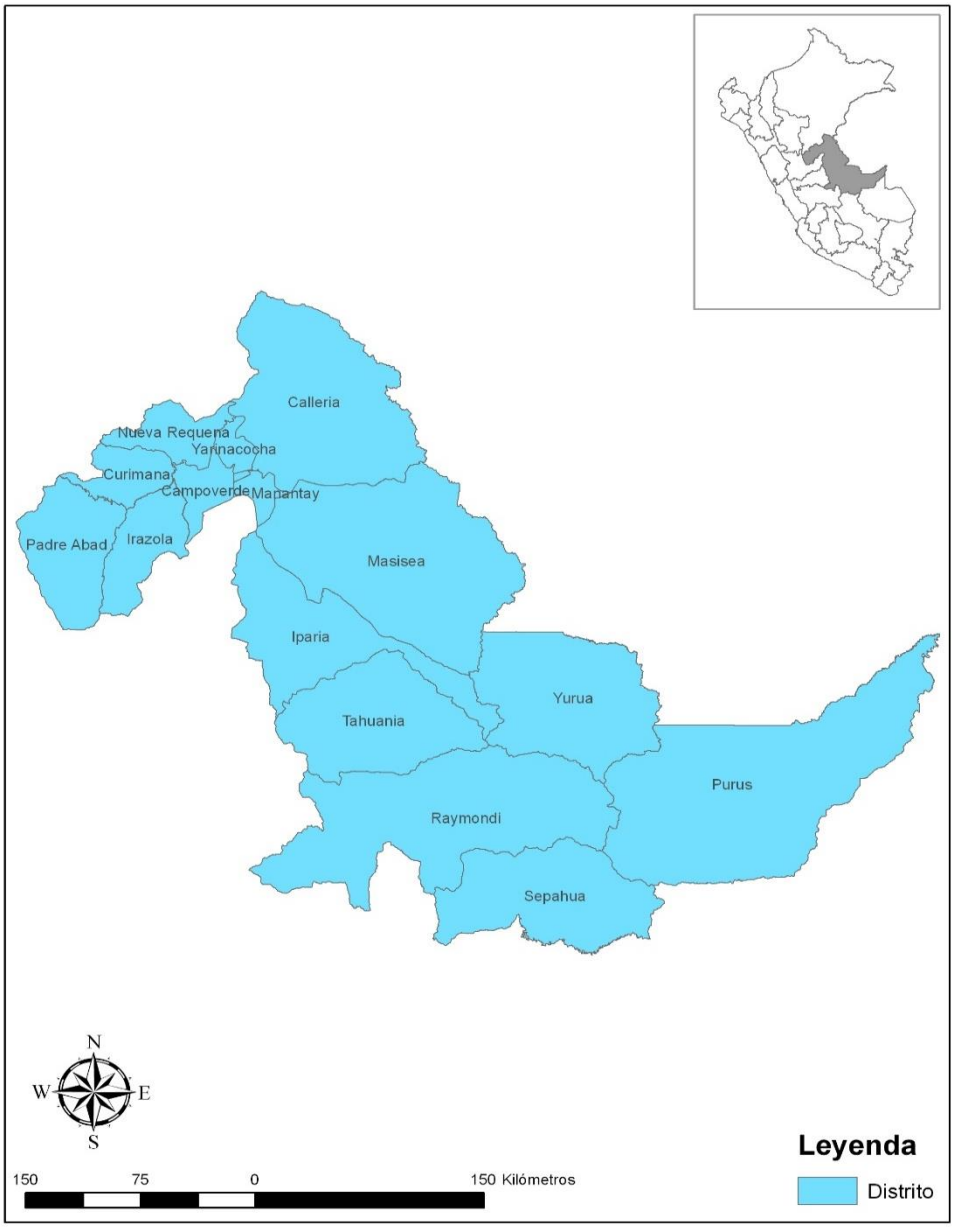
ANNEXES

Annex 1. Districts of San Martin and Ucayali

San Martin

Ucayali


Calleria
Nueva Requena
Yarinacocha
Curimana
Campoverde
Manantay
Padre Abad
Irazola
Masisea
Iparia
Tahuania
Yurua
Purus
Raymondi
Sepahua
N
W
E
S
150
75
0
150 Kilómetros
Leyenda
Distrito

Annex 2. Commercial Crop and Forestry Value Chains and Deforestation in the Peruvian Amazon

Deforestation in the Peruvian Amazon

Peru is the second country with the largest area of rainforest in Latin America. However, accelerating deforestation and forest degradation are threatening its diverse natural resources. According to MINAM, between 2008 and 2017 deforestation of Peru´s Amazon ecoregion, which includes about 95% of the country's forests, occurred at an average rate of 147,198 ha/yr, an increase of 56% compared to the average annual deforestation of 94,021 ha/yr measured between 2000 and 2007 (Figure 1). Historically, annual deforestation attained its highest value of 177,566 ha in 2014, and has since fluctuated around a value of about 159,000 ha/yr.

Deforestation during 2008 – 2017 in the 15 regions that make up the Peruvian Amazon is shown in Figure 2. Five of the regions - San Martin, Ucayali, Loreto, Madre de Dios, and Amazonas - are found entirely within the Amazon, whereas the others have lesser portions of their territory there. Three (Loreto, San Martin, and Ucayali) of the five regions found entirely in the Amazon contribute the majority (55%) of deforestation found in the entire region.

Figure 1. Deforestation in the Peruvian Amazon, 2000-2016 (PNCB-MINAM, 2018).

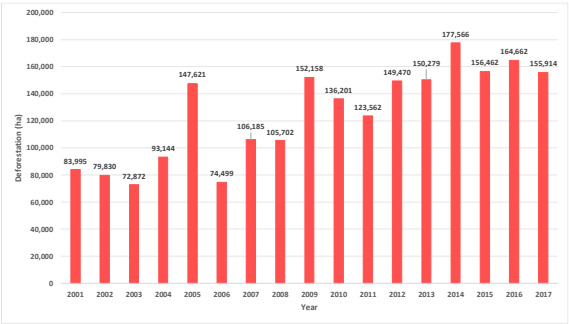
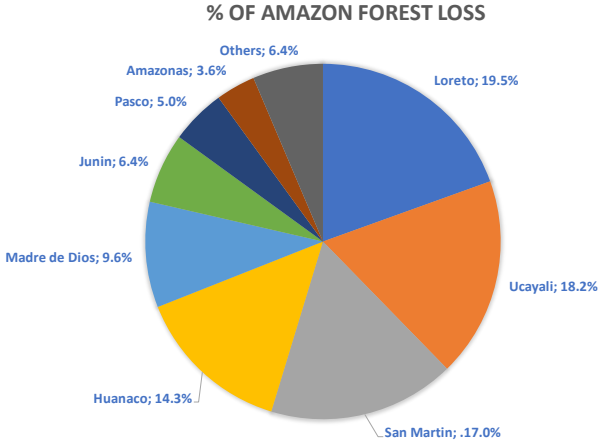


Figure 2. Deforestation during 2008 – 2017 in the regions that comprise the Peruvian Amazon (PNCB-MINAM, 2018).



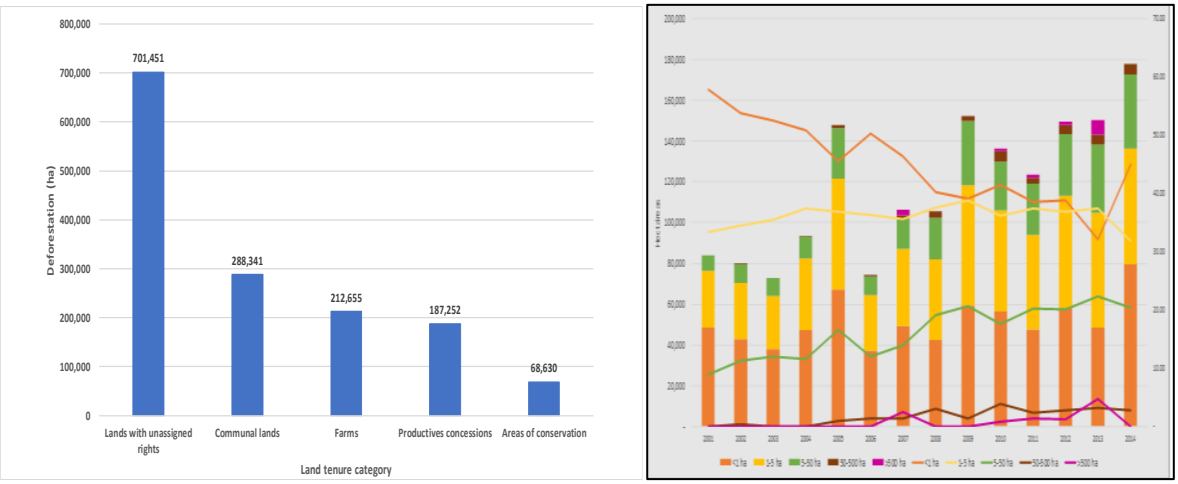
On a landscape scale, the Amazonian highlands (1000 – 2300 m above sea level - masl) and high jungle (400 – 1000 masl) have the least forest cover due to historical processes of migration and deforestation, whereas the low jungle (less than 400 masl) has the greatest amount of forest, but also the highest current rates of deforestation as well as the greatest amount of deforested land (Table 1).

Table 1. Forest cover and forest loss in the three Amazon landscapes (Robiglio et al., 2015 based on data from the 2012 national agriculture census).

