

Chapter 12

Indigenous Participation in the Native Seed Market: Adapting Ethnic Institutions for Ecological Restoration in the Southeastern Amazon



Danilo Ignacio de Urzedo, Robert Fisher, Dannel Sá,
and Rodrigo Junqueira

Abstract Forest and landscape restoration are emerging globally as a major challenge for development and conservation in the twenty-first century. With a restoration market providing demand for participation in supplying products and services, such as native seed, Indigenous communities have experienced new opportunities for cash income and livelihood improvements. This chapter explores the ways different Indigenous populations in Brazil have engaged in the native seed trade for restoring degraded lands, and the outcomes of their participation. We cover a case study based on one decade's experience of the Xingu Seeds Network, focusing on challenges faced by 232 Indigenous people, mostly women, from 13 villages of Ikpeng, Kawaiwete, Matipu, Panará, Wauja, Xavante and Yudja ethnicity in the southeastern Amazon. Indigenous communities have engaged in the activity mainly to secure current and future access to natural resources. Although communities have shown a large fluctuation in their seed production and cash income over the years, these collectors have produced 6.7 tonnes of seeds from 159 species leading to US\$ 65 thousand cash income for households. Native seed production is strongly aligned with traditional knowledge with outcomes related to women's empowerment, opportunities for young people, territorial mapping, and building local organizations. However, communities have faced constraints in adapting ethnic institutions to business management requirements mainly due to scales of production, language difficulties and

D. I. de Urzedo (✉) · R. Fisher
School of Geosciences, The University of Sydney, Sydney, NSW, Australia
e-mail: danilo.urzedo@sydney.edu.au

R. Fisher
e-mail: robert.fisher@sydney.edu.au

D. Sá
Programa Xingu, Instituto Socioambiental, Canarana, MT, Brazil
e-mail: dannel@socioambiental.org

R. Junqueira
Programa Xingu, Instituto Socioambiental, Brasília, DF, Brazil
e-mail: rodrigojunqueira@socioambiental.org

lack of accounting skills. Therefore, institutions must be developed acknowledging Indigenous knowledge and culture for building a more inclusive and flexible approach to support Indigenous groups to adapt to participation in markets.

Keywords Indigenous knowledge · Livelihoods · Seed collection · Ecological restoration · Brazilian amazon

12.1 Introduction

The Amazon is the largest rainforest in the world, encompassing an area of almost seven million square kilometres distributed among nine nations (Goulding et al. 2003). The region delivers important ecosystem services for human livelihoods (Soares-Filho et al. 2006). However, competition between forest land and economic production has historically driven a rapid deforestation process (Badger and Dirmeyer 2016). The Brazilian government has stimulated economic development programmes in the Amazon region since the 1960s, resulting in high deforestation rates. According to the Brazilian National Institute for Space Research (INPE), more than 436 thousand square kilometres of the Brazilian Amazon has been cleared between 1988 and 2018 (Fig. 12.1), representing an area larger than Norway. Although clearing rates have dramatically dropped since 2004, a huge swathe of the Amazon is currently deforested.

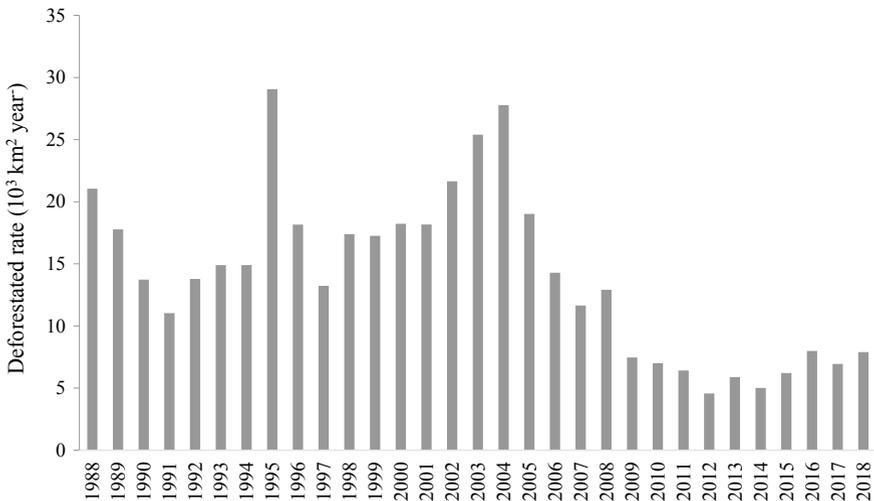


Fig. 12.1 Accumulated deforestation rates for Legal Amazon from 1988 to 2018. *Source* Prepared by the authors based on INPE (2018)

In attempting to protect forests from degradation, the Brazilian government has created protected areas and established environmental legislation for restricting and preventing land-uses that lead to deforestation (Nunes et al. 2015). Additionally, the current Law of Native Vegetation Protection and Restoration (N° 12,651/2012) requires that landowners conserve native vegetation on their rural properties. Considering the different legal mechanisms supporting this requirement, the minimum amount of required restoration in Brazil amounts to approximately 12.5 million hectares of which almost half is required in the Amazon region (Soares-Filho et al. 2014). This target was reaffirmed at the Conference of the Parties of the Convention on Climate Change in Paris where the national government internationally agreed to restore this amount of degraded area and zero illegal deforestation by 2030 (COP, Conference of the Parties 2015).

As forest clearance in the tropical region is one of the gravest social–environmental issues (Fearnside 2008), ecological restoration has been developed quickly as a worldwide response (Aronson and Alexander 2013). Progressive integration into a rapidly emerging market configures restoration as a component of a value chain. Forest and landscape restoration can directly impact society in terms of poverty alleviation and livelihoods opportunities (Aronson et al. 2010). However, the impact of restoration initiatives on community livelihoods is not clear for many situations around the world (Adams et al. 2016). One opportunity for improving livelihoods is native seed production, especially when it is assumed that large-scale programmes require a huge volume of seed (Merritt and Dixon 2011), that is in the order of hundreds to thousands of tonnes. Indigenous and rural communities can play a key role in natural seed production because they have deep knowledge and conserve high biodiversity resources.

