Working Paper

Agroforestry species of Peru: Reference list and contribution to prioritization for the conservation of agroforestry genetic resources

Jonathan P. Cornelius, Jéssica M. Cerrón-Macha, Juan D. del Castillo and Jean C. Valverde-Quiroz

Coast

Amazon

Andes

World Agroforestry

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PO Box 30677, GPO 00100
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Tel: +254(0)20 7224000, via USA +1 650 833 6645
Fax: +254(0)20 7224001, via USA +1 650 833 6646
Email: worldagroforestry@cgiar.org
Website: www.worldagroforestry.org

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This document lists reported uses of native and exotic Peruvian agroforestry tree species or products derived from them. It does not imply endorsement by World Agroforestry or the authors of the effectiveness or safety of said uses, and neither World Agroforestry nor the authors are responsible for any adverse consequences resulting from said uses.

Cover photos, left to right: *Prosopis pallida* ('algarrobo'), *Bixa orellana* (annatto), *Sambucus peruviana* (Peruvian elder) (Jonathan P. Cornelius / World Agroforestry).

About the Authors

Jonathan Philip Cornelius

Senior Researcher, World Agroforestry, Apartado 1558, Lima 12, Peru (j.cornelius@cgiar.org) and Adjunct Associate Professor, James Cook University, Cairns, Queensland, Australia.

Jéssica Marith Cerrón-Macha

Forestry Consultant, World Agroforestry, Apartado 1558, Lima 12, Peru (jessicamcerronm@gmail.com) (BSc Forestry, La Molina National Agrarian University, Lima, Perú). Currently working on the impact of different restoration practices on ecosystem services and local livelihoods in Peru.

Juan Diego del Castillo

Forestry Consultant, World Agroforestry, Apartado 1558, Lima 12, Peru (BSc Biology, La Molina National Agrarian University, Lima, Peru) ((j.delcastilloruiz@gmail.com).

Jean Carlos Valverde-Quiroz

Researcher, World Agroforestry, Apartado 1558, Lima, Peru (j.valverde@cgiar.org) (BSc Forest Sciences, MSc Environmental Sciences, La Molina National Agrarian University, Lima, Peru).

Abstract

Peru is a megadiverse country with three distinct ecological macroregions (Coast, Andes and Amazon). Agroforestry is widely practised and is promoted by governmental and non-governmental agencies working in agriculture, environmental management and rural development. Constraints to effective agroforestry in Peru include lack of awareness of the full range of agroforestry species (and, therefore, agroforestry options) and threats to agroforestry genetic resources. These constraints lead to ineffective prioritization, narrowing of the range of available species options, and genetic erosion. In response, this publication provides a listing of Peruvian agroforestry species, including 185 native species and 53 major introduced species. The native species include food, timber, agroecological service and multiple-use species used in the Coastal, Andean and Amazon regions. The introduced species are mostly food species, but also include eucalypts and pines. We also list 40 native Peruvian agroforestry species considered to be endangered in all or part of their ranges. Several priorities for future actions were identified, including the following: establishment of seed sources or genebanks of endangered Peruvian agroforestry tree species; establishment or consolidation of local seed sources of a wide range of agroforestry species relevant to different localities or agroecologies; clarification of the status of seed sources under Peruvian seed law and other legal instruments; investigation of intraspecific genetic diversity of Peruvian agroforestry species; synthesis and publication of information on the cultivation techniques and benefits, including ecological benefits, of Peruvian agroforestry species; actions to ensure that key elements of the national environmental and agricultural agenda recognize the full range of agroforestry species and their benefits; clarification and dissemination of information on genetic diversity and provenance of major introduced agroforestry species.

Keywords

Andes, Amazon, Coast, dry forest, exotic species, introduced species, mountain zones, native species, tropical rainforest

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Any error of omission or commission remains the responsibility of the authors.

Note

Scientific names in this publication follow the Kew Gardens database Plants of the World Online[2].

[1] http://www.cgiar.org/about-us/our-funders

[2] http://powo.science.kew.org/

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Introduction

Many globally important agroforestry species are native to neotropical countries (Table 1). In addition, in neotropical countries, farmers value and use hundreds of other species of local, national or regional importance (Sotelo and Weber 1997, Shanley and Medina 2005). Peru, in particular, is rich in agroforestry genetic resources, probably largely due to the country's large size[3], ecological diversity[4], and a long history of use and domestication of plants (Brack 2003).This document aims to provide a reference list of Peruvian agroforestry species, and to contribute to the establishment of priorities for conservation of agroforestry genetic resources. We now briefly expand on these.

Reference list of Peruvian agroforestry species

A listing of agroforestry species has a number of applications. First, as a land use, agroforestry both overlaps with, and, in a sense, transcends agriculture and forestry. Consideration of species from agricultural or forestry perspectives is likely to lead to neglect of species that do not fall naturally into these categories.

Second, a list provides a reference point for agroforestry and landscape restoration projects, which otherwise may fail to take into account the full diversity of options available. Awareness of the full range of options permits effective prioritization, whether for conservation, restoration, research or other purposes, and helps ensure that species of potential interest are not overlooked.

Finally, a listing of agroforestry species aids in communicating the full conceptual breadth of agroforestry and the diversity of functions it can play in sustainable land management. Currently, such communication in some cases can be impeded by the persistence of narrow concepts of agroforestry, e.g., as simply a plot-level combination of trees and agricultural crops.

In the present document, we have expanded on a precursor publication (Cerrón et al. 2018), which was limited to native species, to include exotic species. This permits consideration of a number of ancient introductions, including some that have been considered native by scientists, practitioners or farmers. It also permits

[3] At a little less than 13M km2, Peru is the fourth largest country in Latin America and the largest of those found entirely in the tropics.

[4] Of Holdridge's 108 global life zones, 84 are represented in the country's three main regions (Coast, Amazon and Andes).

Table 1. Illustrative list of globally important neotropical agroforestry species

Common name*	Scientific name
	Major commercial food and/or cash crops
Cacao	*Theobroma cacao* Tussac
Cashew	*Anacardium occidentale* L.
Avocado	*Persea americana* Mill.
Papaya, paw-paw	*Carica papaya* L.
Rubber	*Hevea brasiliensis* (Wild. Ex A. Juss) Müll. Arg)
	Other food crops
Açai	*Euterpe oleracea* Mart.
Acerola	*Malpighia emarginata* DC.
Annato	*Bixa orellana* L.
Cherimoya	*Annona cherimola* Mill.
Soursop	*Annona muricata* L.
Guava	*Psidium guajava* L.
Peach palm	*Bactris gasipaes* Kunth
Allspice	*Pimenta dioica (L.)* Merr.
Tomarillo, tree tomato	*Solanum betacea* Cav.
Zapote	*Manilkara zapota* (L.) P. Royen
	Energy crops
Jatropha	*Jatropha curcas* L.
	Agroecological service-providing species
Calliandra	*Calliandra calothyrsus* Meisn.
Erythrina	*Erythrina* L. spp.
Gliricidia	*Gliricidia sepium* (Jacq.) Steud.
Ice-cream bean	*Inga edulis* Mart.
Leucaena	*Leucaena leucocephala* (Lam.) de Wit
Prosopis, mezquite	*Prosopis* L. spp.
	Timber species
Balsa	*Ochroma pyramidale* (Cav. ex Lam.) Urb.
Mahogany	*Swietenia humilis* Zucc., *S. macrophylla* King, *S. mahagoni* (L.) Jacq.
Cypress	*Hesperocyparis lusitanica* (Mill.) Bartel
Pine	*Pinus caribaea* var. *hondurensis* (Sénécl.) W.H. Barrett & Golfari, *P. oocarpa* Schiede ex Schltdl., *P. patula* Schiede ex Schltdl. & Cham., *P. tecunumanii* F. Schwertdf. ex Eguiluz & J.P. Perry

*See the Spanish edition of this publication for common names in Portuguese, Quechua, Spanish and other languages.

Conservation of agroforestry genetic resources

Globally, ICRAF maintains a genebank of 162 agroforestry species, including both seed holdings and field plantings[5]. Neotropical species are well-represented in this collection (42 species). However, only two species (*Bactris gasipaes* and *Jatropha curcas*) are held in field genebanks, and all but seven of the other species, and >99% of the individual neotropical accessions, are Mesoamerican leguminous species. ICRAF, and particularly ICRAF-Latin America, is therefore interested in broadening its holdings of neotropical species, specifically with respect to endangered agroforestry species and populations of South America.

Consequently, in 2017 ICRAF initiated a prioritization process aimed at guiding its future genebank activities in Peru. The present document contributes to this process. It also contributes to the prioritization process of the project FuenteS[6], which is aimed at enhancing capacity in Peru for establishment of seed stands for restoration and genetic conservation, and seeks to inform activities of other governmental and non-governmental organizations.

Methods

The present document is partly based on the results documented previously in Cerrón et al. (2018). The following description incorporates the methods used in this precursor document, as well as additional methodological elements employed.

List of agroforestry species

In generating the list, a wide definition of agroforestry was adopted, i.e., 'any tree, palm or shrub species that is actively managed by farmers.' This reflects prevailing wide concepts of agroforestry; for example, as land use that combines aspects of agriculture and forestry, including the agricultural use of trees (van Noordwijk et al. 2016).

Native species

In the case of native species, an initial list was compiled based on reports of on-farm use in published and unpublished sources, including books and articles (Brack 2003; Fernández and Rodríguez 2007; Meza and Cornelius 2006; Reynel and Felipe-

[5] http://www.worldagroforestry.org/products/grunew/index.php/seeds

[6] http://www.worldagroforestry.org/project/agroforestry-seed-sources-restoration-and-genetic-conservation-fuentes

Morales 1987; Reynel et al. 2003, 2006, 2016; Whaley et al. 2010a; Reynel, Pennington and Pennington 2016), references located in the bibliographic databases Scopus and Google Scholar, unpublished reports (Cerrón et al. 2017; Robiglio et al. 2018; Valdivia-Díaz and Mathez-Stiefel 2015a, 2015b), and unpublished databases derived from previous ICRAF research.

This process yielded an initial 'long list'. It was evident that the inclusion of many species merely reflected use, rather than active management, while also probably arbitrarily excluding many other species that are occasionally or regularly used by farmers. To avoid such arbitrariness, the final list excluded species that did not meet at least one of three criteria, as evaluated based on the sources indicated above. The three criteria were as follows:

- Use for specific agroecological services, e.g., shade for perennial crops, windbreaks, live fences, livestock fodder
- Regularly planted by small-scale farmers
- Domesticated species or their wild congeners.

The resulting list was published in Cerrón et al. (2018) and presented or circulated at public meetings[7], and in consultation with experts convened in the Peruvian Amazon (Pucallpa), Andes (Huancayo) and Coast (Tumbes). Based on the inputs received, a specific study of the northern zone (Cerrón et al. 2019), and additional sources such as Levis et al. (2017) and Whaley et al. (2010b), a final list of native species was developed.

The species were categorized by main ecological regions of use, based on the three main regions of Coast, Andes and Amazon. The highland Amazon zone, sometimes referred to as the 'tropical Andes'[8] was classified as Amazon; therefore, the species classified under Andes are those of the Pacific basin and the inter-Andean valleys.