Landscape	Forest cover, 2011 (ha)	% of total forest cover	Forest loss (2000-2011) (ha)	% of total forest loss	Relative annual rate of forest loss (%)
Highlands	7,676,400	11	295,394	26	0.37
High jungle	7,334,090	11	195,672	18	0.26
Low jungle	53,101,311	78	646,896	56	0.12
Total	**68,111,801**	**100%**	**1,137,962**	**100%**	**0.16**

With regards to land tenure, during 2008-2017 most (40%) of the deforestation occurred on lands without clearly defined rights, i.e. unassigned lands or non-concessioned permanent production forests (PPF), followed by 22% in communal lands (indigenous or campesino communities + indigenous territorial reserves), titled private farms (16%), productive forest concessions (14%), conservation areas (4%), and other areas (4%) (Figure 3). Analyses[1,2] suggest that deforestation occurs on a small scale (about 88% of deforestation occurs on a scale of less than 5 ha) and is associated with agriculture practiced by small and medium-sized landholders (Figure 3). According to Robiglio et. al (2015), 90% of deforestation occurs as openings of areas of less than one hectare and the main direct drivers of deforestation are agriculture and livestock. In effect, these are micro-deforestation processes that, in aggregate, cause significant losses of forest cover and degradation of existing forests.

Figure 3. Deforestation in relation to land tenure (left) and size of clearings (right) (MINAM).



[1] Estrategia Nacional de Bosques y Cambio Climático (2016). MINAM, Lima, Peru.
[2] Robiglio, V., M. Reyes Acevedo, and E. Castro Simauchi (2015). Diagnóstico de los productores familiares en la Amazonía Peruana. ICRAF Oficina Regional para América Latina, Lima, Perú.

At a more local scale, deforestation intensity is associated with 1) distance to roads or rivers that enable access to markets (associated with the majority of deforestation; 2) distance from population centers, and 3) topography[3]. However, the evolution of deforestation on the agricultural frontier is varied and depends on the types and origin of farmers involved, migratory and colonization processes, the history of land use, the principal crops and dominant productive strategies, the size of landholdings, and the opportunity to access incentives provided by development programs (Robiglio et al., 2015 obsit).

Drivers of deforestation in the Peruvian Amazon

Drivers of deforestation in the Peruvian Amazon are diverse and include agricultural expansion, land speculation/trafficking, legal or illegal logging, and illegal activities such as mining and coca production. Order-of-magnitude estimates, based on different time intervals, suggest that agriculture, coca production, mining, and the combination of logging and other uses each contribute about 25% to annual deforestation[4].

Agriculture

During the last 20 years, the agricultural sector in Peru and in the Amazon has expanded greatly. As a result, according to the 2012 Agricultural Census, there are 3.5 million ha of farms in the Amazon and another 7.3 million ha of abandoned deforested land that could be reconverted into high value crops without contributing to deforestation. Of the 3.5 million ha of farmland, 1.8 million ha are under crops or fallow[5]. Forests occupy approximately 1.45 million ha of the remaining 1.7 million ha of farm land and are found on 42% of the land holdings, but are more extensive on medium-sized farms.

The volume and value of agricultural production has grown steadily and has become increasing oriented towards external markets. These production increases have come mainly from expansion of the agricultural frontier, which poses high environmental costs in terms of deforestation[6] (World Bank, 2017), rather than increases in productivity, which has stagnated and is associated with the use of unproductive, smallholder agricultural systems that are poorly integrated into markets. As a result, the Amazon produces 13% of agricultural GDP, despite containing 38% of the country's agricultural land[7]. Underlying causes of low productivity include the low use of technology or inputs caused by low levels of capital, little access to credit and technical assistance, low levels of producer organization, and lack of connectivity and access to markets.

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[3] Zegarra, E. and J.P. Gayoso (2015). Cambios en la agricultura y deforestación en la selva peruana: análisis basado en el IV Censo Agropecuario, p. 225-286, in Escobal, J., R. Fort, and E. Zegarra (eds.) *Agricultura peruana: nuevas miradas desde el Censo Agropecuario. GRADE,* Lima, Peru.

[4] Robiglio et al, 2015; CORAH, 2018 https://mail.corahperu.org/index.php/estadisticas/#monitoreo; Wake Forest Univewrsity, 2018 www.sciencedaily.com/releases/2018/11/181108130525.htm

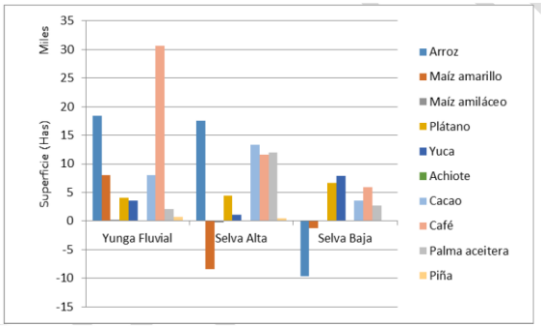
[5] This figure is greater than that cited in Table 4.1.1 due to the approximately 700,000 ha deforested since 2011.

[6] World Bank (2017) Gaining Momentum in Peruvian Agriculture: Opportunities to Increase Productivity and Enhance Competitiveness

[7] Based on data from MINAGRI, 2017. Boletín Estadístico de la Producción Agrícola y Ganadera 2017 and Robiglio et al, 2015.

Industrial or export crops account for 38% of the area under crops or fallow and include coffee (25.4%), cocoa (8.7% but accelerating greatly), and oil palm (1.8%, but also accelerating). Pastures used for extensive grazing account for another 25% of the agricultural land, followed by other, including subsistence, crops (27%). Figure 4 shows that during 2004 – 2010 coffee increased greatly in the highlands, while in the high and low jungle areas, increases in coffee, cocoa, and oil palm are observed. The increase of permanent crops in the lowland jungle is only about one-third that observed in the other two landscapes.

Figure 4. Net changes in the area of annual and permanent crops in 3 landscapes in the Peruvian Amazon, 2004-2010 (Robiglio et al, 2015).



Robiglio et al.´s review of land use in the Peruvian Amazon suggest that deforestation has been driven not by subsistence-oriented production, but mainly by permanent crops grown by specialized small farmers, in association with livestock in the case of medium-size farmers[8], or planted on an industrial scale. Permanent crops have been replacing annual crops in importance, since the former increased by 91,000 ha during 2004-2010 compared to 53,000 ha for annual or transitory crops (Table 2). Specialized or larger farmers have a greater investment capacity than subsistence farmers, which allows them to put larger areas into production via forest clearing.

Table 2. Net increases of annual and permanent crops (ha) in the Peruvian Amazon, 2004-2010 (Robiglio et al 2015).

Crop Type	Highlands	High jungle	Low jungle
Annuals	34,273	14,370	3,749
Permanent	41,605	37,432	12,351

According to Robiglio et al., farmers specializing in permanent crops are found mainly in the highlands and highland jungle. In the highlands, 85% of the 192,000 small and medium-sized farmers produce coffee, but medium-sized farmers tend to associate coffee with livestock. In the highland jungle, 75% of the farmers have coffee or cocoa. In the lowland jungle, producers are more diversified; only 27% of the farmers in the lowland jungle plant coffee, cocoa, or oil palm, although this percentage increases to about 40% among the lowland jungle smallholders oriented principally to sales instead of subsistence. It should be noted that medium-sized landholders in all landscape categories have

[8] Farmer classification: small farmers have < 10 ha of land in the highland jungle and <15 ha in the lowland jungle; medium-size farmers have 10 – 50 ha in the highland jungle and 15-115 ha in the lowland jungle (Robiglio et al., 2015).

significant amounts of standing forest (45%+ of the farm area in the highlands, 63% in the highland jungle, and 84% in the lowland jungle), due to the larger size of their land holdings compared to small farmers, and hence have a greater potential for deforestation, as well as conservation.

Production of these crops is based primarily on extensive and shifting land use by smallholders. These farmers can be classified into two types, subsistence and transitional, based on their levels of production, income, and integration into markets[9]. Both groups, however, face multiple constraints on production that contribute to extensive land use. These constraints are mentioned below; some of them affect more strongly one type of farmers as opposed to the other.

- *Little use of varieties, fertilizer, crop chemicals, machinery* is due to the lack of resources to purchase inputs, equipment, or pay for technical assistance (Table 3), but a more general problem is that input distribution systems are underdeveloped and extension services are largely non-existent. Since input distribution is principally a private sector activity, opportunities for public participation are limited. Contrary to the conventional wisdom that farmers—especially subsistence-oriented smallholders—are unwilling or unable to pay for extension advice, experience in Peru and globally makes clear that farmers of all types are willing to pay for extension advice when the advice is relevant and profit-enhancing (World Bank, 2017 obsit). Thus, a market opportunity exists to build new types of advisory service delivery systems, possibly funded publicly, but implemented by private service providers on a fee-for service basis and driven by evolving information and communications (ICT) sector, which has lowered the cost of accessing and delivering information (World Bank, 2017 obsit).

Table 3. Use (%) of technologies, inputs, and credit by small and medium-sized farmers in the Peruvian Amazon (Robiglio et al., 2015 based on data from the 2012 national agricultural census).

Variable	Amazon Average	Highlands	High Jungle	Low Jungle
Irrigation	9	12	3	8
Certified seed	11	8	16	10
Fertilizers	21	23	28	9
Insecticides	18	15	28	11
Fungicides	15	13	25	7
Herbicides	30	27	45	18
Credit	Small farmers	11	16	7
	Medium farmers	22	20	13

Innovative technologies, improved production inputs, and relevant advisory services will contribute to productivity growth and enhanced competitiveness only if farmers and livestock keepers have the knowledge and skills to take advantage of them. In general, farmers with more education tend to be more responsive to new opportunities: they adopt improved technologies at a higher rate, use greater amounts of purchased inputs, and achieve higher levels of efficiency and productivity. In Peru, educational levels are low in rural areas, and relatively few farmers have received technical training

[9] Escobal, J., and C. Armas. 2015. El uso de encuestas y censos agropecuarios para desarrollar una tipología de la pequeña y mediana agricultura familiar en el Perú. Capitulos de Libros, 123-165.

related to agriculture. Capacity development thus offers a clear avenue for enhancing productivity in agriculture over the longer term, particularly among subsistence farmers.