In Brazil, seed networks have created opportunities for Indigenous and rural households to supply native seed from terrestrial ecosystems. This strategy involves linking communities who have harvested, processed and stored seeds with landowners who need seeds for mandatory ecological restoration (Urzedo et al. 2016). The Xingu Seeds Network in the state of Mato Grosso has a commercial production system that is capable of contributing to meeting regional market demand (Urzedo et al. 2020). It is considered a model because in one decade it has facilitated the production and sale of 175 tonnes of native seeds that are contributing to the restoration of around 5,000 ha. In this chapter, we evaluate Indigenous participation in forest and landscape restoration in the southeastern Amazon, covering Indigenous organization, community production outcomes and issues for adapting Indigenous institutions to business management realities. We present a case study based on the experiences of the Xingu Seeds Network focusing on challenges faced by Indigenous peoples from Ikpeng, Yudja, Wauja, Kawaiwete, Xavante and Panará ethnicities which have practised commercial seed production for one decade. All the data on the case study come from the Xingu Seeds Network’s records.

12.2 Contrasts and Conflicts: Deforestation in the Southeastern Amazon

Over the past 1200–1500 years, the Xingu headwaters in the southeastern Amazon has been an anthropogenic landscape, that is, it has been continuously occupied and managed by Indigenous peoples (Schwartzman et al. 2013). However, colonization of the Xingu region is a recent historical process promoted by the Brazilian government for a ‘national integration’ programme. Geographic specificities prevent navigation on the Xingu River from its outfall in the Amazon River towards the interior of the country. Thus, a national agency named the ‘Central Brazil Foundation’ was created in 1943 for the national integration of the centre of Brazil. This organization was responsible for colonizing the Upper Xingu and Araguaia river regions. Expeditions, called the ‘March for the West’, had operations involving building sugarcane mills, roads, landing fields, communication networks, and acquiring commercial warehouses.

The development projects in the southeastern Amazon were intensified from the 1970s with the execution of development programmes supported by the dictatorial civil–military regime. These programmes stimulated production plans which were supported by the population who migrated from the South of Brazil to the Amazon (Barraclough and Ghimire 2000). Roads built by the federal and state governments and easy access to financing and tax incentives stimulated private colonization programmes (or colonization enterprises/companies) and agribusiness models funded by transnational capital (including from the World Bank) as a global development paradigm. However, it was known that the plan would necessarily impact on numerous Indigenous peoples who had been identified by European travellers since the nineteenth century, including by Steinen (1886). At the same time, the government recreated the perspective of the Amazon as an unpopulated region and granted lands to colonizing companies, overlapping extensively with the traditional Indigenous land occupation, culminating in the expropriation of the largest part of the Indigenous territory. For instance, the Kawaiwete and the Yudja people have experienced dramatic conflicts in regards to the occupation of their territories by development projects: the Kawaiwete ethnicity had conflicts with rubber tappers on the Teles Pires River, and the Yudja people moved from islands of the Xingu River in Pará State. Both experienced their population dividing into distinct groups between those who remained in the traditional territory and those who sought refuge in other regions. This situation lasted until the early 1960s when the government created the Xingu Indigenous Park, the first large Brazilian Indigenous protected area in Mato Grosso State. Currently, renamed by the Indigenous peoples as the Xingu Indigenous Territory, it covers 2.8 million hectares and involves 16 Indigenous ethnic groups around 9 municipalities.

However, outside the limits of the Indigenous territory, the region has undergone a recent process of land use transformation (Fig. 12.2) after the abrupt insertion of the region into the international economic system (Gonçalves 2005). Since the 1990s, the landscape has faced rapidly changed circumstances, becoming a major livestock



Fig. 12.2 The farming area surrounding the Xingu Indigenous Territory in the southeastern Amazon. *Source* Fábio Garcia Moreira (ISA)

farming, logging, and more recently, soybean cultivation region, surrounding the Indigenous territory with farms and ranches (Schwartzman et al. 2013). The regional land management is strongly shaped through the farm lobby which has influenced policies and laws for exclusive agribusiness benefits in the Mato Grosso state. For instance, between 1995 and 2017, cattle numbers jumped from 14 to 24 million and soybean production increased by three times in the last decade reaching 29 million tonnes in 2017 (IBGE 2017). This recent expansion was promoted by large-scale mechanized agriculture, newly adopted technologies and governmental and private investments in infrastructure (Nepstad et al. 2006). Consequently, this intense productive model resulted in a large environmental liability, totalling 6.5 million deforested hectares, which represents 37% of the Upper Xingu area (INPE 2018).

12.3 Community-Based Restoration in the Southeastern Amazon

The recent large-scale deforestation process of the southeastern Amazon has resulted in dramatic environmental and social consequences (Durigan et al. 2013). Land cover realities have affected the quantity and quality of the water, causing changes in the water level and humidity and rainfall regime, besides harming the livelihoods of rural communities and Indigenous peoples, who have reported the impacts, such as forest fires and poor fishing conditions (Schwartzman et al. 2013). According to the Indigenous leader Mairawë Kaiabi, describing the environmental condition of the

Xingu headwater, ‘the head of the Xingu River is sick’.¹ In this context, Indigenous leaders were motivated to advocate the local authorities for territorial planning which could support the conservation of the most relevant resource for everyone, the water. This issue was announced in a letter written by leaders on behalf of Indigenous peoples on the 50th anniversary of the Xingu Indigenous Territory in 2011:

Without water, river, forest, and land, without all this diversity, there is no Xingu society. Languages, cultures, and Xingu people would not exist. The richness of our territory is the reason we are alive. We are struggling to secure the future of the new Indigenous generations of the Xingu... Non-Indigenous society wanted so much to take our feet, our hands and our power, for good or bad, to do whatever they want with our territory, just as they have already done... in the name of what is called ‘progress’ and the country’s development. This is a future ecological disaster. Nature will respond phenomenally and spiritually because nature is the life we breathe. Authorities, we want our territories to serve as examples of environmental, territorial, cultural and linguistic preservation.