The use of each species was also categorized. Such a categorization is not straightforward, as 'use' encompasses both end-product and agroecological service concepts, and most species produce more than one good or service. Consequently, our classifications reflect main or dominant use. This was based on the above sources and our own observations and experiences, using the following categories:

[7] I) Peruvian Symposium on Restoration of Amazonian, Andean and Coastal Ecosystems, Lima; II) Regional Dry Forest Congress, Tumbes.

[8] Equivalent to 'selva alta' and 'ceja de selva' in Peru.

agroecological services, food (fruits, spices, beverages), timber, medicine, multiple purposes (when it is difficult to identify a single dominant use) and 'other'.

Finally, commercial species included in the list were identified, using criteria such as the inclusion of the species in either the official list of timber species (Serfor 2016) or its inclusion or that of its derived products in the National Classification of Agricultural Products (Minagri 2016).

Introduced species

A different approach was used for exotic species, as most of the sources mentioned above cover only native species. Key exotic species were identified from the results of the IV Agricultural Census (INEI 2012)[9] and the official list of timber species (Serfor 2016). 'Principal species' are defined as those species either listed by Serfor, or recorded by the census as being present in dispersed form in more than 1000 agricultural units or with planted area of >100 ha, in the latter case only in units <50 ha. The National Classification of Agricultural Products (Minagri 2016) was used to confirm the scientific names of the species mentioned in the census, which uses common names.

The list of introduced species is not intended to include all exotic species used in Peruvian agroforestry, but the principal ones, according to the explicit criteria mentioned. It should be noted that one or more of the three criteria mentioned in the case of native species are implicit in the criteria used for introduced species.

Assessment of the state of conservation of genetic resources

Agroforestry species are, by definition, species useful to rural people. Therefore, in a sense, the concept of 'endangered agroforestry species' might seem contradictory: if a taxon is used and valued, then it may not be clear how or why it can be endangered. It is true that many agroforestry species are non-threatened precisely due to their wide use and propagation. However, at least two factors pose threats to the integrity and continued survival of agroforestry species.

First, it is not only the species as such that is of interest and value; indeed, the special concern of the present study is with conservation of genetic resources, with emphasis on the conservation of within-species variation, including that of natural origin as well as landraces and cultivars. Such diversity may be threatened by

[9] Specifically, the tables 'Total Nacional C044' ('Permanent crops, by size of agricultural units, by group, crop and type of agriculture, 2012') and 'Total Nacional C046' ('Fruit trees in dispersed form, by size of agricultural units, by name, number of trees and agricultural units, 2012').

habitat destruction due to land-use change[10] or fragmentation in parts or all of species' ranges, or, in the case of cultigens (*sensu* Spencer and Cross 2007[11]), through displacement of traditional varieties and changes in consumer preferences.

Second, unsustainable harvesting may lead to local extinctions. Useful or valuable species are often unsustainably managed; short-term needs may prevail, or in other cases, the interests of the majority may be overridden by those of local elites, e.g., in the case of precious timber species.

The assessment of conservation status was based on the updated official list of endangered Peruvian plant species (Minagri 2016), supplemented by dendrological guides (Reynel et al. 2003, 2006) and other sources cited below. These sources were also supplemented by assessments based on the authors' own observations and knowledge, as well as comments on the previous publication by Cerrón et al. (2018).

The conservation status of exotic species was not evaluated, because, by definition, they do not have natural populations in the country. However, some aspects related to their genetic diversity are briefly discussed.

Results

Agroforestry species

In total, 238 native or introduced agroforestry species were recorded, representing 59 botanic families.

Native species

A total of 185 native species were recorded in 56 botanic families: 33 species in the Coast, 76 in the Andes, and 96 in the Amazon. The most frequent families were the Fabaceae (39 species), the Asteraceae (14 species) and the Solanaceae (12

[10] Much of the native forest of the Pacific watershed located in the high Andean zone below the altitudinal limit for tree growth is now reduced to small relict areas. Also, although much of Peru's vast Amazon rainforest is intact, some areas, such as the San Martin Region, are heavily deforested, while annual deforestation in the Peruvian Amazon is of the order of 100,000 ha. In the coastal dry forest, deforestation is proportionally greater than in the Amazon.

[11]'A plant whose origin or selection is primarily due to intentional human activity.'

species). The native species are listed by botanic family and scientific name in Appendix A (Table A1)[12]. In Table A2, the species are listed by common name.

Of the dominant uses, the most common was agroecological services (53 species), followed by multiple uses (50), timber (39) and food (31) (Figure 1). In Figure 2, the number of species by use and region are presented. However, the figures hide the versatility of most species. For example, some medicinal use has been reported for more than half of the species.

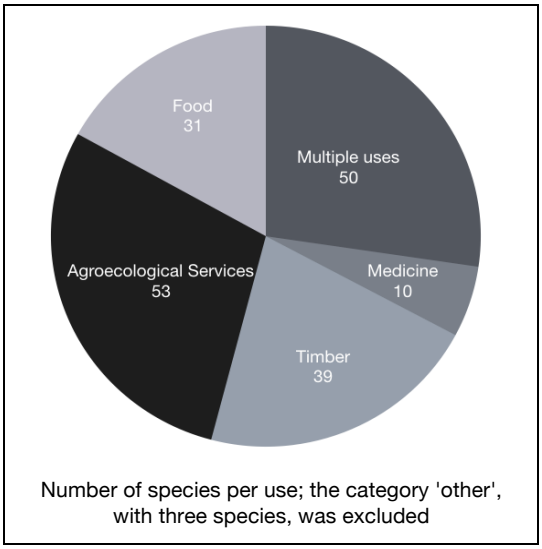


Figure 1. Dominant uses of native Peruvian agroforestry species

Introduced species

Fifty-three exotic species were recorded (Table A3): 45 fruit- or nut-producing species, six timber species (eucalypts and pines) and two agro-industrial species (coffee, oil palm). The 45 edible species include 10 species of the Rosaceae (mainly *Prunus* spp.) and 14 of the Rutaceae, including 13 of the genus *Citrus*. Species native to all continents, except Antarctica, are represented. However, around 75% originate from North America (mostly Mesoamerica) or Asia (Figure 3).

Some of the American exotics were present in Peru before the Spanish invasion and have often been considered native to Peru (e.g., see Brack 2003). The distribution of food and timber species by region is presented in Figure 4.

[12] Numbers do not add up to 185 because some species occur in more than one area.

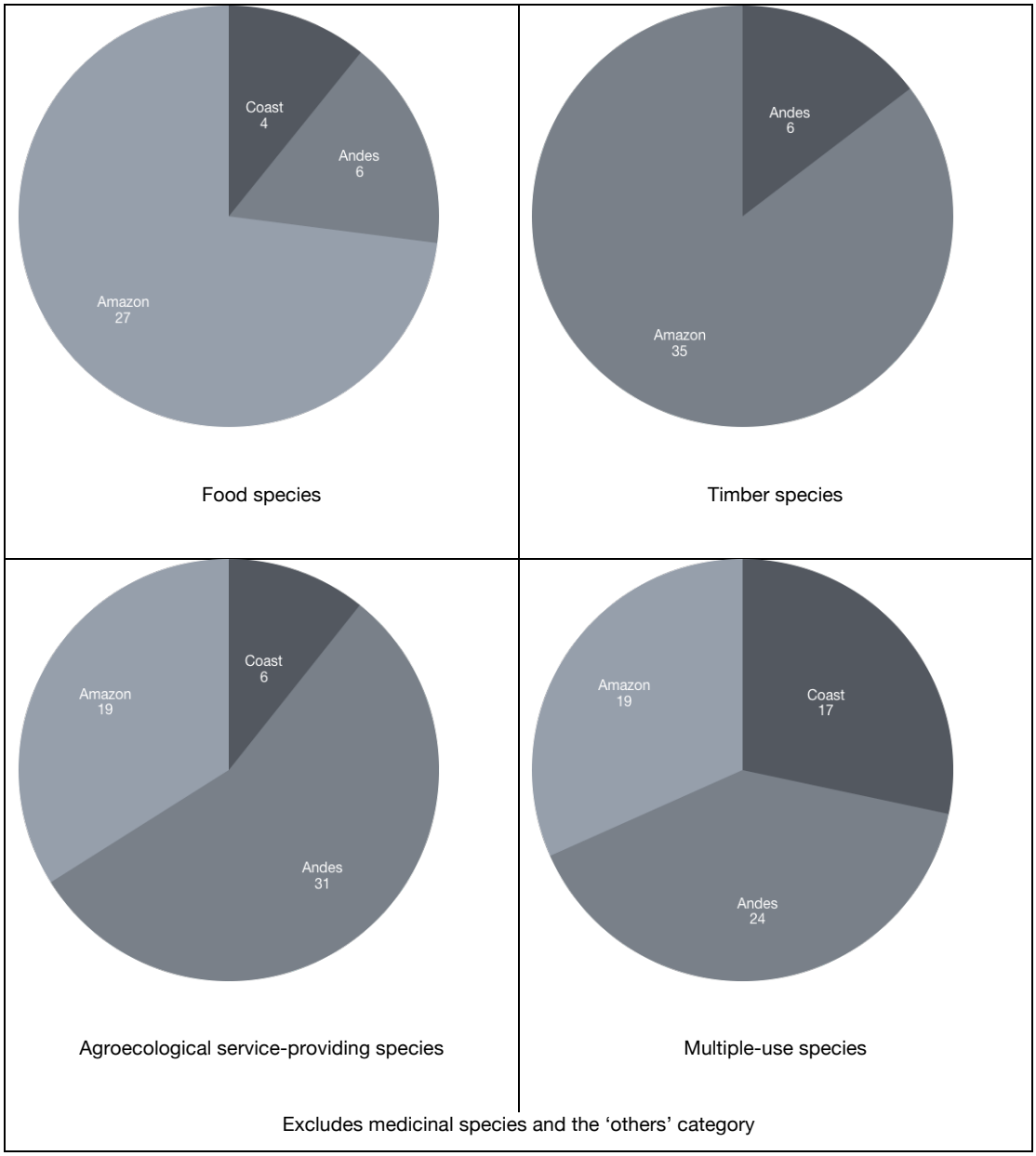
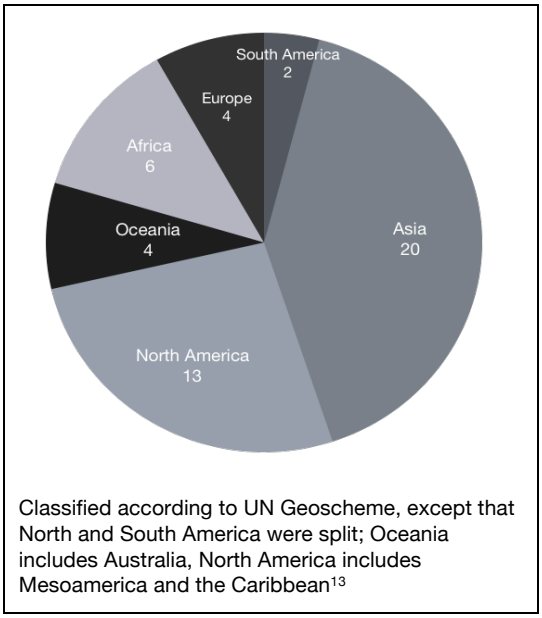


Figure 2. Number of species by dominant use and region



Classified according to UN Geoscheme, except that North and South America were split; Oceania includes Australia, North America includes Mesoamerica and the Caribbean[13]