- *Limited capital and credit*. Since most farmers, but especially subsistence level producers, have little available capital and limited access to credit, farm management is largely dependent on hand labor, with little use of inputs, technology, and technical assistance, and results in low productivity and product quality[10] (Table 3). The supply of credit is limited by:

* High costs of processing credit applications and administering loans due to the dispersed nature and lack of solid databases or credit profiles related to small-sized producers and the small size of average loans.

* A paucity of existing producer organizations which could produce economies of scale, since the majority of smallholders are disaggregated and located in remote, inaccessible areas.

* High costs to producers of accessing or managing credit due to high transportation costs and the lack of local banking agencies or services.

* Low rates of bank use and capture of deposits which consequently increase the cost of capital and interest rates of loans.

* Perceived high risk by financial institutions due to international commodity price fluctuations, exchange rates, erratic weather and loan default.

* The lack of credit histories and low levels of financial education on the part of small producers.

* The lack of solid guarantees or collateral to back loans due to the low level of formal land titling and other collateral.

* Financial products that are poorly aligned with the characteristics of logging, perennial crops or reforestation – notably due to loans with terms of one to two years.

* The scarcity of enabling goods or services such as technical assistance, road infrastructure, irrigation and drainage, and energy systems needed in order to potentiate the use of credit.

* Scarcity of crop insurance (it should be noted, however, that Agrobanco offered agricultural insurance for climate-related risk - more than 10,000 farmers were insured and 305 claims, worth about US$700,000, were paid in 2015).

* A widespread perception on the part of smallholders that banks and financial institutions are remote and unlikely to provide services to them and/or that the processes and costs involved are beyond their reach.

[10] Szott, L.T. et al (2017) A Financial Strategy for the Production-Protection Compact in the Peruvian Amazon. https://www.mda.org.pe/wp-content/uploads/2017/08/PP3.pdf.

Moreover, the public system of agricultural credit is in the process of being restructured; Agrobanco (the public bank for the agricultural sector) is closing and a second-tier financial institution is being established.

- *Lack of organization.* The relatively small participation of farmers in producer associations (Table 4) means that their opportunities to achieve economies of scale, share information or knowledge, or spread risk are reduced. Although a number of farmer associations have been formed in recent years, their focus is often on commercialization, rather than productivity, despite the fact that they lack the scale, managerial experience and funding needed for organizational success. As a result, unfulfilled expectations, lack of basic services or the low quality of them, and lack of transparency are factors that slowly undermine the organization.

Table 4. Membership of small and medium-sized farmers in producer organizations in the Peruvian Amazon (Robiglio et al., 2015 based on data from the 2012 national agricultural census).

Farmer type	**Membership in producer organizations (% of farmers)**		
	Highlands	**High jungle**	**Low jungle**
Small	12	14	8
Medium	22	18	15

- *Deficient connectivity.* In Peru as in other countries, a critical factor driving productivity and competitiveness in agriculture is connectivity related to travel and information sharing. Greater road connectivity results in less travel time, reduced travel costs, and greater access to information as a result of more active participation in markets. These changes, in turn, reduce inefficiencies, help direct resources to their most productive and profitable uses, as well increase the knowledge and technologies used by farmers and other actors throughout the value chain. This has a real impact on productivity, since Peruvian farmers who sell in markets achieve higher levels of productivity (World Bank, 2017 obsit).

As a result of these limitations, small, resource-limited farmers resort to one of their few available resources – their forests – to maintain production. By felling and burning forests, they enrich their nutrient-poor soils, and when their nutrient-poor soils become depleted by crop off-take, they abandon their non-productive plots and convert more forest to agriculture.

This decision, while negative from a social welfare perspective, is logical from the perspective of farmers. Since forests produce low incomes (typically about $100/ha for poor farmers, or about $400 for poor households that exploit multiple hectares - Ickowitz et al., 2017, obsit) relative to the opportunity costs of land use alternatives (mainly ranging from approximately $600/ha to more than $3000/ha according to SERNAMP[11]), farmers opt to substitute forests for input use and technology. The result is a system where forest clearing plays a valuable role in maintaining (albeit low) agricultural productivity under conditions of inadequate technological and investment capacity as well as high aversion to risk. In this system, forests are valued more as a future reserve of cheap agricultural land, rather than a source of products or services.

[11] SERNANP (2009) Pagos por Servicios Ambientales para la conservación de bosques en la Amazonía peruana: Un análisis de viabilidad.

Unfortunately, this informal, forest-intensive system, which may be optimal for resource-poor farmers, is an inefficient use of public goods with high social costs, since the loss of natural ecosystems and their services produces little corresponding benefits for farmers or society in general and contributes greatly to deforestation and Peru´s annual GHG emissions.

Logging

Logging is another important activity In the Peruvian Amazon and the accounting area, but it is implicated in forest degradation, rather than a direct cause deforestation. Indirectly, however, the low economic return to forest use and management contributes to the conversion of forests to other uses.

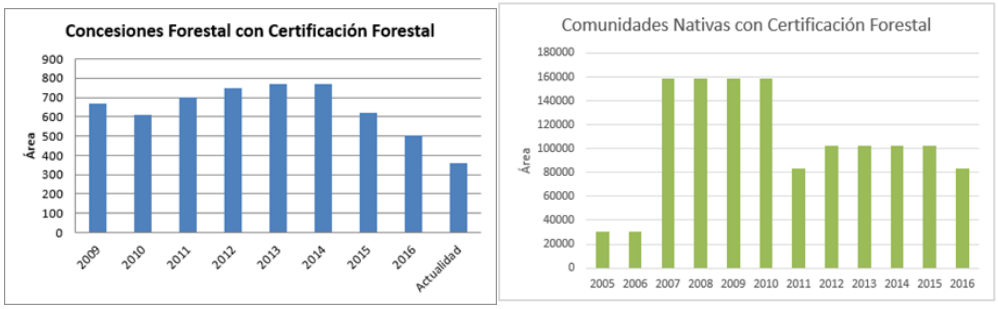
In general, statistics for the timber sector are scarce and are made more unreliable by the large production of undocumented illegal wood. The following overview of the sector is based on official data from SERFOR for 2015, and a series of assumptions related to the proportion of exports to total wood production and legal wood production.

National timber production of about 2.3 M m^3 is estimated based on exports (0.35 M m^3) and the assumption that exports are equivalent to 15% of total production[12]. This implies that 2 M m^3 of wood produced annually is channeled to the domestic market, which is also supplied by approximately 0.8 M m^3 of imports, thus giving a total domestic demand of about 3 M m^3. Of the total estimated annual production of 2.3 M m^3, 1.4 M m^3 is official, thus implying that illegal wood contributes about 40% of domestic production (other reports that suggest that illegal wood is 40% - 62% of total production, see Mejia et al., 2015 ibid and Apoyo Consultorías, unpublished). Between 2012 and 2016, decreases of about 30% in legal annual production and wood exports, largely due to questions about the source and legality of timber origin, combined with relatively stable imports, suggest that an estimated 10% annual increase in domestic demand for wood (ADEX, personal communication), is largely being met by increases in illegal wood.

One defense against illegal wood is the use of forest certification, however the area of certified forests in Peru has decreased from appoximately 1 M ha in 2013 to 700,000 ha in 2016. During this period, some companies (e.g. Maderas Peruanas S.A.) lost their concessions, while others went broke (Consorcio Forestal Amazónico with 180,000 ha). Figure 5presents data on certified forest areas during recent years.

[12] Mejia, E. et al. (20017) Actores, aprovechamiento de madera y mercados en la Amazonía peruana. CIFOR. Documento Ocasionales 145.

Figure 5. Area of certified forests in forestry concessions (left, in 1000s of ha) and indigenous communities (ha) (FSC)[13].



Most (48%) timber originates in native communities, 34% from timber concessions, and 17% from farms and local forests (Mejia et al., 2015 obsit). Small farmers and loggers make up about 40% of the actors involved in timber extraction, but account for only 2% of the volume of timber harvested (Table 5). Small farmers extract timber from their own lands or communities, while the great majority of small loggers operate without formal authorization and extract timber from public lands, farms, native communities, and concessions. Medium-sized loggers obtain wood from their own concessions as well native communities and unauthorized sources; and large loggers use mostly their own concessions, but also buy authorized or unauthorized timber mainly from native communities, but also farmers and intermediaries (Figure 6).