A shared responsibility campaign, named ‘Y Ikatu Xingu’ (save the good water of Xingu), was launched in 2004 to articulate and implement a development plan compatible with conservation of the Xingu’s headwaters. This campaign promoted collective action to plan the development of the Xingu’s headwaters in collaboration with landowners, Indigenous and rural communities, non-governmental organizations (NGOs), and political representatives (Durigan et al. 2013). These efforts, with increased enforcement of the ecological restoration requirements in the Brazilian laws, led to increased demand for native seeds. Considering this demand for seeds, civil society organizations started encouraging local communities and households in different sociocultural contexts to provide native collectors (Campos-Filho et al. 2013). In 2007, the Xingu Seeds Network was created as a partnership between Indigenous communities, landowners, local governments and NGOs: Instituto Socioambiental, Comissão Pastoral da Terra, Associação Terra Viva, Associação de Educação e Assistência Social Nossa Senhora da Assunção, and Operação Amazônia Nativa (Urzedo et al. 2016). Indigenous communities started to engage in the activity in 2008 with the main motivation to promote ecological restoration, seeking for alternatives to support forest and water conservation. According to Kaji Waurá, a Wauja collector, his community made a decision to participate in native seeds production to deal with regional environmental conditions:

We are very concerned about the recent increase of uncontrolled fires within the boundaries of the Xingu Indigenous Territory, especially around our village. For this reason, we have decided to work with seed collection to contribute to the ecological restoration around our land where farm areas are extremely deforested.

Another dimension is the approach which involves negotiations with the rural landowners to enable the ecological restoration of the region. Local farmers have signalled in different local meetings and events the importance of the Indigenous peoples for the supply of native seeds, through their skills, knowledge and land conservation ethics. Thus, Indigenous communities could provide resources for the

¹All quotes from Indigenous people have been translated into English, often from Indigenous languages through Portuguese. They have been quoted from Xingu Seeds Network records.

farmers to restore their riparian areas. Although this understanding was accepted by some Indigenous ethnicities and groups, other leaders have opposed this discourse as an epistemological contradiction which does not consider seed collection as an Indigenous peoples' role, as explained by a Kawaiwete leader, Siranho Kaiabi:

At first, my father did not agree with this seed collection idea. He said that we did not ask for the farmers to clear all the vegetation... but I explained to him that they ended up with all their forests. Thus, we were those who had native plants which could help to supply seeds. Many people thought like my father, saying 'I will not collect seed to give to the farmers because they have been responsible for all of this natural degradation'. But in my view, you could not have only this idea, we needed to act. I knew that deforestation was not just a matter of one or the other, in fact, it has affected our river. So, it is an everyone's problem.

12.4 Indigenous Participation in Native Seeds Production

The Xingu Seeds Network operates in a complex production system which connects farmers' demand for native seeds with the local community's supply (Urzedo et al. 2020). The network involves more than 30 organizations, including seed collectors, NGOs, public agencies and the private sector. This social diversity represents an integration of actors in the forest and landscape restoration value chain. Over one decade, the network has facilitated the production of a substantial volume of seeds (175 tonnes) of 220 native species. In 2017, the Network had 450 collectors in 16 municipalities in the Upper Xingu region, covering 14 rural settlements, 1 extractive reserve, 4 Indigenous territories and 7 Indigenous ethnicities (Fig. 12.3). Thus, not all of the collectors come from Indigenous groups. Some come from the population of internal migrants encouraged by government policies to settle the Xingu Region. Many of these people are now peasant farmers facing major challenges in operating agriculture production due to poor access to financial support, technical assistance and markets.

Native seed supply started to be a relevant economic alternative opportunity for communities in the southeastern Amazon. Currently, Indigenous groups represent approximately two-thirds of the collectors in the Network, encompassing the Ikpeng (Moygu and Arayo villages), Kawaiwete (Ilha Grande, Kwaruja, Tuiararé and Samaúma villages), Yudja (Tuba Tuba village), Panará (Nāsêpotiti village), Wauja (Piyulaga and Piyulewene villages) and Xavante ethnicities (Pimentel Barbosa and Marãiwatsédé Indigenous Territory). As shown in Table 12.1, women represent a large majority of Indigenous participants (80.6%). Indigenous collectors are mainly adults (averaging 35.5 years of age) with experience in seed collection averaging 5.2 years. Within the Indigenous ethnicities, the Ikpeng community is the largest group in terms of collector numbers (67 participants). It also represents the most experienced group (averaging 7.3 years' experience). On the other hand, within the Yudja ethnicity, seed collection has been driven by nine young people who have developed their activities supported by the local school. This is an indication of the