Figure 3. Origin of introduced species used in Peruvian agroforestry

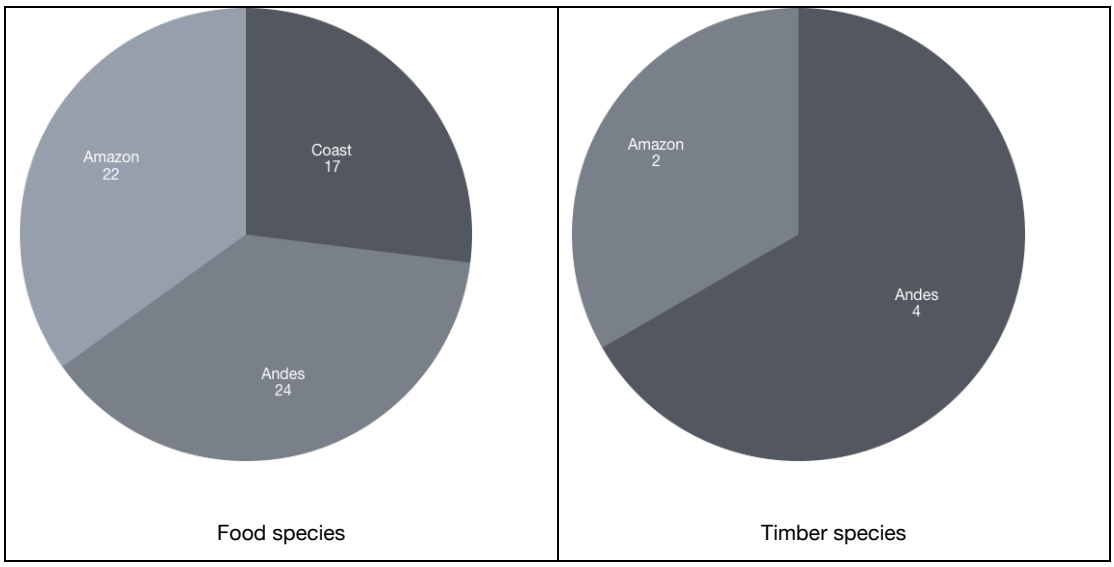


Figure 4. Distribution by Peruvian region of introduced food and timber species

State of conservation of genetic resources

Forty native species were classified as threatened to some degree: eight in the Coast (Table A4), 17 in the Andes (Table A5) and 19 in the Amazon (Table A6[14]).

[13] Totals do not add up to 53 because some species are native to more than one of the UN regions.

[14]The regional totals add up to more than 40 because some species are threatened in more than one region.

Discussion

Native agroforestry species

The listing includes many well-known species from the three regions: species such as moriche palm (*Mauritia flexuosa*), mezquite (*Prosopis pallida* and *P. limensis*), alder (*Alnus acuminata*), mahogany (*Swietenia macrophylla*), Brazil-nut (*Bertholettia excelsa*), ice-cream bean (*Inga edulis*), *lúcuma* (*Pouteria lucuma*), *palo santo* (*Bursera simaruba*), peach palm (*Bactris gasipaes*), elder (*Sambucus peruviana*), rubber (*Hevea brasiliensis*), tara gum (*Tara spinosa*), cat's claw (*Uncaria tomentosa*) and others. All the foregoing species, and more than 50 others, are also listed in the official Peruvian list of timber species or in the Peruvian Classification of Agricultural Products, or in both. These species include those most likely to be selected for agroforestry, reforestation or restoration projects. However, it is also apparent that many important agroforestry species in the lists (115 species, i.e., 72% of the total) are not captured in these two official documents. These species include dozens of agroecological service and multiple-use species. This observation is not a criticism of either document, but rather underlines the limitations imposed by their stated objectives: for example, there is no reason why a species used principally as a living fencepost should be included in either list. However, it also underlines the importance of clarifying objectives before selection of species for agroforestry, revegetation or restoration projects.

Our species inventory eloquently illustrates the diversity of Peruvian agroforestry practice, and how species use is related to social and environmental contexts. The effect of environment on species used is most obviously seen in the numbers and types of native species listed for Coast, Andes and Amazon regions.

The number of species is highest in the Amazon, intermediate in the Andes, and lowest in the Coastal Region. This trend is partly 'supply-driven', as the number of native species of flora is much higher in the Amazon than in the Andes, and higher in the Andes than in the very dry conditions of the coast. The trend is also 'opportunity-driven', as (agro)ecological conditions in the coast, particularly, place stringent limits on the variety of species that can be employed, particularly without irrigation.

A priori, one would expect a higher number of agroforestry species in the Amazon than in the Coast or Andes. Although these overall trends in agroforestry species richness follow expectations, the differences in numbers of species in the three regions are smaller than might be expected on grounds of their respective floristic richness.

In terms of the reported numbers, the relative evenness of species numbers is due to the similarity in numbers of multiple-use and agroecological service trees in the Amazon and the Andes (and, to a smaller extent, in the Coast), whereas the numbers of food and timber trees in the Amazon is an order of magnitude greater than in Andes or Coast. Possibly, this reflects the number of tree species that can feasibly be incorporated into farming practices or used regularly by farming families. Although individual species might not be mentioned frequently enough to be considered important, as a group they fulfil highly significant functions.

In the Amazon, there are hundreds of tree species that might be used in some way by farmers, many of which are intersubstitutable (Sotelo-Montes and Weber 1997). Our methodology has certainly captured a subset of the more common or more commonly used Amazonian species of all types. By contrast, due to lower numbers of species in the Andes and Coast, individual species are more likely to be more universally used and recognized. This implies that although, with our methodology, the numbers of commonly used agroforestry species in Amazon and Andes are relatively similar (in comparison to the respective floristic species richness of the two regions), in the Amazon there is a 'reservoir' of other species that could be used in similar ways.

Introduced agroforestry species

The use in Peruvian agroforestry of many introduced species of importance can be explained by two main factors. First, the large diversity of Peruvian (agro)ecologies, corresponding to niches for exotic species from a wide range of tropical, subtropical and temperate environmental conditions. Second, the obvious utility—for on-farm use and commerce—of all of the species listed (all except eucalypts and pines are domesticates). Many of them are widely distributed in countries throughout the world, and it would be odd if Peru were an exception.

It is not uncommon in neotropical countries, including Peru, to hear criticism of the use of exotic species, i.e., considering the wide diversity of native species available. The criticism of the use of some species in some sites or microsites is well-founded, e.g., the almost automatic use, in reforestation projects and similar, of the 'easy option' of the widely available, well-known eucalyptus or pine species. However, many of the exotic species listed, 85% of which are food species, have unique properties and are not substitutable by other species. Rather, their success in meeting the needs of commerce and subsistence should be taken as justification for wider promotion of promising native species that can be similarly successful. Such promotion would be part of a diversification agenda, rather than one necessarily associated with replacement of widely used exotic species.

Conservation status

Native species

Overall, about 21% of the listed native species are considered to be threatened. The proportions decrease from coast (26%) to Andes (22%) to Amazon (18%), possibly due to differing degrees of habitat loss. Each species listed can be considered to be in danger in at least part of its distribution. Nevertheless, before using the listings as a basis for prioritization of conservation activities, several caveats should be considered.

First, it may be that the inclusion of some species in the official Peruvian listings reflects wide awareness or usefulness of particular species. For example, *palo santo* (*Bursera graveolens*) is an 'iconic' species of Northern Peru, the illegal logging of which has been reported in the Peruvian mass media[15]. However, recent ecological studies in dry forests in Lambayeque found that *B*. *graveolens* was the second most common species in 186 transects[16]. This is not to say that *B*. *graveolens* is not at risk, but rather that other, unlisted, less 'visible' species may be equally or more threatened.

Second, the case of algorrobo (*Prosopis limensis* and *Prosopis pallida*) requires specific mention. Their listing as (critically) endangered probably reflects the current high incidence of the dieback syndrome. Although the existential threat of dieback to populations of algarrobo should be taken seriously, it should be clarified that healthy trees of algarrobo are still abundant in Peruvian coastal regions.

Third, the list of endangered species includes few domesticated species. In some cases (e.g., *Pouteria* spp., *Theobroma* spp.,) were more information available, other species might have been included in the list.

Finally, in all three regions, the lack of information on intraspecific diversity implies that these lists represent minimum estimates of the number of threatened agroforestry species; effectively, there is an implicit assumption that populations are not highly differentiated. This is unlikely to be correct. The consequences of not taking into consideration possible genetic differentiation are likely to be much greater in cases where large parts of the range of a given species or a distinctive

[15] https://elcomercio.pe/peru/piura/piura-autoridades-decomisan-15-toneladas-de-palo-santo-de-procedencia-ilegal-noticia/

[16] Personal communication, Tobias Fremout to Cornelius and Cerrón, 13.19.19

habitat type have been lost. The concern over lack of information on genetic diversity also applies to domesticated species. It seems unlikely that the Pampa Hermosa population of peach palm is the only endangered land race of agroforestry species native to Peru. For example, varieties of *Theobroma bicolor* with very different fruit morphology exist, but we are unaware of any information on their conservation status. A definitive list of agroforestry species whose genetic resources are threatened would require much more information and analysis of both genetic structure and reproductive ecology. Indeed, the lack of information on the status of species, although not in itself indicative of endangerment, can be considered a cause for concern.

Introduced species

As indicated previously, the aim of this publication is not to present information on the genetic status of introduced species. However, a study of the genetic base of introduced species would be of great interest, and could contribute both to avoiding genetic problems (whether due to inbreeding or, for example, to failure to respond to changing climate) and to improve productivity. In fruit species, such a study could characterize the extent and distribution of common grafted varieties and their rootstocks, as well as the genetic diversity and characteristics of any locally developed land races. In the case of timber species, particularly *Eucalyptus*, *Corymbia* and *Pinus* species, better information on the provenance of material currently in use would be beneficial.

Conclusion and recommendations

One hundred and eighty-five woody species native to Peru that meet our criteria for definition as agroforestry species were identified. They include fruit, timber, multiple-purpose, agroecological-service providers and medicinal species from the Coastal, Andean and Amazonian regions. It is proposed that managers and planners of projects that promote agroforestry, reforestation or restoration should be aware of farmers' use of this wide range of species and that, in project design and implementation, should consider systematically which of these species will best meet farmer and project goals.

We have also listed 53 major introduced agroforestry species. We suggest that these too should be systematically considered by project planners and managers, particularly with regard to their income-generating potential. Nevertheless, practitioners should avoid the easy or default option of using easily available exotic species where native species might be more suitable. Our injunction to consider use of introduced species is not an endorsement of the unsustainable practices with

which some species are often associated. Introduced species, as much as native species, can be employed within well-designed agroecological practice.

We have provisionally identified 40 species as candidates for genetic conservation interventions. Among them are four critically endangered species, according to the Minagri classification: *Loxopterygium huasango* (on the Coast), *Bursera graveolens* (Coast and Andes), *Prosopis limense* (Coast) and *Cedrela angustofolia* (Andes and Amazon).

Establishment of seed sources is an effective approach, both to facilitating wider use of Peruvian agroforestry species and to conserving those that are considered threatened. In this sense, conservation status is only one criterion among several of relevance in planning and prioritizing multifunctional *ex situ* conservation and seed production units. Others include local demand for seed and seedlings, cost-effectiveness of interventions, and the existence and condition of already established seed sources. These criteria too should be taken into account in planning interventions.