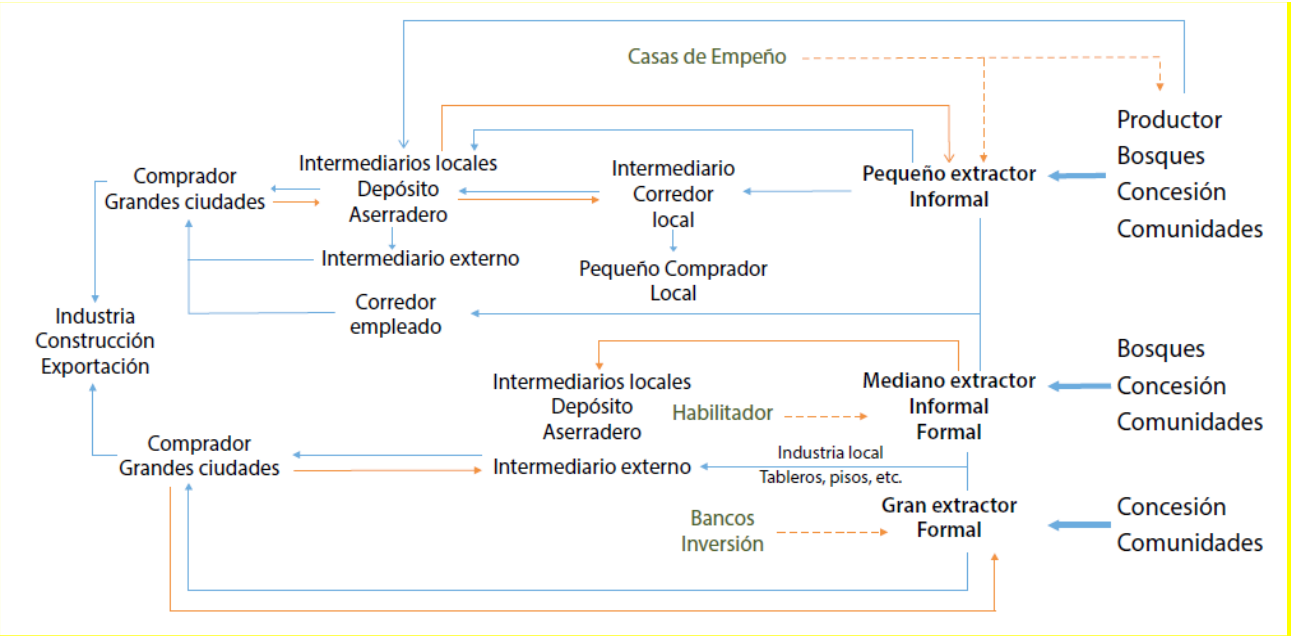
Table 5. Type of loggers involved in timber extraction (from Mejia et al., 2015, obsit).

Type of logger	*Timber harvested (m^3/yr)*	*Loggers (%)*	*Volume of timber extracted (%)*
Small	< 200	40%	2%
Medium	500 - 1500	28%	15%
Large	>2800	32%	83%

[13] FSC .
https://pe.fsc.org/es-pe/nuestro-impacto/datos-y-cifras/datos-y-cifras-2014

https://www.serfor.gob.pe/wp-content/uploads/2016/03/estadistica_certificacion.pdf

Figure 6. Timber supply chains in Peru (Mejia et al., 2015 obsit)



In the case of San Martin and Ucayali, in San Martin there are currently 39 concessions, of which 16 are active, 8 inactive, and 15 are expired. The 16 active concessions cover 105,190 ha (GORESAM, 2018). As a result, timber production from San Martin is relatively unimportant, accounting for about 1% (approximately 15,000 m^3) of national timber production in 2016.

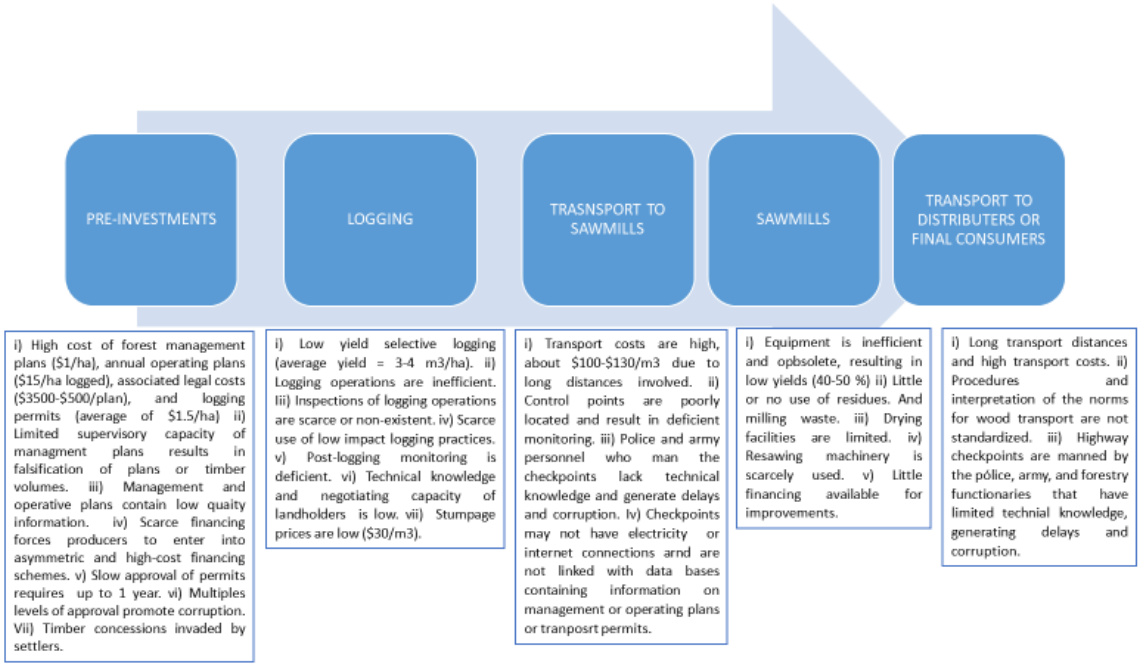
Ucayali produces about 19% of the national legal production of roundwood (GOREU, 2017), equivalent to about 0.26 – 0.32 million m^3/yr. There are 90 forest concessions, but only 29 are in active operation, covering only one million of the 2.7 million hectares where concessions have been granted. Ucayali´s wood exports make up about 20% of the national value of wood and wood products exported, and involve approximately 60 companies, not all registered in Ucayali (GOREU, 2017). However, the value of wood exports has decreased by 40% between 2015 and 2017 due to questions about the legality and source of timber (GOREU, 2017). Estimates of illegal timber in Ucayali, based on the assumption that the percentage contributions of Ucayali to timber production and illegal timber are about equal, suggests that illegal timber production is about 0.12 – 0.3 M m^3/yr.

Problems along the timber/wood value chain are shown in Figure 7. Many of these problems contribute to illegal wood production, including: land invasion and speculation associated with limited forest and land use monitoring and control, the high cost of legality, inadequate systems of verification and control of forestry plans and timber extraction, weak timber tracking and control (checkpoints) systems, corruption of functionaries, resource and personnel limitations of SERFOR, and undiscriminating markets for illegal products.

It should be noted that since 2009 the forestry sector has been undergoing a slow process of reform, due to the need to comply with the Forest Chapter of the Free Trade Agreement between Peru and the United States. Some important milestones of this reform have been the transfer of competences

in forestry to regional governments (since 2009), the promulgation of a new Forestry and Wildlife Law in 2011; and the creation of the Forest and Wildlife Service - SERFOR - in 2014.

Figure 7. Problems along the wood value chain.



Coffee, cocoa, oil palm, and forestry value chains

Increases in permanent crops have accelerated in recent years. At the national level, approximately 425,000 ha (approximately 360,000 ha in production), involving about 225,000 producers, are devoted to coffee, making it the most important export crop and the most important crop in the Amazon[14]. Production is about 250,000 tons, which translates into a low average yield of 750 kg/ha that reflects, in part, the recovery from coffee rust and other phytosanitary problems in 2012-2014[15]. As a result of this problem, about 40% of the plantations have been renovated, thus causing significant coffee-related deforestation which is not reflected in net increases in the area of coffee. Within Peru, coffee production is shifting from the central Amazon highlands (Chanchamayo, Junin) to the northeastern highlands in the Amazonas, Cajamarca and, San Martin regions[16].

The area planted to cocoa nationally is currently around 140,000 - 150,000 ha; the area harvested expanded from 41,000 to 130,000 ha between 2000 and 2016[17]. In a similar fashion, farm households

[14] https://www.globalcoffeeplatform.org/assets/files/Resources/General-Information/Peru/Boletin-estadistico-camcafe-19-12-2017-vf1.pdf

[15] Nolte GE (2017) Peruvian Coffee Production Bouncing Back. USDA FAS GAIN Report.

[16] Ibid.

[17] MINAGRI-DGPA-DEEIA (2016) Estudio del Cacao en el Perú y el Mundo. Situación Actual y Perspectivas en el Mercado Nacional e Internacional al 2015. Also see: SERFOR (n.d.) Nationally Appropriate Mitigation Actions (NAMA) in the Cacao sector of the Peruvian Amazon Region.

engaged in cocoa cultivation jumped from 30,000 around 2006 to an estimated 45,000 in 2014[18], and is likely around 70,000 now, based on extrapolation of cocoa hectarage using an average farm size of 2 ha[19].

Finally, Peru´s approximately 86,000 ha of oil palm is distributed in 4 regions (Loreto, Huánaco, Ucayali, and San Martin). The area under oil palm has increased from approximately 14,600 ha in 2000 to 44,400 ha in 2010, to more than 58,000 ha in 2013, 77,000 ha in 2014, and 86,000 ha in 2017. Approximately 29,000 hectares were in production by 2010, 38,000 hectares by 2013, 51,000 ha in 2016, and 53,000 ha in 2017[20]. However, increases in plantation area are not matched by increases in productivity, since annual yields generally fluctuate between 11 and 17 tons/ha, with no consistent trend with time (Pinzon, 2018)[21]. This may be due to the long time periods needed for oil palm to come into production (3-4 years), the increasing involvement of smallholders with less access to technical capacity than industrial plantations, hence lower per hectare yields, or a decrease in management and input use as competition from cheaper soybean oil from Argentina increased between 2009 and 2016.