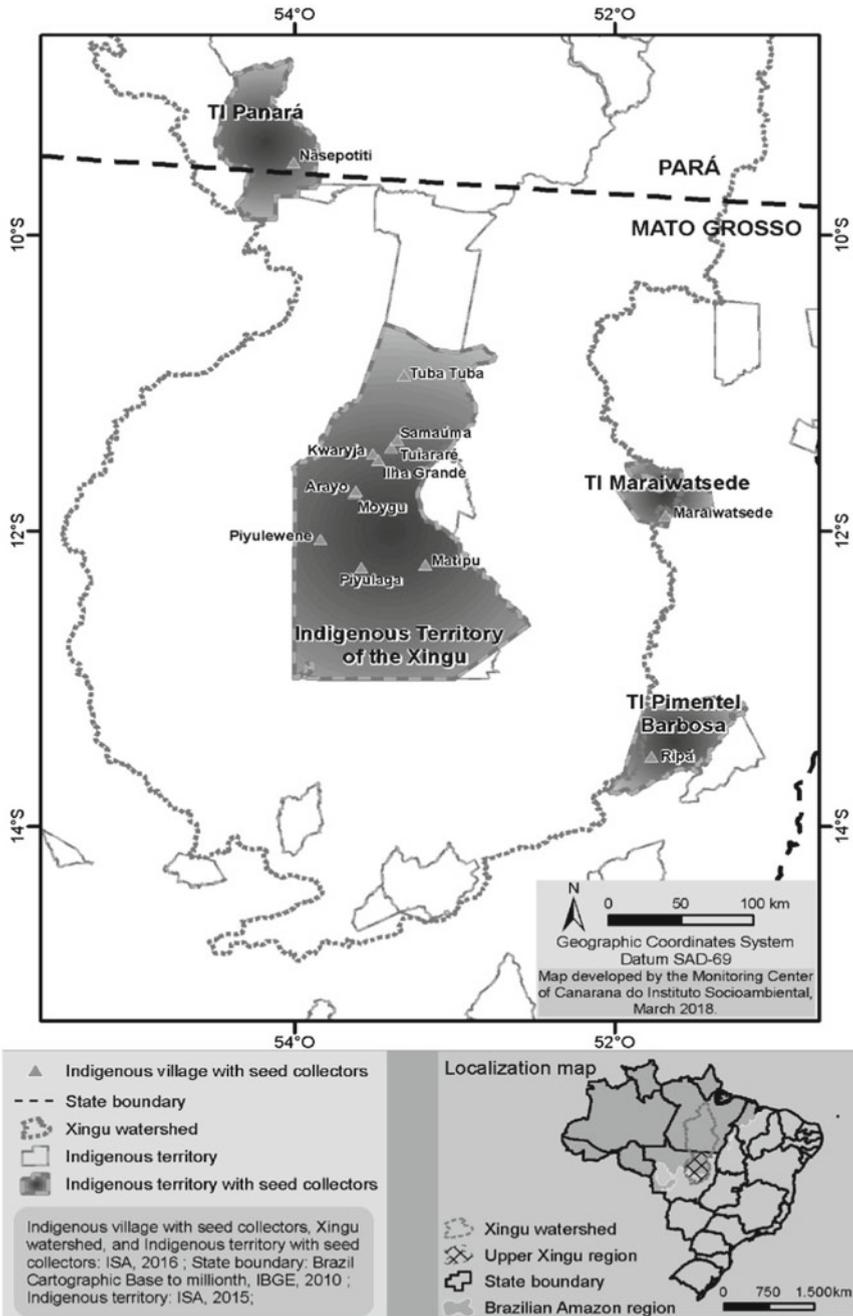


Fig. 12.3 Indigenous villages and territories with seed collectors in the Xingu Seeds Network, Upper Xingu region, southeastern Amazon. Source ISA

Table 12.1 Indigenous seed collector characteristics of members of six ethnic groups of the southeastern Amazon in 2016

Ethnicity	Collectors	Gender		Age (years)		Experience in seed collection (years)	
	n	Men (%)	Women (%)	m	1 STD	m	1 STD
Ikpeng	67	6.0	94.0	36.1	14.1	7.3	1.7
Kawaiwete	54	37.0	63.0	34.3	15.0	4.1	2.9
Panará	6	–	100	24.8	2.3	5.0	–
Wauja	40	32.5	67.5	38.3	13.2	4.8	0.8
Xavante	56	3.6	96.4	40.7	19.2	4.8	1.5
Yudja	9	66.7	33.3	20.0	6.8	0.7	1.1
Total for Indigenous group	232	19.4	80.6	35.5	14.9	5.2	2.3
Total for Network	385	34.3	65.7	41.16	19.76	5.16	2.74

m: mean, 1 STD: standard deviation

Source Prepared by the authors based on Xingu Seeds Network's database

way that Indigenous participation in seed collection varies according to each community context. More recently, inspired by these experiences, Matipu ethnicity only began to collect native seed in 2017.

12.5 Local Knowledge and Innovation for Native Seed Production

Theories and natural resources management practices have recognized the key role Indigenous knowledge plays for ecosystem conservation (Mistry 2009). Native seed collection is strongly related to local knowledge and the daily life and activities of the Indigenous peoples and their household members. One of the first steps for the collectors is the planning activity through the establishment of the annual list identifying potential demand for seed supply. Each collector needs a well-prepared plan to ensure the capacity to collect and produce seed in the required quantity with quality. Men, according to the traditional division of labour, are responsible for identifying mother trees and their flowering and fruiting process when they go hunting, fishing, travelling or clearing the farm areas. This information helps collectors and local coordinators to develop the plan for collection activity. Besides this, the older people also provide advice on the fruit ripening period, based on their knowledge about natural cycles. Meanwhile, the Xingu Seeds Network management office establishes partnerships with landowners who need to restore degraded lands. The

relationship between the collectors 'potential list' for supplying seed and the market demand establishes the annual seed production quota. The management office sends an 'order list' to seed collectors who have the commercial demand assured that the participation patterns differ considerably between Indigenous groups because the traditional knowledge of each specific group shapes the way production and economic activity will be arranged. These patterns also differ from the other (non-Indigenous) collector groups in the Xingu Seeds Network (Urzedo et al. 2016).

