumption of some substances of vegetable origin, mainly



through the contribution of bioactive substances in the diet (Valenzuela et al. 2014). In parallel, from the perspective of the 21st century consumer, there is a strict correlation between food and tourism; the new trends point to an inclusive approach towards indigenous communities, respectful of their worldview and based on a process of mutual learning, community empowerment and limited access to ancestral knowledge (Sidali, et al. 2016).

Table 1 shows the calendar of products from plants collected for food in communities in the Ecuadorian Amazon. The seasonality of these foods and the need for conservation through agro-industrial processes is observed (Vargas et al. 2018).

Table 1. Calendar of activities and forest products collected for food.

Month	Prevailing production in the forest or in the gardens in indigenous communities
January (Shuwia)	Grapes, hunting, fishing, hunting time of “machín” and “chichico”
February (Puach)	Frog and fishing season
March (Tangu)	Bird and pigeon time
April (Macha)	Animal fattening time, hunting time
May (Yuma)	Time of sowing, “Yuma” (tree of red flowers) that the parrots consume, time of hunting of some animals.
June (Yumanch)	Winter season
July (Paach)	Bird Time
August (Wampuash)	Ceibo season, ants start coming out to be harvested.
September (Sampi)	Season of guava.
October (Ishiap)	Time when lizards lay eggs
November (Purusham)	It's the time when the toads come out
December (Charap)	“Charapa” Egg Time

Table 2 has the evidence about ongoing relation among feeding culture, diet, health and resource from different indigenous communities and table 3 shows the main marketable consumer products in the Ecuadorian Amazon region, for consumption. It can be seen that bananas constitute the largest production, 80,710 Tm in the region, while in the province of Pastaza 21,320 Tm are harvested.

Table 2. Main forest products, medicine, with other uses and wild animals collected.

Community	Forest products, medicine, with other uses and wild animals
Tzawata	“Chuncho”, “ahuano”, “cedro”, “laurel” fine woods; fiber; barks and medicines, leaves, guava, cat's claw; “guanta”; edible fruits of “hungurahua”.
Wayuri	Firewood; edible “chonta” fruit; medicine from “Chugchuhuazo” and “Guayusa”.



Flor de Bosque	Fine woods of cinnamon and laurel; soft wood of pihue; firewood; animals armadillo, guatusa, guanta; fibers of chambira and pita; species turmeric and ishpingo; medicine of cat's claw, blood of drago.
Boayaku	Fine woods of cinnamon, chuncho and laurel; soft wood of pihue; sajino; chambira fiber; medicine mushukhuan.
Unión de Llandia	Hard cinnamon wood; soft pihue wood.
Veinticuatro de Mayo	Hard cinnamon wood; soft pihue wood; firewood; heart of palm, guatusas, monkey.
Low forest, Charapacocho	Natural seasonal fruits harvested in the purines, "chontacuros", fern sprouts, papangu and chicha sprouts, banana, fish, bush meat

Table 3. Main marketable consumer products in the Ecuadorian Amazon region

Product	National Total	Sierra Region	Coastal Region	Amazon Region	Province Pastaza
Dried hard corn (Tm)	1 042 011	118 480	903 873	19 657	895
Banana (Tm)	604 134	167 096	356 328	80 710	21 320
Yucca (Tm)	45 769	26 226	6 192	13 350	3 158
Oranges (Tm)	42 050	31 297	10 703	50	22
Sugar cane (ha)	50 316	38 102	3 165	9 049	6 354
Chickens, hens (quantity)	9 924 632	4 527 940	3 975 638	1 421 054	200 181
Cattle (quantity)	5 134 122	2 655 374	1 727 333	751 415	85 713
Pigs (quantity)	1 218 538	845 659	303 045	69 834	5 637
Horses (quantity)	307 911	150 658	103 908	53 345	11 829
Mules (quantity)	118 462	48 716	56 537	13 208	1 969

Conclusions

The knowledge of the peoples in the forest can be enhanced for their own benefit, in alliance with universities, through research into foods with functional properties, such as antioxidants, dietary fiber, prebiotic and probiotic biopreparations. It is also evident the intimate relationship between food, medicines and raw materials suitable for the production of cosmetics and the opportunities to sell the surpluses or plan the production for a growing market of organic products. The agro-biodiverse system can be the form of reproduction of these useful species, allowing the formation of market networks based on the gradual increase of agricultural productivity without forgetting food sovereignty. There is a need to develop laboratory research on the functional components of the food of the indigenous peoples of the Amazon to help optimize the food balance and the volumes of food to be consumed for better health and quality of life.



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