Coffee, cocoa, and oil palm value chains

In many respects, value chains of coffee and cocoa and their effects on deforestation are relatively similar (Table 6). These chains are complex and involve hundreds of intermediaries, where major actors such as independent or company stockpilers, processors, and domestic or international buyers may intervene at various points along the chains (Figure 8). Perhaps the two most important influences of the chains on deforestation are found at the extremes of the chains: the markets, which provide economic signals to producers and the producers themselves. Coffee and cocoa markets based on product sustainability and quality are still small, and the large majority of buyers of Peruvian products have yet to incorporate low emissions or climate friendly criteria in their purchasing policies. This reflects the relatively small importance assigned to environmental criteria by businesses in Peru (Freundt and Perla, 2015). Processors and other intermediaries along the chain are less likely to exert a major influence on this transformation, although entities such as cooperatives can help in broadening markets and raising production standards of producers.

In contrast, oil palm is characterized by more limited, but relatively tight, functional and commercial linkages among a small number of processors and producers located in close proximity to the relatively

[18] Arevalo Sanchez, M et al. (2016) Estado actual sobre la producción, el comercio y cultivo del cacao en América. IICA

repositorio.iica.int/bitstream/11324/6422/1/BVE18019631e.pdf

[19] https://www.technoserve.org/files/downloads/case-study-building-a-sustainable-and-competitive-cocoa-value-chain-in-peru.pdf

[20] MINAGRI (2010) http://www.minagri.gob.pe/portal/download/pdf/direccionesyoficinas/dgca/Cartilla-de-difusion-Palma.pdf
MINAGRI (2012). http://minagri.gob.pe/portal/gestion-empresarial-rural/6368-pequenos-productores-de-palma-aceitera-conducen-el-60-de-las-plantaciones-cultivadas-del-pais
MINAGRI (2017) Plan nacional de desarrollo sostenible de la palma aceitera en el Perú 2016 – 2025.
USDA-FAS (2017)
https://ipad.fas.usda.gov/cropexplorer/util/new_get_psd_data.aspx?regionid=nsa&cntryid=PE&cntryname=Peru
USDA-FAS (2016) https://ipad.fas.usda.gov/highlights/2016/09/peru/index.htm
JUNPALMA (2016) https://junpalmaperu.org/publicacion/estadistica-de-la-palma-aceitera-al-2014

[21] Pinzon, A. 2018. Sustainable Palm Oil Production in Peru. Global Canopy.

few existing processing plants. Thus, processors-producers play important roles in deforestation due to their direct effect on deforestation or their influence on associated small producers. However, major processors, such as Grupo Palma, are moving towards alignment with the principles of the Roundtable on Sustainable Palm Oil (RSOP), which includes among its objectives the aim to reduce the establishment of oil palm based on deforestation.

In some respects, forestry value chains are similar to those of coffee and cocoa, but differ from them in that they produces relatively low value per hectare, which, in turn, provides incentives for the conversion of forests to other uses. In general, a high degree of illegality is present along the forestry value chain due to high compliance costs with regulations, which have a greater relative effect on small and medium-sized loggers as well as processors and transporters. Moreover, the major certification system, FSC, which includes environmental and conservation criteria, has been losing ground (see below).

In general, more complex and fragmented value chains result in farmers receiving less of the aggregate value of the end products based on their production, and thus the level of resources that they can invest in upgrading production and protecting the environment. In oil palm, farmers and farmer organizations have direct links to processing plants and receive increased benefits as a result (Hayek et al., 2015[22]); oil palm is also more profitable when calculated on a per capita basis than other crops such as coffee, cocoa, and palm hearts (UNODC, 2012[23]). However, these resources may be used for production rather than environmental protection since capital costs during the long pre-production development period of the plantations are high and large capital investments are required to establish and operate a palm oil processing mill. In forestry, a relatively large number of farmers and small loggers produce timber, but their contribution to the overall commercial volume is small, approximately 2%, due to financial limitations and the high costs of legality. Moreover, timber production represents a small proportion of wood end-products.

Table 6. Characteristics of coffee, cocoa, and palm oil value chains in the Peruvian Amazon[24] (Szott et al., 2017).

Characteristic	Coffee	Cocoa	Oil palm
Total # producers (families)	223,000	90,000	7,209
Organized	29%	30%	81%
Independent	71%	70%	19%
Production share by sector			
Small holders	85% of farms < 3 ha	80% of farms < 2 ha	53%
Mid-size holders			5%
Corporate			42%
Geographic area of production	50% from San Martin, Cajamarca, and Amazonas	40% from San Martin	39% from San Martin, 39% Ucayali, remainder from Loreto and Huanuco
Total area under production (ha)	425,500	144,000	77,000 (47,000 under production)

[22] Hayek F, et al (2015) Toward zero-deforestation oil palm in Peru: understanding actors, markets, and barriers. Forest Carbon, Markets and Communities (FCMC) Program/USAID.

[23] UNODC. (2012). Retrieved from www.unodc.org/peruandecuador/es/noticias/2012/Agosto/1208unodc-y-usaid-firman-convenio-con-palmicultores.html.

[24] Szott, L.T. et al (2017) The Production-Protection Compact in the Peruvian Context. Mecanismos Para Desarrollo Alternos (MDA) https://www.mda.org.pe/media/2017/02/publications/ENGTPPCitPC.pdf

Future increases expected	120,000-150,000 ha in 10 years	100,000-150,000 ha in 10 years	150,000 ha in 10 years
Total production 2015 (MT)	236,000	81,300	768,863 racemes of fresh fruit, 185,275 crude oil (2014)
Total production 2016 (MT, proj.)	286,000	n.d.	n.d.
Average Productivity (kg/ha)	450 – 675	600 - 800	10,000 – 14,000
Optimal (kg/ha)	1350 –2250	1000 – 1200	15,000-22,000
Technified (kg/ha)	2700 – 3600	2000 - 3500	23,000-28,000
Value chain structure	Complex, involving numerous intermediaries and varying participation of processors and buyers along the chain	Complex, involving numerous intermediaries and varying participation of processors and buyers along the chain (see Figure 4.7	Relatively simple due to farmers´ association with mills
Buyers	7 processors/exporters (5 private companies and 2 coops) hold 65% of the market	8 processors/exporters (6 private companies and 2 coops) control 80% of market	5 processors. Grupo Romero, controls almost all exports
Main markets	3% domestic, 97% exports. Export markets = USA, Germany, and Belgium. 80% of export coffee shipped to conventional markets, 20% to markets based on certification or specialty coffees.	33% domestic, 67% export. Holland, Germany, Belgium, Italy, US, Canada. 75% of Peru cocoa is categorized as fine. 20-25% is certified.	>90% domestic, crude oil. Exports to Chile, Colombia, Ecuador.
Market information and signals at the farmer level	Weak	Weak	Intermediate
Producer Organizations	Generally < 20%. Producers: *Junta Nacional del Cafe* (JNC). Aggregates 70,000 families organized in 56 cooperatives or farmer associations. Cooperatives/farmer associations are mainly focused on commercialization and not all of them are members of JNC. Processors/exporters: *Camara Peruana del Café y Cocoa*	Generally < 20%. Producers: *Asociacion Peruana de Productores de Cocoa* (APPCOCOA) with more than 30,000 affiliated producers from 25 cocoa cooperatives and producer associations. Similar to JNC, not all cocoa producer organizations are affiliated with APPCOCOA 26+ cooperatives in San Martin only.	Small and mid-sized producers: the *Junta Nacional de Palma Aceitera del Peru* – JUNPALMA aggregates 7,000 producers.
Technical assistance	Govt: Mainly provided by MINAGRI's National Coffee Renovation Plan to ~25% of farmers; also DEVIDA (about 27,000 ha, mostly in Huanuco) Private: *Proyecto Desarrollo Sostenible del Café* of JNC/CEINCAFE – limited to JNC members; Proasocio, with funding from the Neumann Foundation and some European roasters, serves about 1500 farmers. Programa Familia, related to Comercio y Compañia and Molinos & Cia. Both programs served about 1,000 farmers in total in San Martin and about 1,500 farmers in Cajamarca.	Mainly provided by government organizations like GORE San Martin, Ucayali and Huanuco; DEVIDA; multilateral agencies (UNDCP); and NGOs as part of coca eradication programs (e.g. Peruvian Cocoa Alliance and Technoserve; the latter assisted about 21,000 cocoa farmers in San Martin , Ucayali, and Huanaco).	Producer-owned palm oil processing companies provide some technical assistance. DEVIDA, multilateral agencies (UNDCP) and NGOs as part of coca eradication programs.
Threats	Climate change impacts on 183,000 ha lower than 1200 masl result in increased susceptibility to pests and diseases and quality, which increase credit risk and limit access to markets based on quality.	Low productivity, and low input use. Use of hybrid varieties may limit access to markets based on quality or flavor profiles.	Low productivity, and low input use. High processing and maintenance costs associated with under-utilized plant processing capacity.

	Low prices, low productivity, and low input use result in economic losses. Lack of traceability and payment based on quantity, not quality, discourage quality improvements. Weak governance structure and operative and financial management hampers coops´ and producer associations´ abilities to deliver additional services besides commercialization.	Weak governance structure hampers coop's and producer association's abilities to deliver additional services besides commercialization. High cadmium levels in samples needs to be verified and addressed.	Foreign competition from lower-prices vegetable oils (e.g. soy oil from Argentina).
Opportunities	Growing markets for specialty coffees. Conditions for specialty coffees exist on 170,000 ha. Opportunity to transition coffee below 1200 masl to other crops like cocoa	Increases in international prices and markets for fine, aromatic cocoa. Presence of fine, aromatic specialty cocoa. High cocoa biodiversity.	Domestic market for oil is large and unsatisfied. Palmiste oil for cosmetics.