Based on these considerations and others mentioned in the text, recommendations for action by governmental and non-governmental actors include the following:

Action 1: Establish or consolidate seed sources and/or genebanks of endangered Peruvian agroforestry tree species, particularly the 40 endangered species listed in the current report.

Action 2: Establish or consolidate local seed sources of a wide range of agroforestry species relevant to different localities or agroecologies, and ensure that the status of these under Peruvian seed law and other legal instruments is clear.

Action 3: Further investigate intraspecific genetic diversity of Peruvian wild and domesticated agroforestry species, including its spatial distribution with respect to habitat loss, as a basis for identification of threatened agroforestry genetic resources.

Action 4: Make the listing of Peruvian agroforestry species widely available, in order to promote the use of a range of species that adequately address farmers' needs and opportunities.

Action 5: Investigate, synthesize and publish information on cultivation techniques and benefits, including ecological benefits, of Peruvian agroforestry species.

Action 6: Ensure that key elements of the national environmental and agricultural agenda (e.g., Programa Nacional de Restauración de Ecosistemas y Tierras Degradadas (PNREST), Nationally Determined Contributions (NDCs), Biodiversity

Action Plan) are cognizant of the full range of agroforestry species and their benefits, and that these are reflected in corresponding operational plans.

Action 7: Clarify and make available information on genetic diversity and provenance of major introduced agroforestry species.

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Appendix A: Lists of agroforestry species

Table A1. Native agroforestry species of Peru with dominant uses and principal region(s) of use

Table A2. Native agroforestry species of Peru by common name

Table A3. Agroforestry species introduced to Peru, with main cultivation zone and origin

Table A4. Endangered agroforestry species of the Peruvian Coast

Table A5. Endangered agroforestry species of the Peruvian Andes

Table A6. Endangered agroforestry species of the Peruvian Amazon

Table A1. Native agroforestry species of Peru with dominant uses and principal region(s) of use

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
ANACARDIACEAE				
Haplophorus peruviana Engl.	C'assi, ccashi jassi, **M**		1	
Loxopterygium huasango Spruce ex Engl.[a]	Hualtaco, **U**	1		
Schinus molle L.	Molle, **U**	1	1	
Spondias mombin L.	Ubos, **A**			1
ANNONACEAE				
Annona muricata L.[b]	Guanábano, **A**			1
Guatteria hyposericea Diels [a]	Carahuasca, **U**			1
Rollinia mucosa (Jacq.) Baill.	Anona, nona, **A**			1
APOCYNACEAE				
Cascabela thevetia (L.) Lippold	Trompetilla, **U**			1
Vallesia glabra (Cav.) Link	Cuncun, **U**	1		
AQUIFOLIACEAE				
Ilex guayusa	Guayusa, huayusa, **A**			1
ARALIACEAE				
Oreopanax oroyanus Harms	Aaqui-maqui, **M**		1	
ARECACEAE				
Phytelephas macrocarpa Ruiz & Pav.	Yarina, tagua, marfil vegetal, **U**			1
Astrocaryum murumuru Mart.	Huicungo, chonta, **A**			1
Attalea butyracea (Mutis ex L.f.) Wess.	Shapaja, shebón, **U**			1
Boer*Attalea phalerata* Mart. ex Spreng.	Shapaja, **U**			1
Bactris gasipaes Kunth [b]	Pijuayo, **A**			1
Mauritia flexuosa L. [b]	Aguaje, **A**			1

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
ASTERACEAE				
Ambrosia arborescens Mill.	Malco, marco, **U**	1	1	
Baccharis salicina Torr. & A. Gray	Chilca, chilco macho, **E**	1	1	
Baccharis tricuneata (L.f.) Pers.	Chilca, tayanku, **U**		1	
Barnadesia dombeyana Less.	Yauli, **S**		1	
Barnadesia horrida Muschl.	Yauli, **S**		1	
Barnadesia polyacantha Wedd.	Yauli, **S**		1	
Gynoxis calyculiolvens Hieron.	Japur, japru, **U**		1	
Gynoxys jelskii Hieron.	Japur, **S**		1	
Gynoxys longifolia Sch.Bip. ex Wedd.	Oque-oque, **U**		1	
Gynoxys macfrancisci Cuatrec.	Japur, **S**		1	
Mutisia acuminata Ruiz & Pav.	Chinchilcuma, **S**		1	
Ophryosporus chilca (Kunth) Hieron.	Pilhuish, **S**	1	1	
Tessaria integrifolia Ruiz & Pav.	Pájaro, bobo, huapariu, tseco, **E**	1	1	
Verbesina hastifolia S.F. Blake	Putka, **S**		1	

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
BERBERIDACEAE				
Berberis cliffortioides Diels	Chejche, **S**		1	
Berberis lutea Ruiz & Pav.	Chejche, **S**			1
BETULACEAE				
Alnus acuminata Kunth [a]	Aliso, **M**		1	
BURSERACEAE				
Bursera graveolens (Kunth) Triana & Planch. [a]	Palo santo, **E**	1	1	
BIGNONIACEAE				
Crescentia cujete L.	Huingo, túmumo, **U**	1		1
Handroanthus chrysanthus (Jacq.) S.O. Grose [a]	Tahuarí, **M**			1
Handroanthus ochraceus (Cham.) Mattos [a]	Tahuarí colorado, **M**			1
Handroanthus serratifolius (Vahl) S.O. Grose [a]	Tahuarí amarillo, **M**			1
Jacaranda copaia (Aubl.) D.Don [a]	Huamansamana, **M**			1
Tecoma stans (L.) Juss. ex Kunth	Huaranhuai, **U**			1
BIXACEAE				
Bixa orellana L. [b]	Achiote, **A**	1		1
BORAGINACEAE				
Cordia alliodora (Ruiz & Pav.) Oken [a]	Añayo caspi, chullachaqui, laurel, **M**			1
Cordia iguaguana Melch. ex I.M.Johnst.	Iguaguana, **S**		1	
Cordia lutea Lam.	Sanguarco, chánguano, **S**	1		

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
CALOPHYLLACEAE				
Calophyllum brasiliense Cambess. [a]	Palo asufre, lagarto caspi, **M**			1
CANNABACEAE				
Trema micrantha (L.) Blume	Aadijo, **S**			1
CAPPARACEAE				
Beautempsia avicenniifolia (Kunth) Gaudich.	Vichayo, guayabito de los gentiles, **U**	1		
Colicodendron scabridum (Kunth) Seem.	Sapote**, U**	1	1	
CALCEOLAREACEAE				
Calceolaria linearis Ruiz & Pav.	Zapatito, globito, romero silvestre, **S**		1	
CAPRIFOLIACEAE			1	
Sambucus peruviana Kunth [b]	Sauco, **A**		1	
CARICACEAE				
Vasconcellea candicans (A. Gray) A.DC.	Mito, papaya silvestre, **A**		1	
Vasconcellea pubescens A.DC. [b]	Papayuela, **A**		1	1
CELASTRACEAE				
Maytenus andicola Loes.	Paltay-paltay, **U**			1
COMBRETACEAE				
Terminalia amazonia (J.F.Gmel.) Exell [a]	Yacushapana, **M**			1
Terminalia oblonga (Ruiz & Pav.) Steud. [a]	Yacushapana, **M**			1

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
ERICACEAE				
Cavendishia bracteata (Ruiz & Pav. Ex J. St. Hil.) Hoerold	Manzanilla, **U**		1	
Gaultheria myrsinoides Kunth	Alaywilli, piki piqchana, **U**		1	
ERYTHROXYLACEAE				
Erythroxylum coca Lam. [b]	Coca, **O** (stimulant)		1	1
Erythroxylum novogranatense (D. Morris) Hieron.	Coca, **O** (stimulant)		1	
ESCALLONIACEAE				
Escallonia myrtilloides L.f.	Chachacomo, **U**		1	
Escallonia resinosa (Ruiz & Pav.) Pers.	Chachacomo, **M**		1	
EUPHORBIACEAE				
Caryodendron orinocense H. Karst.	Metahuayo, **A**			1
Croton draconoides Mueller Arg	Sangre de grado, **E**			1
Hevea brasiliensis (Willd. ex A. Juss.) Müll.Arg. [b]	Shiringa, **O** (latex)			1
Sebastiania obtusifolia Pax & K. Hoffm.	Vinagrillo, **S**		1	
FABACEAE				
Acacia loretensis J.F. Macbr. [a]	Pashaco, **M**			1
Albizia multiflora (Kunth) Barneby & J.W. Grimes	Angolo, **S**	1	1	1
Albizia niopoides (Spruce ex Benth.) Burkart [a]	Pashaco amarillo, **S**		1	

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
FABACEAE				
Amburana cearensis (Allemão) A.C. Smith [a]	Ishpingo, **M**			1
Andira inermis (Wright) DC.	Varzea, **M**			1
Caesalpinia paipai Ruiz & Pav.	Charán, **U**	1		
Cedrelinga catenaeformis (Ducke) Ducke [a]	Tornillo, M			1
Dipteryx micrantha Harms [a]	Shihuahuaco, **M**			1
Erythrina edulis Micheli [b]	Pisonay, pajuro, poroto, **U**		1	
Erythrina falcata Benth.	Pisonay, **U**		1	
Erythrina poeppigiana (Walp.) O.F.Cook	Amasisa eritrina, **S**			1
Erythrina ulei Harms	Eritrina, amasisa, pisonay, oropel, **S**			1
Geoffroea spinosa Jacq.	Almendro, **S**	1		
Inga adenophylla Pittier	Pacae, shimbillo, pacae mono, **S**			1
Inga densiflora Benth.	Pacae, **S**			1
Inga edulis Mart. [b]	Guaba, guabilla, pairajo, pacae soga, **S**			1
Inga feuillei DC.	Pacae, **S**	1	1	
Inga oerstediana Benth.	Pacae, guaba, **S**			1
Inga semialata (Vell.) C. Mart.	Pacae, guaba, ajo ajo, **S**			1
Inga spectabilis (Vahl) Willd.	Guaba, pacae machete, **S**			1
Inga thibaudiana DC.	Shimbillo, **S**			1
Inga velutina Willd.	Shimbillo, pacae peludo, **S**			1
Leucaena trichodes (Jacq.) Benth.	Chapra, chamba, **S**		1	

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
FABACEAE				
Machaerium inundatum (Benth.) Ducke [a]	Pashaco, **S**			1
Macrolobium acaciifolium (Benth.) Benth. [a]	Pashaco, **M**			1
Parkinsonia aculeata L.	Uña de gato, palo verde, **E**	1		
Parkinsonia praecox (Ruiz & Pav. Ex Hook. & Arn) Harms	Rompe trapo, **U**	1		
Prosopis juliflora (Sw.) DC.	Algarrobo, **S**		1	
Prosopis limensis Benth.[1]	Huarango, algarrobo, **U**	1		
Prosopis pallida (Willd.) Kunth[1] [a]	Algarrobo, **U**	1		
Schizolobium amazonicum Ducke [a b]	Pino chuncho, pashaco, **M**			1
Senegalia polyphylla (DC.) Britton & Rose	Pashaco, **S**		1	
Senegalia weberbaueri (Harms) Seigler & Ebinger	Atash, **S**		1	
Senna birostris (Vogel) H.S. Irwin & Barneby	Mutuy, pacte, **U**	1	1	
Senna multiglandulosa (Jacq.) H.S.Irwin & Barneby	Mutuy, **S**		1	
Spartium junceum L.	Retama, **S**		1	
Tara spinosa (Molina) Britton & Rose [a b]	Tara, taya, tanino, **U**	1	1	
Vachellia macracantha (Humb. & Bonpl. ex Willd.) Seigler & Ebinger	Espino, faique, **U**	1	1	
FLACOURTIACEAE				
Xylosma tessmannii Sleumer	Huanganam, palupero, christo-casha, **S**			1