Seed production processes are composed of collection, processing, drying and storage steps. Techniques adopted depend directly on the local context of the collectors in regard to local infrastructure, technical assistance, local knowledge and social organization. Indigenous groups collect seeds entirely within the boundaries of the Indigenous territory, involving substantially the village outskirts areas where people walk for other daily activities (Fig. 12.4). Accordingly, most seed collection areas are native vegetation, agroforestry or 'capoeira', secondary forest fallows. Indigenous groups have preferences for collecting fruit tree seeds, usually recalcitrant species (that is having high seed moisture content) which are used as hardwoods for the construction of houses and clothing handicrafts. Conversely, the restoration market has restrictions on buying recalcitrant seed because, due to high moisture content and high metabolic activity, it is difficult to store (Umarani et al. 2015). Consideration needs to be given to the ancestral management practices of the Indigenous peoples capable of domesticating many of these species important for their social practices. According to Miller and Nair (2006), Indigenous systems promoted cultivation of



Fig. 12.4 Seed collectors from the Xavante ethnicity collecting native seed at the Pimental Barbadosa Indigenous Territory in the southeastern Amazon. *Source* Rogério Assis (ISA)

fruit trees and useful plants for several thousands of years in the Amazon; however, currently, there are few institutional models to promote domestication of species for new demands. Thus, technical limitations restrict the commercial use and domestication of native species which limits the potential of restoration market to support local culture, health and nutrition.

Indigenous collectors have their own techniques and equipment for seed collection and processing that are related to their own ethnicity's experiences and culture. Traditional materials are essential in seed activities, such as producing a mat and strainer from a native palm fibre (*Mauritia flexuosa* L. f.) and producing wooden pruning shears. For example, Ikpeng seed collectors use a traditional basket (called a *motopa*) to indirectly quantify the weight of seeds, because in their culture there is no quantification of weight (Fig. 12.5). Otherwise, over the years Indigenous peoples have learned, from non-Indigenous collectors, other techniques and materials to improve their performance. For instance, most of the Indigenous groups now use bowls, knives, trimmers and wheelbarrows for seed production. On the one hand, this demonstrates the local adaptive capacity to learn and experiment with new solutions for every day challenges (Mistry 2009). On the other hand, infrastructure conditions have been identified as a limiting factor in the production system, since the groups have limited access to necessary materials, equipment and transportation. The collectors consider that material and transportation costs are an external responsibility. Therefore, the groups recognize that financial support is essential to finance the infrastructure needed for the production.

After collection and processing, seeds can be dried and then locally stored for a short time in a community seed house (Fig. 12.6) until the seed lots are transported to one of three storage houses located in the cities. Geographic distance, logistic costs, transportation, and road infrastructure are also considered huge gaps in the production system. Under these conditions, Indigenous collectors rely on external logistical support, mainly because of the high costs of river and road transportation.



Fig. 12.5 Ikpeng traditional basket (*motopa*) used to indirectly quantify the weight of seed lots.
Source ISA



Fig. 12.6 Community seed house at the Piyulaga village of the Wauja ethnicity in the Xingu Indigenous Territory. *Source* Danyel Sá, ISA

Where possible, they combine transport with travel for other activities to reduce costs. When lots arrive in storage houses, there is infrastructure and systems to maintain the seed quality, until they are sent to farmers who will be responsible for ecological restoration.

12.6 Holistic Indigenous Knowledge Aspects of Native Seed

According to Mistry (2009), the holistic Indigenous knowledge encompasses numerous interlinked facets of people's lives. Indigenous beliefs of some groups consider that the natural environment also has a value given to it by God which must be respected and believe that no one has the right to destroy it (Kelbessa 2013). Although native seed production is a production activity, it is tightly associated with the totality of Indigenous culture, with expressions that give meaning, orientation and inform decision-making. Seed collection activities express a permanent interdependence in the life exchanges, encompassing interaction with the physical environment, and all living beings and spirits (Fig. 12.7). For instance, in the Ikpeng culture, all living beings have a spirit responsible for protecting their existence. Seed collectors recognize, in their own practices, the interactions between different forms of life and a



Fig. 12.7 Ikpeng Indigenous peoples are connected with land, trees, water and animals which express signs for native seed collection in a complex system shaped by spirituality. *Source* Katuma Ikpeng, ISA

complex system based on a spiritual dimension which is explained by Oreme Ikpeng, a community seed manager:

Since the creation of the earth, every living being has had its own spirit-owner. Insect larvae inside a fruit, in our Ikpeng society's view, are conceptually the owner of the fruit. Therefore, seed collectors must respect those insects. It is recommended that women who are looking after babies cannot collect seeds because the spirit-owner can do harm to the baby. It is also indicated to eat some fruits in moderation... because they can cause a toothache in people. The tree spirit gets angry when trees are taken down or their fruits are overly collected, therefore collectors have to respect its source.

Indigenous knowledge has been understood as a holistic 'cultural–ecological' system in which the human and the ecological aspects are tightly integrated over a range of scales (Mistry 2009). Thus, Indigenous peoples' knowledge allows the understanding of the natural dynamics which support the development of strategies for local planning and organization for natural resources management. Based on this holistic understanding, collectors establish cultural alternatives to meet their production demand. Mani Kaiabi reports the alternative strategy employed by the Kawaiwete people for achieving seed collection:

When Kawaiwete men go hunting or fishing, we cannot say what we are going to do, because the owner-spirits can hear and then hide these resources to protect them. The same thing

happens when we receive the 'seed collection list'. After it, seeds of these particular species start disappearing in nature, creating difficulties for us to collect the amount we need. When these species are not on our order list, we can see in nature how trees produce a lot of fruits and seeds. But when it comes on our list, these seeds just disappear. To overcome this situation, we use a nickname, so the owner-spirit cannot hear and hide what we are looking for. We have a nickname for each animal, and now we do the same for seeds.

12.7 Community Organization: Indigenous Associations' Roles

The case of Indigenous peoples engaged in seed production must consider a huge diversity of realities of each village and ethnicity because each has a particular way of organization and decision-making. Although the collectors organize themselves through household groups for seed collection and processing, the governance structure is based on associations that provide social control at the different levels of this initiative. The participation of associations in the Indigenous organization has been evident since the 1990s. This development was based on the 1988 Constitution that changed official policy for Indigenous peoples from 'guardianship' to 'autonomy' (Brazil 1988). From this period, the National Indian Foundation (FUNAI) ceased to be responsible for providing assistance in education, health, protection and oversight and it began to assign responsibilities to other government organizations. In this context, Indigenous associations started to develop for representing their own proposals in partnership with NGOs (Schwartzman et al. 2013). In the Upper Xingu region, the pioneer organization was the Xingu Indigenous Territory Association (ATIX), founded in 1994. Consequently, the association model began to spread in local communities to enable them to access national and international funds for development projects and projects that could only be accessed by formal organizations.