Farmer and forestry producer organizations

Most coffee and cocoa farmers are mostly unorganized and do not participated in producer association or cooperatives (Table 6), thus creating opportunities for multiple intermediaries. Moreover, since more small farmers are unorganized, they are unable to participate in the benefits related to inputs, technical assistance, or product commercialization which farmer organizations could potentially provide. Compared to coffee, cocoa farmers are more directly associated with major buyers such as cooperatives, stockpilers/traders, processors/traders, or integrated agribusinesses, whose business models involve production, stockpiling or product aggregation (*acopio*), processing, and exportation to varying degrees. About one-third of producers participate in these types of associations, rather than chains based on intermediaries.

In new or even existing coffee and cocoa associations and cooperatives, however, the benefits related to inputs, technical assistance, or product commercialization are generally minimal. Although organizations generally focus on expanding and consolidating their supply base (often in the face of intensive local competition from members), improving post-harvest handling, and cooperating on more effective marketing strategies, the majority do not have the experience or knowledge to manage this area effectively. Moreover, many organizations also face problems related to governance, financial management, and overall administration (Scott et al., 2016[25]; Donovan et al., 2017[26]). "(S)trategies for supporting cooperative development have largely failed to address major internal weaknesses and the challenges posed in the external environment…. Important areas related to business management and governance structures, trust relationships with buyers, and sufficient working capital have largely been ignored." (Donovan et al., 2017, ibid). As a result, few (mainly large cooperatives) organizations offer services needed in order to upgrade production or respond to

[25] Scott, G.; Donovan, J.; Higuchi, A. (2017). Costs, quality, and competition in the cocoa value chain in Peru: an exploratory assessment. Custos e @gronegócio on line - v. 11, n. 4 – Out/Dez - 2015. www.custoseagronegocioonline.com.br

[26] Donovan J., Blare T., and Poole N. (2017): Stuck in a rut: emerging cocoa cooperatives in Peru and the factors that influence their performance. International Journal of Agricultural Sustainability http://dx.doi.org/10.1080/14735903.2017.1286831

environmental threats. This suggests that most producer organizations, especially new ones, would be better served if they focused more on increasing economies of production at scale, and the productivity and quality of products, rather than commercialization.

Exceptions are more sophisticated, larger associations or cooperatives that have financial institutions that provide producer loans, which partially subsidize technical assistance aimed at improving coffee quality and yields (see section on value chains below).

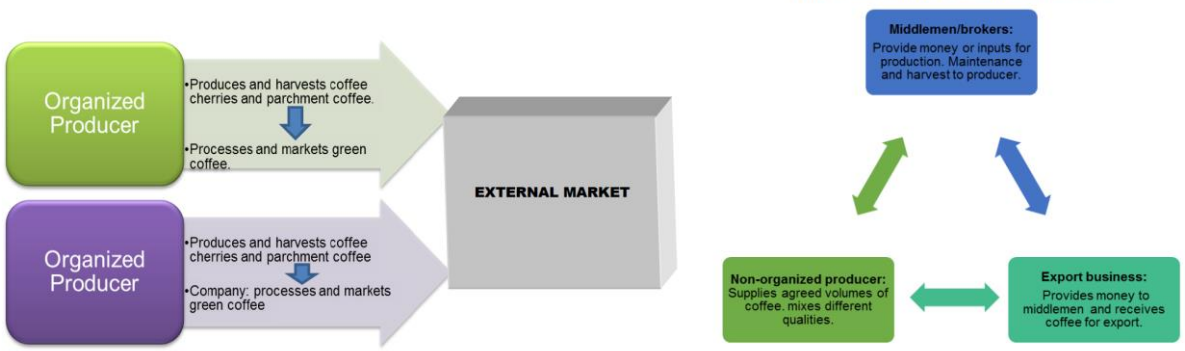
In oil palm, small and medium-sized oil palm producers are largely grouped in farmer associations linked with oil palm processors. In some cases, farmer associations may participate in the management and earnings of the processing plants.

Forestry producers are generally unorganized, although an exception is the Consorcio Forestal, an organization of relatively large loggers that operates in the region of Madre de Dios. The objective of the Consorcio is to achieve economies in scale with regards to credit, equipment purchases, and wood commercialization. In general, small loggers, indigenous or campesino communities have little interest in organized, formal logging because the legal alternatives are expensive or require additional organizational effort (Mejia et al., 2015[27]).

Value chain structure

*V*alue chains for coffee and cocoa are complex and involve hundreds of intermediaries, where major actors such as independent or company stockpilers, processors, and domestic or international buyers may intervene at various points along the chains (Table 7 and Figure 8 for coffee, and Table 8 and Figure 9 for cocoa).

Figure 8. Coffee value chains based on organized producers and cooperatives (left) and unorganized producers (right) (MINAGRI).



[27] Mejia, E. et al. (20017) Actores, aprovechamiento de madera y mercados en la Amazonía peruana. CIFOR. Documento Ocasionales 145.

Table 7. Public and private actors in the Peruvian coffee chain, by type and activity[28]

Actor	Type	Activity
Non-organized producers	Private	Individuals, representing 70% of individual producers.
Organized producers	Private	Legal entities. Groups comprised of cooperatives and associations; it is estimated that there are 120 organizations in the country, representing 30% of coffee producers.
Peruvian Coffee and Cacao Chamber	Private	Exporters' trade association, made up of 18 private companies that sell coffee and cacao on the foreign market.
JNC	Private	Producers' trade organization made up of associations and cooperatives. Made up of 55 cooperatives. Represents the interests of organized small-scale coffee producers.
Ministry of Agriculture and Irrigation	Public--Government	Carries out activities in support of organized and non-organized producers, through the National Plan for the Renovation of Coffee Farms, as a program of the Directorate-General for Agribusiness.
Ministry of Production	Public--Government	Promotes technological innovation, supports the establishment of the Center for Technological Research (CITE)
SENASA	Public-Government	Carries out specific activities in support of producers, especially non-organized producers.
INIA	Public-Government	Conducts research on genetics aimed at breeding coffee varieties not currently grown in the country,
National Council of Science, Technology and Technological Innovation (CONCYTEC)	Public--Government	Supports research on postharvest practices and processing of green coffee through roasting and grinding processes, to develop appropriate technologies.
PROMPERU	Public--Government	Agency responsible for promoting the sale of Peruvian products on the foreign market .
National Financial System	Private	Made up of banks, rural credit unions, municipal credit unions.
Agrobanco	Public-Government	Second-tier bank for the agriculture sector.
Central Café y Cacao del Perú	Private	Non-governmental organization (NGO) that provides technical services to producer cooperatives. It is made up of 12 cooperatives.
Universities	Public	Universities offer training courses for specific circumstances. These include the National Agrarian University, the National University of La Selva, the National University of San Martín.
Certification companies	Private	These companies certify cooperatives that sell organic, fair-trade and other products.
Savings and Loan Cooperative for Integration and Rural Development (CIDERURAL)	Private	This cooperative is comprised of 15 cooperatives in the rural sector. It promotes a solidary rural economy and provides quality financial and non-financial services, with the aim of promoting the sustainable development of the rural sector.
Latin American Guarantee Fund (FOGAL)	Private	FOGAL provides guarantees so as to provide access to credit for organizations that carry out economic activities, especially in the rural areas of the Andean region of Latin America.
National Fund for Worker Training and Job Promotion (FONDOEMPLEO)	Public-Government	An institution that finances projects to promote the development of job skills.
Program on Compensation for Competitiveness	Public-Government	A non-reimbursable fund designed to improve competitiveness in agriculture. It supports the organized sector and conducts competitions to allocate economic resources.
Regional Governments	Public-Government	Under Act 27867, article 9, Regional Governments promote agricultural, agro-industrial, tourism and mining activities, among others.
Local Governments	Public-Government	Promote economic activities in their local areas.
Middlemen/brokers	Private	Middlemen usually represent export companies, mainly selling conventional coffee. During the production process, they offer advance financing to producers and then discount the funds loaned when farmers deliver their production; in some cases, they provide inputs such as fertilizer and agrochemicals.

Source: MINAGRI.

In cocoa, buyers may be involved in improving production, either directly with farmers or indirectly through farmers cooperatives or associations or NGOs. "Some cocoa buyers have partnered with NGOs to expand cocoa production and directly source cocoa… In other cases, buyers have established local subsidiaries to source cocoa from cooperatives and have sometimes created farmers' associations managed by the buyer to capture the production of farmers not currently involved in cooperatives and to more directly control the quality of the product. In promoting cocoa, the major focus of buyers has been on expanding areas and helping producers and their cooperatives meet quality expectations (Chesnoy 2015)" (Donovan et al., 2017, obsit).

[28] IICA, USDA (2016). Trade opportunities and challenges for the coffee chain in Peru within the framework of the Trade Promotion Agreement with the United States.