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
GROSSULARIACEAE				
Ribes cuneifolium Ruiz & Pav.	Yanacanchi, **S**		1	
Ribes viscosum Cels ex Dum.Cours.	Yanahara, **U**		1	1
HYPERICACEAE				
Vismia baccifera (L.) Planch. & Triana	Pichirina, **S**			1
ICACINACEAE				
Poraqueiba sericea Tul. [b]	Umarí, **A**			1
JUGLANDACEAE				
Juglans neotropica Diels [a b]	Nogal, **M**		1	1
LAMIACEAE				
Vitex pseudolea Rusby	Paliperro, **U**			1
LAURACEAE				
Aniba robusta (Klotzsch & H. Karst. ex Meisn.) Mez [a b]	Moena amarilla, **M**			1
Nectandra reticulata Mez	Laurel, moena, **M**			1
Ocotea cernua (Nees) Mez [a]	Moena, **M**			1
LECYTHIDACEAE				
Bertholletia excelsa Bonpl. [a b]	Castaña, **A**			1
Grias neuberthii J.F.Macbr.	Sachamango, chope, **A**			1
Grias peruviana Miers	Sachamango, **A**			1

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
MALPIGHIACEAE				
Bunchosia armeniaca (Cav.) DC.	Ciruelo de fraile, cansa boca, **A**	1		1
Byrsonima crassifolia (L.) Kunth	Indano, **A**			1
MALVACEAE				
Ceiba lupuna P.E. Gibbs & Semir [a b]	Hiumba blanca, **M**			1
Ceiba pentandra (L.) Gaertn. [a]	Lupuna, huimba, lupuna blanca, **M**			1
Ceiba samauma (Mart. & Zucc.) K. Schum [a]	Huimba, lupuna, huimba negra, **M**			1
Ceiba trischistandra (A.Gray) Bakh.	Ceibo, **U**	1		
Eriotheca ruizii (K.Schum.) A.Robyns	Pasallo, **U**	1		
Guazuma crinita Mart. [a]	Bolaina, bolaina blanca, **M**			1
Guazuma ulmifolia Lam. [a]	Bolaina, bolaina negra, **U**		1	1
MALVACEAE				
Matisia cordata Bonpl. [a]	Sapote, **A**			1
Ochroma pyramidale (Cav. ex Lam.) Urb. [a]	Topa, palo de balsa, **M**			1
Theobroma bicolor Humb. & Bonpl.	Macambo, **A**			1
Theobroma cacao Tussac. [b]	Cacao, cacao silvestre, **A**			1
Theobroma speciosum Willd. ex Spreng.	Cacao sacha, **A**			1
MELASTOMATACEAE				
Brachyotum naudinii Triana	Jaiajsiqui, gauintsaj, **S**		1	

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
	MELIACEAE			
Cabralea canjerana (Vell.) Mart.	Cacharana, cedro macho, cedro masha, requia negra, **M**			1
Carapa guianensis Aubl. [a]	Requia, andiroba, **U**			1
Cedrela angustifolia DC.[1] [a]	Cedro de altura, cedro, **M**		1	1
Cedrela fissilis Vell. [a]	Cedro, **M**			1
Cedrela odorata L. [a]	Cedro, **M**			1
Swietenia macrophylla King [a b]	Caoba, **M**			1
	MORACEAE			
Brosimum alicastrum Sw. [a]	Panguana, manchinga, **U**			1
	MUNTINGIACEAE			
Muntingia calabura L.	Cerezo, **U**			1
	MYRTACEAE			
Eugenia stipitata McVaugh [b]	Arazá, **A**			1
Campomanesia lineatifolia Ruiz & Pav. [b]	Palillo, **A**			1
Myrciaria dubia (Kunth) McVaugh [b]	Camu-camu, **A**			1
	ONAGRACEAE			
Fuchsia abrupta I.M.Johnst.	Ucrush, **S**		1	

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
PODOCARPACEAE				
Podocarpus oleifolius D. Don [a b]	Olivo, saucecillo, ulcumano, **M**			1
Prumnopitys montana (Humb. & Bonpl. ex Willd.) de Laub.	Romerillo hembra, ulcumano, **S**			1
Retrophyllum rospigliosii (Pilg.) C.N. Page [a]	Ulcumano, aserillo, romerillo macho, diablo fuerte, **M**			1
POLEMONIACEAE				
Cantua buxifolia Juss. ex Lam	Cantuta, **U**		1	
POLYGONACEAE				
Monnina salicifolia Ruiz & Pav.	Upraychucro, **S**		1	
RHAMNACEAE				
Colletia spinosissima J.F.Gmel.	Chichi, roque, **S**		1	
Colubrina glandulosa G. Perkins	Shaina, bolaina negra, **M**			1
Scutia spicata (Humb. & Bonpl. Ex Willd.) Weberb.	Negrita, uña de gato, **S**	1		
ROSACEAE				
Hesperomeles cuneata Lindl.	Caputo, **U**		1	
Hesperomeles lanuginosa Ruiz & Pav. ex Hook. [a]	Manzanito, mayu, **S**			1
Polylepis incana Kunth [a]	Quinual, yagual, quinual, **U**		1	
Polylepis racemosa Ruiz & Pav. [a]	Quinual, **U**		1	
Rubus praecox Bertol.	Zarzamora, **S**		1	

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
RUBIACEAE				
Calycophyllum spruceanum (Benth.) Hook.f. ex K. Schum. [a b]	Capirona, capirona negra, **M**			1
Genipa americana L.	Huito, **U**			1
Uncaria guianensis (Aubl.) J.F.Gmel.	Uña de gato, **E**			1
Uncaria tomentosa (Willd. ex Schult.) DC. [b]	Uña de gato, **E**			1
RUTACEAE				
Zanthoxylum riedelianum Engl.	Hualajita, hualaja, **U**			1
SALICACEAE				
Salix humboldtiana Willd. [a]	Sauce, **U**	1	1	1
SAPINDACEAE				
Dodonaea viscosa (L.) Jacq.	Chamana, **U**			1
Sapindus saponaria L.	Tingana, **M**			1
SAPOTACEAE				
Pouteria caimito (Ruiz & Pav.) Radlk. [a b]	Caimito, **A**			1
Pouteria lucuma (Ruiz & Pav.) Kuntze [b]	Lúcumo, **A**	1	1	1
SIMAROUBACEAE				
Simarouba amara Aubl. [a]	Marupa, cedro blanco, **M**			1

Table A1 Native agroforestry species of Peru with dominant uses and principal region(s) of use (continued)

Species and Family ([a]in official list of commercial timber spp, [b]in National Classification of Agricultural Products)	**Common name(s) and dominant use** (A=food, E=medicinal, M=timber, S=agroecological services, U=multiple, O=other)	**Region(s) of use**		
		Coast	**Andes**	**Amazon**
SCROPHULARIACEAE				
Buddleja coriacea Remy [a]	Colle, culli, orco-quishuar, puna-quishuar, **U**		1	
Buddleja incana Ruiz & Pav. [a]	Quishuar, quishuara, **U**		1	
Buddleja longifolia Kunth	Quisuar, **U**		1	
SOLANACEAE				
Acnistus arborescens (L.) Schltdl.	Tuple, macapaqui, toque, **U**			1
Brugmansia × *candida* Pers.	Floripondio blanco, **E**	1	1	1
Brugmansia sanguinea (Ruiz & Pav.) D.Don	Floripondio rojo, **E**		1	1
Brugmansia suaveolens (Humb. & Bonpl. ex Willd.) Bercht. & J. Presl	Toé, **E**			1
Cestrum auriculatum L'Hér.	Yerbasanta, **S**		1	
Cestrum conglomeratum Ruiz & Pav.	Yerbasanta, **U**		1	
Dunalia spinosa (Meyen) Dammer	Tantar, **S**		1	
Grabowskia boerhaviifolia (L.f.) Schltdl.	Canutillo, palo negro, negrillo, **S**	1		
Lycianthes lycioides (L.) Hassl.	Tantar, **S**		1	
Solanum betaceum Cav. [b]	Tomate de árbol, sacha tomate, **A**		1	
Solanum muricatum Aiton [b]	Pepino dulce, **A**	1	1	
Solanum nitidum Ruiz & Pav.	Arete chilpe, **S**		1	1
Solanum sessiliflorum Dunal [b]	Cocona, **A**			1
URTICACEAE				
Pourouma cecropiifolia Mart.	Uvilla, **A**			1

Table A2. Native agroforestry species of Peru by common name

Common name	Scientific name	Family
Atadijo	*Trema micrantha* (L.) Blume	CANNABACEAE
Aaqui-maqui	*Oreopanax oroyanus* Harms	ARALIACEAE
Achiote	*Bixa orellana* L.	BIXACEAE
Aguaje	*Mauritia flexuosa* L.	ARECACEAE
Ajo ajo	*Inga semialata* (Vell.) C. Mart.	FABACEAE
Alaywilli	*Gaultheria myrsinoides* Kunth	ERICACEAE
Algarrobo	*Prosopis juliflora* (Sw.) DC.	FABACEAE
Algarrobo	*Prosopis pallida* (Willd.) Kunth	FABACEAE
Algarrobo	*Prosopis limensis* Benth.	FABACEAE
Aliso	*Alnus acuminata* Kunth	BETULACEAE
Almendro	*Geoffroea spinosa* Jacq.	FABACEAE
Amasisa	*Erythrina poeppigiana* (Walp.) O.F.Cook	FABACEAE
Amasisa	*Erythrina ulei* Harms	FABACEAE
Andiroba	*Carapa guianensis* Aubl.	MELIACEAE
Angolo	*Albizia multiflora* (Kunth) Barneby & J.W. Grimes	FABACEAE
Anona	*Rollinia mucosa* (Jacq.) Baill.	ANNONACEAE
Añayo caspi	*Cordia alliodora* (Ruiz & Pav.) Oken	BORAGINACEAE
Arazá	*Eugenia stipitata* McVaugh	MYRTACEAE
Arete	*Solanum nitidum* Ruiz & Pav.	SOLANACEAE
Aserillo	*Retrophyllum rospigliosii* (Pilg.) C.N. Page	PODOCARPACEAE
Atash	*Senegalia weberbaueri (Harms) Seigler & Ebinger*	FABACEAE
Bolaina	*Guazuma crinita* Mart., *Guazuma ulmifolia* Lam.	MALVACEAE
Bolaina blanca	*Guazuma crinita* Mart.	MALVACEAE
Bolaina negra	*Guazuma ulmifolia* Lam.	MALVACEAE
	Colubrina glandulosa G. Perkins	RHAMNACEAE
C'assi	*Haplophorus peruviana* Engl.	ANACARDIACEAE
Cacao	*Theobroma cacao* Tussac.	MALVACEAE
Cacao sacha	*Theobroma speciosum* Willd. ex Spreng.	MALVACEAE
Cacao silvestre		MALVACEAE
Cacharana	*Cabralea canjerana* (Vell.) Mart.	MELIACEAE
Caimito	*Pouteria caimito* (Ruiz & Pav.) Radlk.	SAPOTACEAE
Camu camu	*Myrciaria dubia* (Kunth) McVaugh	MYRTACEAE
Cansa boca	*Bunchosia armeniaca* (Cav.) DC.	MALPIGHIACEAE
Cantuta	*Cantua buxifolia* Juss. ex Lam	POLEMONIACEAE
Canutillo	*Grabowskia boerhaviifolia* (L.f.) Schltdl.	SOLANACEAE
Caoba	*Swietenia macrophylla* King	MELIACEAE
Capirona	*Calycophyllum spruceanum* (Benth.) Hook.f. ex K. Schum.	RUBIACEAE
Capirona negra		RUBIACEAE
Carahuasca	*Guatteria hyposericea* Diels	ANNONACEAE
Castaña	*Bertholletia excelsa* Bonpl.	LECYTHIDACEAE