It is important to note that these arrangements are not fixed over time because the governments and regulations can change with direct impact on Indigenous communities. The recent election of a far-right president in Brazil, Jair Bolsonaro, has demonstrated how political decisions can threaten Indigenous rights. For instance, the approach to Indigenous land demarcation was recently modified by Bolsonaro and responsibility was moved from FUNAI to the Ministry of Agriculture. This shift in responsibility will dramatically constrain the conditions for Indigenous groups to access their traditional lands and is almost certain to favour agribusiness interests.

The seed network organizational model considers the Indigenous associations' participation in financing projects, and also provides support for seed commercialization. In the Xingu Indigenous Territory, seed production has been shown to be an instrument for the institutional strengthening of Indigenous associations which are responsible for connecting local demands with the 'outside system'. Ikpeng (*Associação Indígena Moygu Comunidade Ikpeng*), Wauja (*Associação Indígena Tulukai*) and *Associação Indígena Sapukuyawa Arakuni*), Kawaiwete (*Associação Tapawia*),

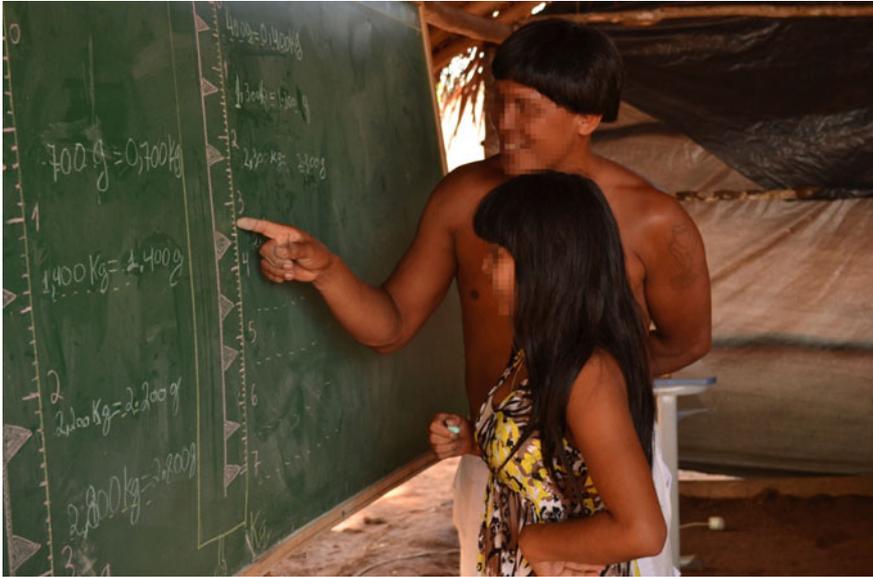


Fig. 12.8 Community workshop on weights and measures skills in the Piyulaga village, Waurá ethnicity, Xingu Indigenous Territory, southeastern Amazon. *Source* Dannyel Sá, ISA

Yudjá (*Associação Yarikayu*) and Panará ethnicities (*Associação Iakiô*) are effectively participating in the forest restoration value chain. This process is impacting on the maturity and autonomy of collectors' performance to provide increased benefits from their insertion into the market economy. While NGOs have supported local communities to understand and adapt local institutions to the market operation systems (Fig. 12.8), these efforts have been only partially successful given the rigidity of the market systems.

On the other hand, business management activities are not always able to dialogue with Indigenous institutional systems. Indigenous groups have reported limitations imposed by differences in language, understanding of business models and issues (such as taxes and inspection) and planning production scale as well as managing finances and accounting with rigid bureaucratic structures. For example, Ball (2012) argued that agents of change misunderstand Indigenous peoples when they do not consider the differences in cultural assumptions about the forms that social relations can and should take even when Indigenous representatives can speak Portuguese. Thus, the association model has been considered an incompatible management system to promote Indigenous institutional systems in the wider business context (Verdum 2009). Based on aspects like these, there are growing criticisms about the Indigenous development programme because it reflects contradictions between economic neoliberalism and local empowerment (Laurie et al. 2005). Therefore, Indigenous systems cannot be assumed to be compatible with neoliberal social policy (Andolina et al. 2009).

12.8 Native Seed Production Outcomes

In one decade of activities, around 6.7 tonnes of native seeds of 159 species were produced and marketed by these Indigenous peoples within the case study. Of this volume of production, two-thirds is attributed to the Ikpeng (2.1 tonnes) and Wauja (2.0 tonnes). Communities have shown a large fluctuation in their production over the years (Fig. 12.9). For example, Kawaiwete collectors dropped more than half of their seed production from 2012 to 2016. On the other hand, seed production capacity of the Wauja ethnicity has increased significantly in the last years, increasing 14 times. Currently, it represents about 60% of the total Indigenous production. Although these numbers are significant in the context of Indigenous communities, this represents less than 4% of total seed network production (175 tonnes). For instance, seeds of 56 species were produced by Indigenous groups in 2016 but almost 80% of them had less than 5 kilos. In contrast, the non-Indigenous collector groups improve their volume of production through investments in materials and technology for upscaling production of achieving better financial outcomes, while the Indigenous institutional systems are not based on capital accumulation (Lanna et al. 2000; Martins 2005). The entrepreneurial logic of non-Indigenous collectors guarantees a stable annual supply of 25 tonnes of seeds, while the participation of Indigenous groups that contribute less in terms of production helps to improve species and genetic diversity.