Figure 9. Cocoa supply chain in San Martin[29]

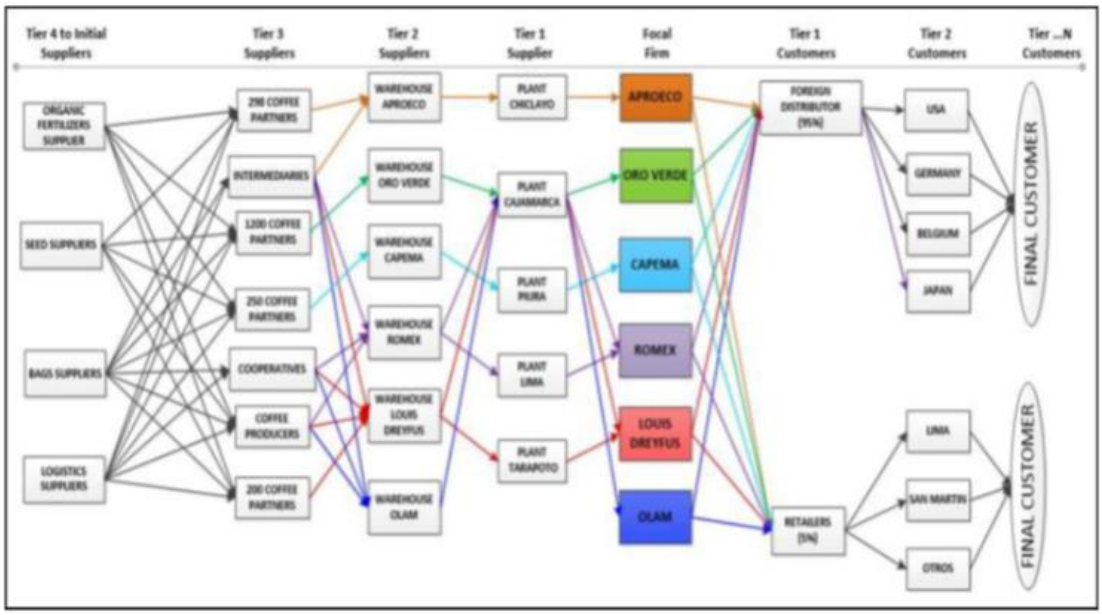


Table 8. Characteristics of actors in cocoa value chain in Peru (Scott et al., 2016, obsit).

Business	Examples	Production	Stockpiling	Processing	Export	Services provided to producers
Vertically integrated cooperatives	Acopagro, Norandino, Naranjillo	+	+	+	+	TA, credit, social asst.
Producer cooperatives	Many	+	+	-	+	Limited or no TA and credit
Stockpilers/ traders	Amazonas Trading, Sumaqao, Ecom	-	+	-	+	TA, social assistance
Stockpilers/ Processors	Macchu Picchu Traders	-	+	+	+	TA, credit, social asst.
Agribusiness	Romex Trading, United Cocoa	+	+	+	+	TA, credit, social asst.

In contrast, the vast majority of palm oil producers in Peru are small farmers (< 50 hectares), who are affiliated with associations that sell their production to producer-owned (e.g. the association of OLPESA, a processing cooperative, with ACEPAT, a producer cooperative, a model applied by OLAMSA, OLPASA, and INDUPAS) or corporate processing facilities (e.g. Grupo Palmas) directly linked to national markets. In 2013, the four operating, cooperatively owned mills provided about 34% of the national supply of palm oil, while the associated plantations occupy about 52% percent of the national oil palm area. The smallholder palm oil production model has been relatively successful in attracting ex-coca farmers, and is more profitable when calculated on a per capita basis than other

[29] Palomino ER et al. (2017) Organic Coffee Supply Chain Management in the San Martin Region of Peru. International Journal of Innovation, Management and Technology, Vol. 8, No. 1, p. 9-16.

crops such as coffee, cocoa, and palm hearts (UNODC, 2012 obsit), but its expansion has been limited because of the long time pre-production development period of the plantations and the large capital investment required to establish and operate a palm oil processing mill.

Other oil palm farmer typologies include medium independent (50 to 1,000 hectares) producers (3 corporate entities, Palmagro SAC, Golden Amazon SAC, and Biodiesel SAC, with less than 700 ha each in Ucayali and 10 in Tocache, San Martin). These producers sell their production to the Industrias del Espino (Grupo Palmas) and other independent growers who are affiliated with ACEPAT/OLPESA (Hayek et al. 2015, obsit).

Finally, large corporate (> 1,000 hectares) producers include Grupo Melka and Grupo Palmas. The former is a holding company of Malaysian and Peruvian investors, while the latter is a subsidiary of the Grupo Romero, one of Peru's largest domestic corporate entities with multi-sectoral holdings. Grupo Palmas has two main facilities composed of a division dedicated to managing plantations and producing palm fruits, as well as an industrial unit that processes fruit into crude palm oil and refines it into a variety of products. The older of the two facilities (Palma del Espino) is located in the province of Tocache in the Upper Huallaga Valley in San Martin. The younger facility (Palmas de Shanusi) is located about 40 km south of Yurimaguas on the border between San Martin and Loreto regions. The Palmas de Espino complex in Tocache also includes a small farmers association, organized as the Federación Regional de Palma Aceitera San Martín (FREDEPALMA - SM), which has been sponsored and supported by Industrias del Espino. The association includes more than 200 families that own an average about 7 ha of oil palm plantations; these farmers receive technical assistance from Palmas de Espino and have a long-term agreement to sell their production to the corporate mill.

In forestry, most (48%) timber originates in native communities, 34% from timber concessions, and 17% from farms and local forests (Mejia et al., 2015, obsit), under various types of permits (Table 9). Small farmers and loggers make up about 40% of the actors involved in timber extraction, but account for only 2% of the volume of timber harvested (Table 5). Small farmers extract timber from their own lands or communities; the great majority of small loggers operate without formal authorization and extract timber from public lands, farms, native communities, and concessions; medium-sized loggers obtain wood from their own concessions as well native communities and unauthorized sources; and large loggers use mostly their own concessions, but also buy authorized or non-authorized timber mainly from native communities, but also farmers and intermediaries. The logging chain also includes timber concessionaires (usually medium-sized and large loggers, intermediaries, processors, and loggers-processors-intermediaries, and buyers (Figure 6).

Markets

Coffee. Peru is the 9th largest coffee producer in the world (FAOSTAT, 2016[30]) and the leading producer (90,000 ha) of organic coffee (Nolte, 2017[31]). Peru produces almost exclusively Arabica coffee, of which over 70% is of the typica variety followed by caturra (20%), and others (10%). Coffee is Peru's main agricultural export commodity, with a value of about $727 million in 2017 (MINAGRI, 2018[32]).

[30] http://www.fao.org/faostat/en/
[31] Nolte GE (2017) Peruvian Coffee Production Bouncing Back. USDA FAS GAIN Report.
[32] MINAGRI (2018) Plan Nacional de Acción del Café Peruano

The principal foreign markets are the US, Germany, and Belgium; they absorb more than half of the coffee exported by more than 100 companies, which include cooperatives and national and international businesses of varying sizes, although only 6 are responsible for half of the coffee exported. At the same time, the local market, while small (about 10,800 mt equivalent to about 3% of total production and a per capita consumption of 0.65 kg), doubled between 2012 and 2016 (Nolte, 2017, obsit), due to international tourism and the overall improvement of the Peruvian economy which has created a new middle class.

Peru´s coffee production increased from about 257,000 mt in 2013 to 341,000 mt in 2017, as farms continue to recover from coffee leaf rust and other phytosanitary problems in 2012-2014. Eighty percent of Peru´s coffee is exported to the conventional or mainstream market, mainly by multinational or national businesses, although participation of cooperatives and farmer associations is growing (Figure 10). The certified coffee market, mainly Fair Trade, organic, Rainforest, and UTZ, makes up 17.5% of coffee exports; 65% of these exports are provided by cooperatives. Finally, niche or specialty coffees of high cupping quality make up 2.5% of exports; 60% of these coffees are provided by cooperatives (CCC-GCP-JNC, 2017[33]). It should be noted that Peru´s export promotion organization, PROMPERU, has been promoting specialty coffee among exporters since 2014 (IICA-USDA, 2016 obsit).

Coffee prices vary with these markets. Prices for conventional coffee are determined by international prices listed on the New York exchange, certified coffees usually demand prices about $0.50 - $1.00 per kilo higher than that of conventional coffee. Niche coffee usually demands prices from less than twice to six times greater than the prices for conventional coffee (CCC-GCP-JNC, 2017, obsit).

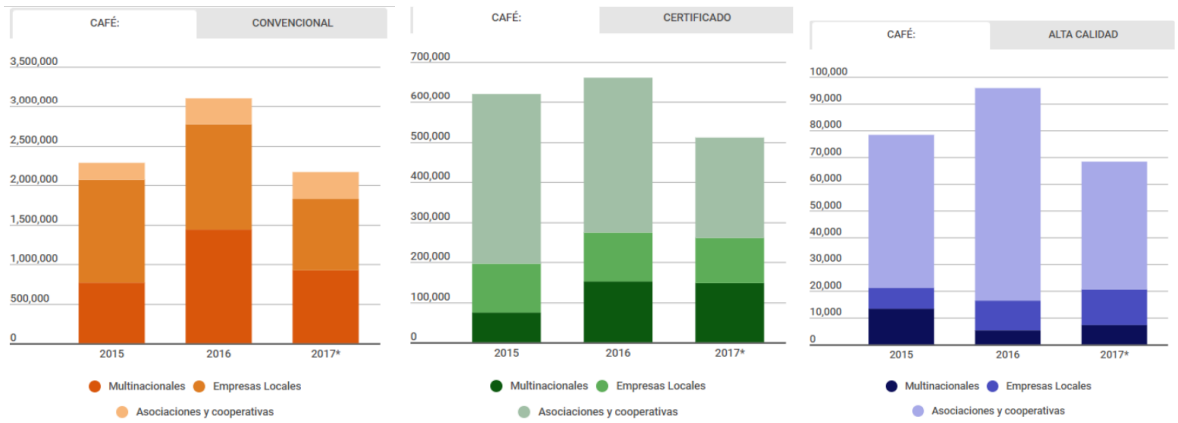
With regards to these markets, it is estimated that coffee's global demand will increase from 155 (9,300 million mt) to 205 million bags (12,300 million mt) between 2015 and 2030, and that Peru´s production will almost double to 7.5 million bags (450,000 mt) during the same period. Other global coffee trends (PROCOLOMBIA, 2016[34]) indicate the potential for market growth, especially for certified or specialty coffees due to increased consumption among young people, increasing number of coffee shops and barristers, increased demand for higher-quality, more natural, sustainable, or certified coffees, and the desire of consumers to trace the origins of the product.