Table A2. Native agroforestry species of Peru by common name (continued)

Common name	Scientific name	Family
Ccashi	*Haplophorus peruviana* Engl.	ANACARDIACEAE
Cedro	*Cedrela angustifolia* DC., *Cedrela fissilis* Vell., *Cedrela odorata* L.	MELIACEAE
Cedro blanco	*Simarouba amara* Aubl.	SIMAROUBACEAE
Cedro de altura	*Cedrela angustifolia* DC.	MELIACEAE
Cedro macho	*Cabralea canjerana* (Vell.) Mart.	MELIACEAE
Cedro masha		MELIACEAE
Ceibo	*Ceiba trischistandra* (A.Gray) Bakh.	MALVACEAE
Cerezo	*Muntingia calabura* L.	MUNTINGIACEAE
Chachacomo	*Escallonia resinosa* (Ruiz & Pav.) Pers., *Escallonia myrtilloides* L.f.	ESCALLONIACEAE
Chamana	*Dodonaea viscosa* (L.) Jacq.	SAPINDACEAE
Chamba	*Leucaena trichodes* (Jacq.) Benth.	FABACEAE
Chánguano	*Cordia lutea* Lam.	BORAGINACEAE
Chapra	*Leucaena trichodes* (Jacq.) Benth.	FABACEAE
Charán	*Caesalpinia paipai* Ruiz & Pav.	FABACEAE
Chejche	*Berberis cliffortioides* Diels, *Berberis lutea* Ruiz & Pav.	BERBERIDACEAE
Chichi	*Colletia spinosissima* J.F.Gmel.	RHAMNACEAE
Chilca	*Baccharis salicina* Torr. & A. Gray, *Baccharis tricuneata* (L.f.) Pers.	ASTERACEAE
Chilco macho	*Baccharis salicina* Torr. & A. Gray	ASTERACEAE
Chilpe	*Solanum nitidum* Ruiz & Pav.	SOLANACEAE
Chinchilcuma	*Mutisia acuminata* Ruiz & Pav.	ASTERACEAE
Chonta	*Astrocaryum murumuru* Mart.	ARECACEAE
Chope	*Grias neuberthii* J.F.Macbr.	LECYTHIDACEAE
Christo-casha	*Xylosma tessmannii* Sleumer	FLACOURTIACEAE
Chullachaqui	*Cordia alliodora* (Ruiz & Pav.) Oken	BORAGINACEAE
Ciruelo de fraile	*Bunchosia armeniaca* (Cav.) DC.	MALPIGHIACEAE
Coca	*Erythroxylum coca* Lam., *Erythroxylum novogranatense* (D. Morris) Hieron.	ERYTHROXYLACEAE
Cocona	*Solanum sessiliflorum Dunal*	SOLANACEAE
Colle	*Buddleja coriacea* Remy	SCROPHULARIACEAE
Culli	*Buddleja coriacea* Remy	SCROPHULARIACEAE
Cuncun	*Vallesia glabra* (Cav.) Link	APOCYNACEAE
Diablo fuerte	*Retrophyllum rospigliosii* (Pilg.) C.N. Page	PODOCARPACEAE
Eritrina	*Erythrina poeppigiana* (Walp.) O.F.Cook, *Erythrina ulei* Harms	FABACEAE
Espino	*Vachellia macracantha (Humb. & Bonpl. ex Willd.) Seigler & Ebinger*	FABACEAE
Faique	*Vachellia macracantha (Humb. & Bonpl. ex Willd.) Seigler & Ebinger*	FABACEAE
Floripondio blanco	*Brugmansia × candida Pers.*	SOLANACEAE

Table A2. Native agroforestry species of Peru by common name (continued)

Common name	Scientific name	Family
Floripondio rojo	*Brugmansia sanguinea (Ruiz & Pav.) D.Don*	SOLANACEAE
Gauintsaj	*Brachyotum naudinii* Triana	MELASTOMATACEAE
Globito	*Calceolaria linearis* Ruiz & Pav.	CALCEOLAREACEAE
Guaba	*Inga edulis* Mart., *Inga semialata* (Vell.) C. Mart., *Inga spectabilis* (Vahl) Willd.	FABACEAE
Guabilla	*Inga edulis* Mart.	FABACEAE
Guanábano	*Annona muricata* L.	ANNONACEAE
Guayabito de los gentiles	*Beautempsia avicenniifolia* (Kunth) Gaudich.	CAPPARACEAE
Guayusa	*Ilex guayusa*	AQUIFOLIACEAE
Hiumba blanca	*Ceiba lupuna* P.E. Gibbs & Semir	MALVACEAE
Hualaja	*Zanthoxylum riedelianum* Engl.	RUTACEAE
Hualajita	*Zanthoxylum riedelianum* Engl.	RUTACEAE
Hualtaco	*Loxopterygium huasango* Spruce ex Engl.	ANACARDIACEAE
Huamansamana	*Jacaranda copaia* (Aubl.) D.Don	BIGNONIACEAE
Huanganam palupero	*Xylosma tessmannii* Sleumer	FLACOURTIACEAE
Huapariu	*Tessaria integrifolia* Ruiz & Pav.	ASTERACEAE
Huarango	*Prosopis limensis* Benth.	FABACEAE
Huaranhuai	*Tecoma stans* (L.) Juss. ex Kunth	BIGNONIACEAE
Huayusa	*Ilex guayusa*	AQUIFOLIACEAE
Huicungo	*Astrocaryum murumuru* Mart.	ARECACEAE
Huilca	*Anadenanthera colubrina (Vell.) Brenan*	FABACEAE
Huimba	*Ceiba pentandra* (L.) Gaertn., *Ceiba samauma* (Mart. & Zucc.) K. Schum	MALVACEAE
Huimba negra	*Ceiba samauma* (Mart. & Zucc.) K. Schum	MALVACEAE
Huingo	*Crescentia cujete* L.	BIGNONIACEAE
Huito	*Genipa americana* L.	RUBIACEAE
Iguaguana	*Cordia iguaguana* Melch. ex I.M.Johnst.	BORAGINACEAE
Indano	*Byrsonima crassifolia* (L.) Kunth	MALPIGHIACEAE
Ishpingo	*Amburana cearensis* (Allemão) A.C. Smith	FABACEAE
Jaiajsiqui	*Brachyotum naudinii* Triana	MELASTOMATACEAE
Japru	*Gynoxis calyculiolvens* Hieron.	ASTERACEAE
Japur	*Gynoxis calyculiolvens* Hieron., *Gynoxys jelskii* Hieron., *Gynoxys macfrancisci* Cuatrec	ASTERACEAE
Jassi	*Haplophorus peruviana Engl.*	ANACARDIACEAE
Lagarto caspi	*Calophyllum brasiliense Cambess.*	CALOPHYLLACEAE
Laurel	*Cordia alliodora (Ruiz & Pav.) Oken*	BORAGINACEAE
	Nectandra reticulata Mez	LAURACEAE

Table A2. Native agroforestry species of Peru by common name (continued)

Common name	Scientific name	Family
Lupuna	*Ceiba pentandra* (L.) Gaertn, *Ceiba samauma* (Mart. & Zucc.) K. Schum	MALVACEAE
Lupuna blanca	*Ceiba pentandra* (L.) Gaertn.	MALVACEAE
Macambo	*Theobroma bicolor* Humb. & Bonpl.	MALVACEAE
Macapaqui	*Acnistus arborescens* (L.) Schltdl.	SOLANACEAE
Malco	*Ambrosia arborescens* Mill.	ASTERACEAE
Manchinga	*Brosimum alicastrum* Sw.	MORACEAE
Manzanilla	*Cavendishia bracteata* (Ruiz & Pav. Ex J. St. Hil.) Hoerold	ERICACEAE
Manzanito	*Hesperomeles lanuginosa* Ruiz & Pav. ex Hook.	ROSACEAE
Marco	*Ambrosia arborescens* Mill.	ASTERACEAE
Marfil vegetal	*Phytelephas macrocarpa* Ruiz & Pav.	ARECACEAE
Marupá	*Simarouba amara* Aubl.	SIMAROUBACEAE
Mayu	*Hesperomeles lanuginosa* Ruiz & Pav. ex Hook.	ROSACEAE
Metahuayo	*Caryodendron orinocense* H. Karst.	EUPHORBIACEAE
Mito	*Vasconcellea candicans* (A. Gray) A.DC.	CARICACEAE
Moena	*Nectandra reticulata* Mez, *Ocotea cernua* (Nees) Mez	LAURACEAE
Moena amarilla	*Aniba robusta* (Klotzsch & H. Karst. ex Meisn.) Mez	LAURACEAE
Molle	*Schinus molle* L.	ANACARDIACEAE
Mutuy	*Senna birostris* (Vogel) H.S. Irwin & Barneby, *Senna multiglandulosa* (Jacq.) H.S.Irwin & Barneby	FABACEAE
Negrillo	*Grabowskia boerhaviifolia* (L.f.) Schltdl.	SOLANACEAE
Negrita	*Scutia spicata* (Humb. & Bonpl. Ex Willd.) Weberb.	RHAMNACEAE
Nogal	*Juglans neotropica* Diels	JUGLANDACEAE
Nona	*Rollinia mucosa* (Jacq.) Baill.	ANNONACEAE
Olivo	*Podocarpus oleifolius* D. Don	PODOCARPACEAE
Oque-oque	*Gynoxys longifolia* Sch.Bip. ex Wedd.	ASTERACEAE
Orco-quishuar	*Buddleja coriacea* Remy	SCROPHULARIACEAE
Oropel	*Erythrina ulei* Harms	FABACEAE
Pacae	*Inga adenophylla* Pittier, *Inga densiflora* Benth., *Inga feuillei* DC. *Inga oerstediana* Benth. *Inga semialata* (Vell.) C. Mart.	FABACEAE
Pacae machete	*Inga spectabilis* (Vahl) Willd.	FABACEAE
Pacae mono	*Inga adenophylla* Pittier	FABACEAE
Pacae peludo	*Inga velutina* Willd.	FABACEAE
Pacae soga	*Inga edulis* Mart.	FABACEAE
Pacte	*Senna birostris* (Vogel) H.S. Irwin & Barneby	FABACEAE
Pairajo	*Inga edulis* Mart.	FABACEAE