Throughout the Indigenous participation, seed collection has contributed to more than US\$ 65 thousand of community cash income (Fig. 12.10). As seen in seed production outcomes, the financial return has been widely variable between years, whereas the results are dependent on several factors, some of them related to natural

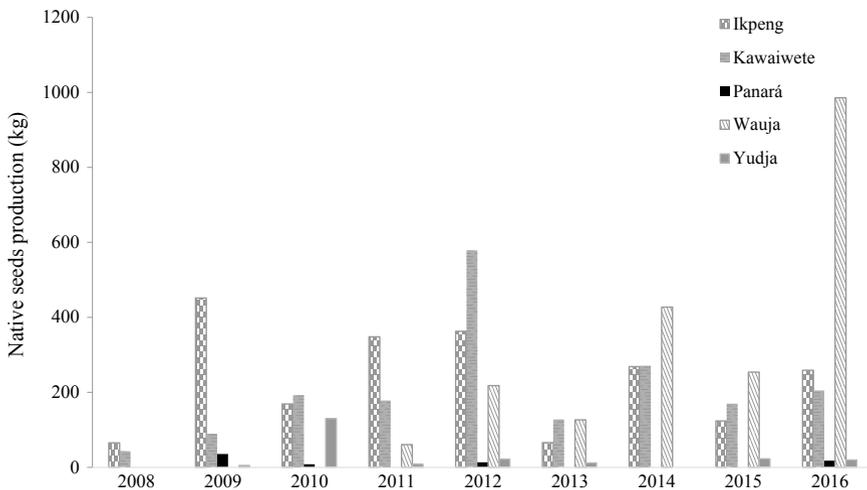


Fig. 12.9 Native seed production by Indigenous groups in the southeastern Amazon between 2008 and 2016. *Source* Prepared by the author based on Xingu Seeds Network’s database

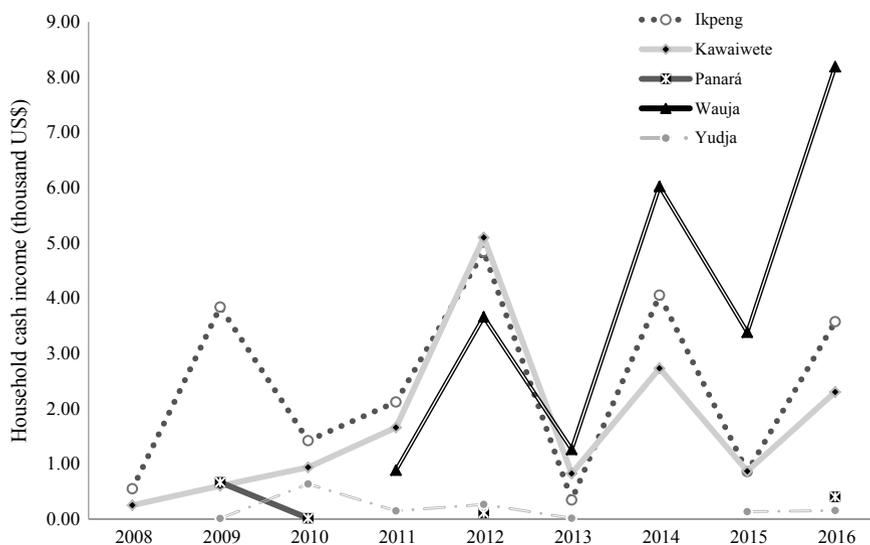


Fig. 12.10 Cash income generated (US\$) from Ikpeng, Kawaiwete, Panará, Wauja and Yudja participation in native seed trade in the southeastern Amazon between 2008 and 2016. *Source* Prepared by the author based on Xingu Seeds Network's database

dynamics, local organization or technical gaps. In 2016, communities achieved the greatest financial return from seed marketing, totalling US\$ 14,614.82. Two-thirds of the total income, since 2008, was generated by Ikpeng (US\$ 21 thousand) and the Wauja community (US\$ 23 thousand). In general, the financial income of Indigenous groups is usually less than 5% of the total value generated by the Network's collectors, although 60% of the collectors are Indigenous. However, cash income earned from the sale of seeds can be directly correlated with livelihoods improvements (Urzedo et al. 2016).

12.9 Community Livelihood Outcomes from Seed Production

The seed network arrangement has been recognized as a way for strengthening the cooperative relations in each Indigenous village and distinct ethnicity, all of which have their own models according to traditional cultural and sociopolitical factors. At the same time, the type of activity involved promotes young peoples' curiosity about natural resources, leading them to seek the wisdom of elders, sharing the tendency to access the new stimuli of non-Indigenous society to which young people are prone. It is, therefore, a work of income generation that contributes to conciliating local experiences with the 'outside society'. Thus, native seed commercialization through

this community arrangement may offer an economic alternative to the process of Indigenous proletarianization in progress (Díaz Polanco 1978). This proletarianization process is based on salaried employment and also the dynamics of urbanization which have surrounded young Indigenous peoples (Horta 2017). Ayakanukala Waura, the first seed coordinator of the Wauja collectors, explains the importance of young people's participation in this activity:

With the old people, we learn the plant names in the Indigenous language, where the mother trees are located, and when the species fruitification happens. On the other hand, we (young people) teach our community what we have learned in courses outside the community. In the work of the Xingu Seeds Network, old and young people are together to preserve the environment, and to restore the forest for a better balance between production and conservation based on local cultures.

The native seed collection also represents actions for territorial planning and monitoring for Indigenous peoples. For instance, the Xavante people of the Marãiwatsédé Indigenous Territory have promoted a women's collector group, named *Pi'õ Rómnhá Ma'Ubumrõi'wa*, which has supported the mapping of their territory with 56 women collectors as members. This Indigenous land suffered the intrusion of non-Indigenous people over 50 years because the military government developed colonization policies to foster large-scale agriculture in this region (Araújo de Oliveira 2017). Due to predatory occupation by the invaders of this traditional territory, more than 60% of the traditional land (165 thousand hectares) has been deforested in 50 years (Fig. 12.11).



Fig. 12.11 Billboard acknowledging Marãiwatsédé Indigenous Territory in the southeastern Amazon established by the Ministry of Justice and National Indigenous Foundation (FUNAI). In the background, degraded land due to predatory occupation by the invaders. *Source* Rafael Goyari, ISA

A portion of the seeds produced by the *Pi'õ Rómha Ma'Ubumrõi'wa* group is also used for ecological restoration projects in the Marãiwatsédé Territory. A similar context is also seen in the case of the Panará people, who in 1994 managed to regain part of the traditional territory when they began a phase of occupation and territorial recognition. The development of an economic alternative has become a considerable matter for Nasëpotiti village. Currently, the Panará are recovering the population parameters that existed before contact and they already live in four villages. Income generation remains an important demand for these communities. Native seed collection represents a cash income opportunity for young women connected with territorial mapping.

Emphasis also must be placed on the fact that women represent the majority of the Indigenous participants. The women collectors participate in both production stages and leadership roles for plan elaboration and decision-making processes for the initiative. Thus, women's empowerment in regard to seed collection engagement has featured prominently in the successful results of the seed network. Women's role in seed production has been recognized in the community-level context and also in external events and meetings. The *Yarang* women's movement, the Ikpeng people's seed collector group, is an emblem of this outcome (Fig. 12.12). *Yarang* collectors are organized for the seed collection under three experienced coordinators, who lead the movement in the Moygu and Arayo villages. These women are also supported by association administrative managers, Indigenous teachers and their husbands. It has been observed that the cash income generated by women's activities with



Fig. 12.12 *Yarang* women's movement collecting native seed. Moygu village, Xingu Indigenous Territory. *Source* Guáira Maia, ISA

seed production is reserved primarily for the benefit of household members. Cash income obtained from seed collection has made possible the acquisition of external goods for daily household and community use. Since the creation of the *Yarang* movement, women have become more active participants in community meetings, more independent and, at the same time, more united, as explained by the seed collector leader, Magaro Ikpeng:

I collect native seed with my family members... We all divide the activities, but usually, there is a person who leads the collection and everyone collects and helps... When they receive the cash income, sometimes they share or buy something that will be useful for everybody. This money benefits everyone in my house, not only women but also men. I am a leader, so I have this responsibility to be in the centre, to be in the decision-making place, to speak. But inside the house too, each one has his reference person, each house has a home leadership. I'm not the people's boss, I'm their leader of women. So, the women's group decides, they say. After that, I'll just say what they decided.

12.10 Conclusions

More than two hundred Indigenous people from Ikpeng, Yudja, Wauja, Kawaiwete, Xavante and Panará ethnicities in the southeastern Amazon have been engaged in seed collection of high biodiversity species over one decade. Their main purpose is the promotion of ecological restoration of the Xingu's headwaters to secure natural resources conservation. Native seed production is an activity compatible with local knowledge, culture and natural resource management. Community-based arrangements have been operated considering each ethnicity's culture, resulting in different ways to arrange the economic activity. Although the production scale and cash income outcomes are significant outcomes, it has been demonstrated that Indigenous institutional systems are not based on capital accumulation or production scale and are not easily compatible with market chain organization involved in seed collection for restoration.

Seed collection has resulted in relevant local outcomes related to cash income generation, livelihood improvements and social organization. Women and young collectors have played a key role in the production, leadership and decision-making processes. Seed collection also contributes to territorial planning and monitoring for Indigenous peoples which have supported Indigenous groups in conflicts surrounding land issues in the region. Moreover, seed activities reflect the interdependence of the Indigenous holistic knowledge encompassing interaction with the physical environment, all living beings and spirits.

However, when Indigenous systems are examined in terms of compatibility with neoliberal social policy and commercial production they fail to adequately address autonomy and local empowerment. The dominant business system does not consider Indigenous reality and culture. Moreover, the local production systems have faced limitations mainly because of lack of financial support, administration and poor infrastructure. The demands of the restoration market also restrict the potential of

native species for supporting species domestication. It is relevant to include Indigenous institutional systems in design rules for business management by modifying some of the practices of the supply chain. It is also essential to support capacity development for Indigenous associations in terms of training in business skills and enabling them to adapt to the institutional needs of businesses involved in the restoration supply chain. The Indigenous associations have been successful in contributing to local social and livelihood needs, but the capacity to make greater contributions depends on adapting both the local organizations and the supply chain to each other's functions and capacities.

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Danilo Ignacio de Urzedo is an environmental geographer who researches, teaches, and advocates for more effective land-use practices to promote ecosystem services and environmental justice in Latin America. He bridges the natural and social sciences, having previously worked as a community forester in the Brazilian Amazon before undertaking a PhD in Human Geography at the University of Sydney.

Robert Fisher is an anthropologist and human geographer specializing in social and political aspects of natural resource management, particularly community forestry. Since working on a community forestry project in Nepal, he has worked widely in Asia and Africa and was Deputy Director of the Regional Community Forestry Training Center in Bangkok from 1997 to 2001. He has a strong interest in forest tenure and the relationships between conservation and poverty. He teaches at the University of Sydney.

Dannyel Sá is an assessor in the Instituto Socioambiental (ISA), Brazil. He holds a bachelor's degree in biology and a master's degree in ecology. His research experience focuses on non-timber forest products and he has worked in the Xingu Seeds Network since 2012, supporting seed collectors from the Wauja, Kawaiwete, Yudja e Ikpeng ethnicities in the Xingu Indigenous Territory, Brazilian Amazon.

Rodrigo Junqueira Programa Xingu, Instituto Socioambiental, Brasília, DF, Brazil. Email: rodrigojunqueira@socioambiental.org