Table A2. Native agroforestry species of Peru by common name (continued)

Common name	Scientific name	Family
Pájaro bobo	*Tessaria integrifolia* Ruiz & Pav.	ASTERACEAE
Pajuro	*Erythrina edulis* Micheli	FABACEAE
Palillo	*Campomanesia lineatifolia* Ruiz & Pav.	MYRTACEAE
Paliperro	*Vitex pseudolea* Rusby	LAMIACEAE
Palo asufre	*Calophyllum brasiliense* Cambess.	CALOPHYLLACEAE
Palo balsa	*Ochroma pyramidale* (Cav. ex Lam.) Urb.	MALVACEAE
Palo negro	*Grabowskia boerhaviifolia* (L.f.) Schltdl.	SOLANACEAE
Palo santo	*Bursera graveolens* (Kunth) Triana & Planch.	BURSERACEAE
Palo verde	*Parkinsonia aculeata* L.	FABACEAE
Paltay-paltay	*Maytenus andicola* Loes.	CELASTRACEAE
Panguana	*Brosimum alicastrum* Sw.	MORACEAE
Papaya silvestre	*Vasconcellea candicans* (A. Gray) A.DC.	CARICACEAE
Papayuela	*Vasconcellea pubescens* A.DC.	CARICACEAE
Pasallo	*Eriotheca ruizii* (K.Schum.) A.Robyns	MALVACEAE
Pashaco	*Acacia loretensis* J.F. Macbr., *Machaerium inundatum* (Benth.) Ducke, *Macrolobium acaciifolium* (Benth.) Benth., *Schizolobium amazonicum* Ducke, *Senegalia polyphylla* (DC.) Britton & Rose	FABACEAE
Pashaco amarillo	*Albizia niopoides* (Spruce ex Benth.) Burkart	FABACEAE
Pepino dulce	*Solanum muricatum* Aiton	SOLANACEAE
Pichirina	*Vismia baccifera* (L.) Planch. & Triana	HYPERICACEAE
Pijuayo	*Bactris gasipaes* Kunth	ARECACEAE
Piki piqchana	*Gaultheria myrsinoides* Kunth	ERICACEAE
Pilhuish	*Ophryosporus chilca* (Kunth) Hieron.	ASTERACEAE
Pino chuncho	*Schizolobium amazonicum* Ducke	FABACEAE
Pisonay	*Erythrina edulis* Micheli, *Erythrina falcata* Benth., *Erythrina ulei* Harms	FABACEAE
Poroto	*Erythrina edulis Micheli*	FABACEAE
Puna-quishuar	*Buddleja coriacea Remy*	SCROPHULARIACEAE
Putka	*Verbesina hastifolia S.F. Blake*	ASTERACEAE
Quinual	*Polylepis racemosa Ruiz & Pav.*	ROSACEAE
Quishuar	*Buddleja incana Ruiz & Pav.*	SCROPHULARIACEAE
Quishuara	*Buddleja incana Ruiz & Pav.*	SCROPHULARIACEAE
Quisuar	*Buddleja longifolia Kunth*	SCROPHULARIACEAE
Requia	*Carapa guianensis Aubl.*	MELIACEAE
Requia negra	*Cabralea canjerana (Vell.) Mart.*	MELIACEAE

Table A2. Native agroforestry species of Peru by common name (continued)

Common name	Scientific name	Family
Retama	*Spartium junceum* L.	FABACEAE
Romerillo hembra	*Prumnopitys montana* (Humb. & Bonpl. ex Willd.) de Laub.	PODOCARPACEAE
Romerillo macho	*Retrophyllum rospigliosii* (Pilg.) C.N. Page	PODOCARPACEAE
Romero silvestre	*Calceolaria linearis* Ruiz & Pav.	CALCEOLAREACEAE
Rompe trapo	*Parkinsonia praecox* (Ruiz & Pav. Ex Hook. & Arn) Harms	FABACEAE
Roque	*Colletia spinosissima* J.F.Gmel.	RHAMNACEAE
Sacha tomate	*Solanum betaceum* Cav.	SOLANACEAE
Sachamango	*Grias neuberthii* J.F.Macbr., *Grias peruviana Miers*	LECYTHIDACEAE
Sangre de grado	*Croton draconoides* Mueller Arg	EUPHORBIACEAE
Sanguarco	*Cordia lutea* Lam.	BORAGINACEAE
	Colicodendron scabridum (Kunth) Seem.	CAPPARACEAE
Sapote	*Matisia cordata* Bonpl.	MALVACEAE
Sauce	*Salix humboldtiana* Willd.	SALICACEAE
Saucecillo	*Podocarpus oleifolius* D. Don	PODOCARPACEAE
Sauco	*Sambucus peruviana* Kunth	CAPRIFOLIACEAE
Shaina	*Colubrina glandulosa* G. Perkins	RHAMNACEAE
Shapaja	*Attalea butyracea* (Mutis ex L.f.) Wess. Boer, *Attalea phalerata* Mart. ex Spreng.	ARECACEAE
Shebón	*Attalea butyracea* (Mutis ex L.f.) Wess.Boer	ARECACEAE
Shihuahuaco	*Dipteryx micrantha* Harms	FABACEAE
Shimbillo	*Inga adenophylla* Pittier, *Inga thibaudiana* DC., *Inga velutina* Willd.	FABACEAE
Shiringa	*Hevea brasiliensis* (Willd. ex A. Juss.) Müll.Arg.	EUPHORBIACEAE
Tagua	*Phytelephas macrocarpa* Ruiz & Pav.	ARECACEAE
Tahuarí	*Handroanthus chrysanthus* (Jacq.) S.O. Grose	BIGNONIACEAE
Tahuarí amarillo	*Handroanthus serratifolius* (Vahl) S.O. Grose [a]	BIGNONIACEAE
Tahuarí colorado	*Handroanthus ochraceus (Cham.) Mattos*	BIGNONIACEAE
Tanino	*Tara spinosa (Molina) Britton & Rose*	FABACEAE
Tantar	*Dunalia spinosa (Meyen) Dammer, Lycianthes lycioides (L.) Hassl.*	SOLANACEAE
Tara	*Tara spinosa (Molina) Britton & Rose*	FABACEAE
Taya	*Tara spinosa (Molina) Britton & Rose*	FABACEAE
Tayanku	*Baccharis tricuneata (L.f.) Pers.*	ASTERACEAE
Tingana	*Sapindus saponaria L.*	SAPINDACEAE
Toé	*Brugmansia suaveolens (Humb. & Bonpl. ex Willd.) Bercht. & J. Presl*	SOLANACEAE

Table A2. Native agroforestry species of Peru by common name (continued)

Common name	Scientific name	Family
Tomate de árbol	*Solanum betaceum* Cav.	SOLANACEAE
Topa	*Ochroma pyramidale* (Cav. ex Lam.) Urb.	MALVACEAE
Toque	*Acnistus arborescens* (L.) Schltdl.	SOLANACEAE
Tornillo	*Cedrelinga catenaeformis* (Ducke) Ducke	FABACEAE
Trompetilla	*Cascabela thevetia* (L.) Lippold	APOCYNACEAE
Tseco	*Tessaria integrifolia* Ruiz & Pav.	ASTERACEAE
Tuple	*Acnistus arborescens* (L.) Schltdl.	SOLANACEAE
Tútumo	*Crescentia cujete* L.	BIGNONIACEAE
Ubos	*Spondias mombin* L.	ANACARDIACEAE
Ucrush	*Fuchsia abrupta* I.M.Johnst.	ONAGRACEAE
Ulcumano	*Podocarpus oleifolius* D. Don	PODOCARPACEAE
Ulcumano	*Prumnopitys montana* (Humb. & Bonpl. ex Willd.) de Laub.	PODOCARPACEAE
Ulcumano	*Retrophyllum rospigliosii* (Pilg.) C.N. Page	PODOCARPACEAE
Umarí	*Poraqueiba sericea* Tul.	ICACINACEAE
Uña de gato	*Scutia spicata* (Humb. & Bonpl. Ex Willd.) Weberb.	RHAMNACEAE
	Parkinsonia aculeata L.	FABACEAE
	Uncaria guianensis (Aubl.) J.F.Gmel., *Uncaria tomentosa* (Willd. ex Schult.) DC.	RUBIACEAE
Upraychucro	*Monnina salicifolia* Ruiz & Pav.	POLYGONACEAE
Uvilla	*Pourouma cecropiifolia* Mart.	URTICACEAE
Varzea	*Andira inermis* (Wright) DC.	FABACEAE
Vichayo	*Beautempsia avicenniifolia* (Kunth) Gaudich.	CAPPARACEAE
Vilca	*Anadenanthera colubrina (Vell.) Brenan*	FABACEAE
Vinagrillo	*Sebastiania obtusifolia* Pax & K. Hoffm.	EUPHORBIACEAE
Willka	*Anadenanthera colubrina (Vell.) Brenan*	FABACEAE
Yacushapana	*Terminalia amazonia (J.F.Gmel.) Exell, Terminalia oblonga (Ruiz & Pav.) Steud.*	COMBRETACEAE
Yagual	*Polylepis incana Kunth*	ROSACEAE
Yanacanchi	*Ribes cuneifolium Ruiz & Pav.*	GROSSULARIACEAE
Yanahara	*Ribes viscosum Cels ex Dum.Cours.*	GROSSULARIACEAE
Yarina	*Phytelephas macrocarpa Ruiz & Pav.*	ARECACEAE
Yauli	*Barnadesia dombeyana Less., Barnadesia horrida Muschl., Barnadesia polyacantha Wedd.*	ASTERACEAE
Yerbasanta	*Cestrum auriculatum L'Hér., Cestrum conglomeratum Ruiz & Pav.*	SOLANACEAE
Zapatito	*Calceolaria linearis Ruiz & Pav.*	CALCEOLAREACEAE
Zarzamora	*Rubus praecox Bertol.*	ROSACEAE

Table A3. Agroforestry species introduced to Peru, with main cultivation zone and origin

Species and Botanic Family	Common name*	Zone(s) of cultivation	Origin
ANACARDIACEAE			
Anacardium occidentale L.	Marañon (cashew)	Amazon	Central Brazil (Miller y Gross, 2011)
Mangifera indica L.	Mango (mango)	Coast, Andes, Amazon	South Asia
Spondias dulcis Parkinson	Taberibá (ambarella, June plum(	Amazon	Southeast Asia (Malesia)
Spondias purpurea	Ciruelo (purple mombin)	Coast	Mesoamerica (Miller y Schaal 2005)
ANNONACEAE			
Annona squamosa L.	Anona (sweetsop)	Amazon	Central America (Larranaga et al. 2018)
Annona cherimola Mill.	Chirimoya (cherimoya)	Coast, Andes	Central America (Larranaga et al. 2017)
ARECACEAE			
Cocos nucifera L.	Coco (coconut)	Coast, Andes, Amazon	Indian and Pacific Oceans (Gunn, Badouin and Olsen 2011)
Elaeis guineensis Jacq.	Palma aceitera (oil palm)	Amazon	West Africa
Phoenix dactylifera L.	Palma datilera (date palm)	Coast	Middle East
CALOPHYLLACEAE			
Mammea americana L.	Mamey (mammee apple)	Coast	Caribbean (Smith et al. 1992)
CARICACEAE			
Carica papaya L.	Papaya (papaya, paw-paw)	Coast, Andes, Amazon	Mesoamerica (Chávez-Pesqueira and Núñez-Farfán, 2017)
FABACEAE			
Tamarindus indica L.	Tamarindo (tamarind)	Coast, Andes, Amazon	Africa
JUGLANDACEAE			
Carya illinoinensis (Wangenh.) K.Koch	Pecano (pecan)	Coast	North America (Mexico and southern USA)
LAURACEAE			
Persea americana Mill.	Palta (avocado)	Coast, Andes, Amazon	Mesoamerica (Chen et al. 2008)

*English common name in parentheses

Table A3. Agroforestry species introduced to Peru, with main cultivation zone and origin (continued)

Species and Botanic Family	Common name*	Zone(s) of cultivation	Origin
MALVACEAE			
Theobroma grandiflorum (Willd. Ex Spreng.) K.Schum.	Copoazu	Amazon	Eastern Brazilian Amazon (Smith et al, 1992)
MORACEAE			
Artocarpus altilis (Parkinson) Fosberg	Árbol de pan (breadfruit)	Amazon	Southeast Asia
Ficus carica L.	Higuera (fig)	Coast	Middle East and Western Asia
MYRTACEAE			
Corymbia citriodora (Hook.) K.D.Hill & L.A.S.Johnson	Eucalipto (lemon-scented gum	Amazon	Tropics and subtropics of Eastern Australia
Eucalyptus camaldulensis Dehnh.	River red gum), Tasmanian blue gum,	Coast, Andes	Australia (continent-wide)
Eucalyptus globulus Labill.		Andes	Southern Australia
Eucalyptus viminalis Labill.	Manna gum	Andes	Southern Australia
Psidium guajava L.	Guayaba (guava)	Coast, Andes, Amazon	Central America (Sitther et al. 2014)
Syzygium jambos (L.) Alston	Pomarrosa (rose apple)	Amazon	Southeast Asia
OLEACEAE			
Olea europea L.	Aceituno (olive)	Coast	Mediterranean basin (Miller y Gross 2011)
OXILADACEAE			
Averrhoa carambola L.	Carambola (star-fruit)	Amazon	Southeast Asia (Miller y Gross 2011)
PINACEAE			
Pinus radiata D.Don	Pino (Monterrey pine)	Andes	California
Pinus tecunumanii F.Schwerdtf. ex Eguiluz & JP Perry	Pino (Tecunuman pine, tecunumanii)	Amazon	Mesoamerica

*English common name in parentheses

Table A3. Agroforestry species introduced to Peru, with main cultivation zone and origin (continued)

Species and Botanic Family	Common name*	Zone(s) of cultivation	Origin
ROSACEAE			
Cydonia oblonga Mill.	Membrillo (quince)	Andes	Central and western Asia
Malus domestica Borkh.	Manzano (Apple)	Andes	Central Asia
Prunus armeniaca L.	Albaricoque (apricot)	Andes	Northeast China
Prunus serotina Ehrh.	Capulí (black cherry)	Andes	Mexico (Reynel et al. 2007)
Prunus avium (L.) L.	Cerezo (cherry)	Andes	Europe, North Africa
Prunus insititia L.	Damasco (damson)	Andes	Southeastern Europe
Prunus cerasus L.	Guinda (sour cherry)	Andes	Eastern Europe, western Asia
Prunus persica (L.) Batsch	Melacotonero (peach)	Andes	Central Asia central (?)
Eriobotrya japonica (Thunb.) Lindl.	Níspero (loquat)	Andes	Southern China
Pyrus communis L.	Pera (pear)	Andes	Western Asia
RUBIACEAE			
Coffea arabica L.	Café (coffee)	Amazon	Ethiopia
RUTACEAE			
Casimiroa edulis La Llave	Chalarina (white sapote)	Andes	Mesoamerica
Citrus aurantiifolia (Christm.) Swingle	Lima agria (key lime)	Coast, Andes, Amazon	Asia[2]
Citrus x limonia Osbeck	Lima-mandarina (Rangpur lime)	Coast, Andes, Amazon	
Citrus limetta Risso (syn *C. medica* L.)	Lima dulce, Limón dulce (sweet lemon)	Coast, Andes, Amazon	
Citrus limon (L.) Osbeck	Limón real (lemon)	Coast, Andes, Amazon	
Citrus × *aurantiifolia* var. *latifolia* Yu.Tanaka (not resolved in review)	Limón Tahiti (Tahiti Lemon)	Coast, Andes, Amazon	
Citrus × *jambhiri* Lush. (not resolved, in review)	Limón rugoso (rough lemon)	Coast, Andes, Amazon	

*English common name in parentheses; [2]Nicolisi et al. 2000; refers to the wild ancestors of the complex of hybrids and varieties that comprise the cultivated citrus fruits.

Table A3. Agroforestry species introduced to Peru, with main cultivation zone and origin (continued)

Species and Botanic Family	Common name*	Zone(s) of cultivation	Origin
Citrus nobilis Lour.	Tangor (tangor)	Coast, Andes, Amazon	
Citrus reticulata Blanco	Mandarina (mandarin)	Coast, Andes, Amazon	
	Tangerina (tangerine)	Coast, Andes, Amazon	
Citrus sinensis (L.) Osbeck	Naranjo (sweet oranges)	Coast, Andes, Amazon	
Citrus × *aurantium* L.	Naranjo agria o amarga (Seville orange)	Coast, Andes, Amazon	Asia[2]
Citrus × *tangelo* JW Ingram & HE Moore	Tangelo (tangelo)	Coast, Andes, Amazon	
Citrus paradisi Macfad.	Toronja (grapefruit)	Coast, Andes, Amazon	
Citrus maxima (Burm.) Merr.	Pomelo (pomelo)	Amazon	
SAPOTACEAE			
Chrysophyllum cainito L.	Caimito (caimito)	Amazon	Central America (Petersen et al. 2012)

*English common name in parentheses; [2]Nicolisi et al. 2000; refers to the wild ancestors of the complex of hybrids and varieties that comprise the cultivated citrus fruits.

Table A4. Endangered agroforestry species of the Peruvian Coast

Species	Justification
	ANACARDIACEAE
Loxopterygium huasango	Critically endangered (Minagri, 2016)
	BURSERACEAE
Bursera graveolens	Critically endangered (Minagri, 2016); populations reduced, with high extraction (felling) pressure (Reynel *et al*. 2006)
	CAPPARACEAE
Colicodendron scabridum	Endangered (Minagri, 2016)
Beautempsia avicenniifolia	Vulnerable (Minagri, 2016); rare in Ica (Whaley *et al*. 2010)
	FABACEAE
Prosopis limensis	Critically endangered (Minagri, 2016); populations reduced by overexploitation and habitat degradation; many are currently threatened by the dieback syndrome (Wharley *et al.* 2010)
Prosopis pallida	Endangered (Minagri, 2016); populations reduced by overexploitation and habitat degradation; many are currently threatened by the dieback syndrome (Wharley et al. 2010)
Vachellia macracantha	Vulnerable (Minagri, 2016)
	SOLANACEAE
Grabowskia boerhaavifolia	Vulnerable (Minagri, 2016)

Table A5. Endangered agroforestry species of the Peruvian Andes

Species	Justification
	ANACARDIACEAE
Haplorhus peruviana	Near-threatened (Minagri, 2016); individuos son escasos (Reynel, 2006)
	ARALIACEAE
Oreopanax oroyanus	Very depleted, populations rare, risk of extinction (Reynel et al. 2006)
	ASTERACEAE
Mutisia acuminata	Near-threatened (Minagri, 2016)
	BETULACEAE
Alnus acuminata	Near-threatened (Minagri, 2016)
	BURSERACEAE
Bursera graveolens	Critically endangered (Minagri, 2016); populations reduced, with high extraction (felling) pressure (Reynel et al. 2006)
	CAPRIFOLIACEAE
Sambucus peruviana	Widely cultivated, but rare in wild state; native populations strongly depleted (Reynel et al. 2006)
	CAPPARACEAE
Colicodendron scabridum	Endangered (Minagri, 2016)
	CARICACEAE
Carica candicans	Vulnerable (Minagri, 2016)
	ESCALLONIACEAE
Escallonia myrtilloides	Vulnerable (Minagri, 2016)
Escallonia resinosa	Near-threatened (Minagri, 2016); Affected by intense harvesting pressure; endangered (Reynel et al. 2006)
	FABACEAE
Prosopis juliflora	Endangered (Minagri, 2016)
	GROSSULARIACEAE
Ribes viscosum	Very depleted, populations rare, risk of extinction (Reynel et al. 2006)
	MELIACEAE
Cedrela angustifolia	Critically endangered (Minagri, 2016)
	POLEMONIACEAE
Cantua buxifolia	Near-threatened (Minagri, 2016)
	ROSACEAE
Polylepis incana	Endangered (Minagri, 2016)
Polylepis racemose[*]	Endangered (Minagri, 2016)
	SCROPHULARIACEAE
Buddleja coriacea	Vulnerable (Minagri, 2016)

[*]Ongoing genetic studies suggest that this unusually fast-growing, polyploid *Polylepis* taxon may be of anthropogenic origin[17] , i.e., a traditional cultigen rather than a species. Confirmation of this finding would require reconsideration of its conservation status.

[17] Tatiana Boza, Universität Zürich, personal communication to Cornelius, 27.11.19.

Table A6. Endangered agroforestry species of the Peruvian Amazon

Species	Justification
	ARECACEAE
Bactris gasipaes	Refers specifically to the Pampa Hermosa landrace (Yurimaguas, Loreto), which is at risk due to infrastructure projects and its restricted range of occurrence
	BIGNONIACEAE
Handroanthus serratifolius	Vulnerable (Minagri, 2016)
	COMBRETACEAE
Terminalia amazonia	Near-threatened (Minagri, 2016)
	FABACEAE
Dipteryx micrantha	Endangered (Minagri, 2016); individuals scarce, seed difficult to obtain
Amburana cearensis	Vulnerable (Minagri, 2016)
	GROSSULARIACEAE
Ribes viscosum	Very depleted, populations rare, risk of extinction (Reynel et al. 2006)
	JUGLANDACEAE
Juglans neotropica	Vulnerable (Minagri, 2016)
	LECYTHIDIACEAE
Bertholettia excelsa	Near-threatened
	MALVACEAE
Ceiba pentandra	Vulnerable (Minagri, 2016)
	MELIACEAE
Cedrela angustifolia	Critically endangered (Minagri, 2016)
Cedrela fissilis	Endangered (Minagri, 2016)
Cedrela odorata	Endangered (Minagri, 2016)
Swietenia macrophylla	Endangered (Minagri, 2016)
	PODOCARPACEAE
Podocarpus oleifolius	Vulnerable (Minagri, 2016)
Prumnopitys montana	Endangered (Reynel *et al*. 2006)
Retrophyllum rospigliosii	Endangered (Minagri, 2016)
	ROSACEAE
Hesperomeles lanuginosa	Low densities of individuals per species (Reynel et al. 2006)
	RUBIACEAE
Uncaria guianense	Near-threatened (Minagri, 2016)
Uncaria tomentosa	Near-threatened (Minagri, 2016)

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