Cocoa. Just three countries – Cote d'Ivoire, Ghana, and Indonesia – dominate global cocoa bean production, accounting for two-thirds of all output. Latin America, on the other hand, represents a relatively small share of the market; the region's 190,000 cocoa farmers produce only 16 percent of the world's total supply.

[33] CCC-GCP-JNC (2017). Boletín Estadístico: Café de Perú, Diciember 2017

[34] PROCOLOMBIA (Exports Tourism Investment Country Brand, Colombia). 2016. Siete tendencias del consumo de café en el mundo y hacia dónde exportarlo (online). Consulted on 14 Jul. 2016. Available at http://www.procolombia.co/actualidad-internacional/agroindustria/siete-tendencias-delconsumo-de-cafe-en-el-mundo-y-hacia-donde-exportarlo

Figure 10. Exports (# 60 kg sacks) and exporters of conventional, certified, and specialty coffee (CCC-GCP-JNC, 2018).



However, total production is growing faster in Latin America than in any other region, at 8% annually (Technoserve, 2017[35]).

Cocoa bean global supply has not kept up with steadily growing demand. In many producing countries, the average cocoa farmer is relatively old, and younger generations are unwilling to produce cocoa, due to the sector's low profits and instability. This supply deficit has tripled the price of cocoa over the past 15 years, and the deficit is expected to continue growing to as much as 1 million metric tons by 2020. Moreover, international chocolate companies (e.g. Nestle) increasingly care about where cocoa is sourced from and how it is produced.

Peru has taken advantage of these macroeconomic trends. Since 1999, annual cocoa output in Peru has more than tripled to 120,000 mt in 2017, as Peru has become the eight largest producer in the world, contributing about 2% to annual global production (FAOSTAT, 2018 obsit). Peru is currently the second largest producer of organic cocoa, as well as the second largest producer of fine, aromatic cocoa, which comprises 5% - 8% of world production (MINAGRI, 2016[36]). According to MINAGRI (2016 obsit), about 44% of Peru´s production corresponds to fine, aromatic varieties (creole and native varieties) and 56% to common (CCN-51+Forastero) varieties. Cocoa has been designated a strategic value chain by Peru's Ministry of Agriculture and Water (MINAGRI) and an alternative to coca production. In March 2014, Peru joined The International Cocoa Organization.

The growing recognition of the quality of Peru cocoa combined with production decline in Africa has resulted in changes in the supply of Peruvian cocoa products. Since the year 2000, Peruvian cocoa exports have shifted from almost entirely cocoa butter shipments to the US, to largely bean shipments to Europe. This shift has been accompanied by direct foreign investment to joint ventures and the direct contracting of cocoa, especially by European cocoa firms (AVSF, 2013[37]; GESTIÓN, 2014a[38];

[35] Technoserve (2017). Building a sustainable cocoa value chain in Peru. Lima
[36] MINAGRI (2016) Estudio del Cacao en el Perú y el Mundo. Situación Actual y Perspectivas en el Mercado Nacional e Internacional al 2015
[37] AVSF (Agronomes et Vétérinaires Sans Frontieres) 2013. . El desarrollo cacaotero peruano. Estrategias para promover y fortalecer la cadena productiva del cacao. Lima: AVSF
[38] GESTIÓN (2014ª). United Cacao apunta a liderar mercado global con proyecto de 3250 hectáreas en Perú. Lima, 12/02/2014.

Huamanchumo, 2013[39]; United Cacao, 2014[40]). In Peru itself, these drivers were reinforced by government and private sector improvements in supporting infrastructure, in particular, roads and telecommunications including access to mobile telephones (Huamachumo, 2013 obsit). Complementary efforts by development agencies involved such initiatives as expanding the warehouse facilities for fermentation and drying, technical assistance, and the formation of cocoa producer cooperatives as major actors in the cocoa value chain (Technoserve, 2016 obsit). Over 25 cooperatives were formed in the San Martin Region during the last twenty years to facilitate small-scale cocoa production and marketing (Technoserve, 2016 obsit).

Cocoa Varieties

Until recently nearly all of the area expansion in cocoa has consisted of CCN-51, a hybrid made available through development assistance programs variety. CCN-51 is resistant to witches' broom disease and has high yields when well-managed, however opinions differ with regard to the flavor profile of the clone. Some connoisseurs characterize the taste of CCN-51 as "acidic and dirty" (Schatzker, 2014) while European industry representatives claim CCN-51 harvested in Peru as among their best cocoa (Huamanchumo, 2013 obsit; Niezen, 2014). Possible reasons for this distinctively different flavor profile between Peruvian CCN-51 and that harvested elsewhere would include the former is produced on small farms in agroforestry systems exposed to the fruits and other flora found in the mega-diverse Amazonian jungle as opposed to the monoculture cultivation prevailing in other countries (Scott, 2016). The classification of Peru's cocoa was recently lowered from 90% to 75% fine and aromatic by ICCO due the increased importance of CCN-51´s share of total output and problems with fermentation and drying (Pipitone, 2015).

Fine cocoa varieties are lower yielding and less resistant, but of higher quality, than CCN-51. These fine cocoa varieties have captured growing commercial attention (Gutsche, 2014). The country itself increasingly recognized as one center of origin for the crop given the high concentration of genetic diversity (Motamayor et al., 2012), and as such traits as "exotic", "differentiated" have emerged as desirable consumer product attributes. Commodity, interest in Peru´s local cocoa varieties has also been taken up by Peru's prominent gourmet food and restaurant industry as a part of their strategy of promoting the country's widely recognized bio-diversity as a key component of their respective business models (Gutsche, 2014). The Peru Cacao Alliance project has established 13,000 ha using seven imported cocoa varieties previously grown locally, but only on a limited scale (Garcia, 2010). These cultivars combine disease resistance and higher productivity along with fine flavor characteristics such as superior aroma and taste (Yturrios, 2015).

Concomitant with changes in markets, the value of exports of cocoa-based products soared from less than US$10 million in 2000 to $134 million in 2013 and then almost doubled to $287 million in 2016, with the majority of the value associated with the export of beans ($201 million in 2016) as compared to cocoa bi-products. About two-thirds of production is exported (although some sources report 90%), mainly to Belgium, the Netherlands, Germany, Italy, the US, and Canada (MINAGRI, 2016), while one-third is consumed nationally.

Fifteen companies are responsible for 70% of the exports, while the top 5 companies account for half of total cocoa exports. About 20% - 25% of the beans have organic or Fair Trade certifications, which include a price premium of 1.9% - 7.5% (Technoserve, 2016 obsit). Currently, 70% of Peru´s cocoa

[39] Huamanchumo de la Cuba, C. (2013) Análisis de la cadena de valor del cacao en la Región San Martin, Perú. Processed. Tarapoto: Swisscontact.
[40] United Caca0. (2014) Admission statement. Grand Cayman: United Cacao

exports is classified as fine, aromatic cocoa, but this proportion has declined in recent years as the lesser quality CCN-51 cocoa hybrid promoted by projects has come into production.

The small, but growing markets that pay high prices for high quality coffee or cocoa represent commercial opportunities, but need to be combined with criteria related to product sustainability. Most certification schemes fail to combine product quality and sustainability criteria (exceptions are some specialty coffees and cocoa); they also fail to meet farmer concerns regarding markets and other economic attributes of production systems (Mithofer et al., 2018[41]). Some have also lost credibility and market share over the last years due to traceability and transparency concerns and the creation of own-company standards by large retailers (Boland, 2017[42]; Vidal, 2017[43]). Therefore, the question of how to combine product quality and environmental impact in certification systems and standards, and the effect on the prices and sale of these commodities, deserves further emphasis.

Oil Palm. Palm oil and kernel oil, extracted from the pulp and kernel of the oil palm fruit respectively, are versatile commodities used in a multitude of products ranging from cooking oil and chocolate bars to soap, toothpaste, cosmetics, as biofuel and in the chemical industries. Thirty years ago, palm oil represented less than 2% of global consumption of fats and oils; today that figure stands at 37%, having displaced soy as the world's most important vegetable oil in 2006 (FAOSTAT, 2013 obsit). Palm oil has grown to dominate the vegetable oil market, largely because vertically integrated corporate producers have developed a cost-efficient agricultural production system that far exceeds the productivity of other oil-producing crops. Long-lived trees produce fatty fruits and oily seeds that are cultivated in industrial plantations with rigorous logistical systems, often integrated to processing facilities fueled by biomass energy. This business model, perfected in Southeast Asia, is now being exported to Latin America and Africa, where it is generating significant economic incentives that increase deforestation (Hayek et al., 2015). By global standards, Peru is a minor oil palm producer, less than 0.1% of world production, which occurs on about 20 million ha.

Peru´s crude palm oil production was 69,118 tons in 2010 (MINAGRI, 2012[44]), 147,000 mt in 2016, and 166,000 mt in 2017 (USDA/FAS, 2018). Recent oil yields are 2.9 – 3.3 mt/ha/yr (USDA/FAS, 2018 obsit), compared to 2.4 mt/ha/yr in 2014 (FENAPALMAPeru, 2014[45]).

According to Pinzon (2018[46]), most (90%) of Peru´s palm oil is consumed nationally, principally by the food and cosmetic industry and the biodiesel industry. Vegetable oil demand in Peru has experienced robust growth over the past two decades, increasing at an annual rate of about 10% and reaching approximately 501,000 tons in 2013, of which palm oil represented about 17% of total consumption

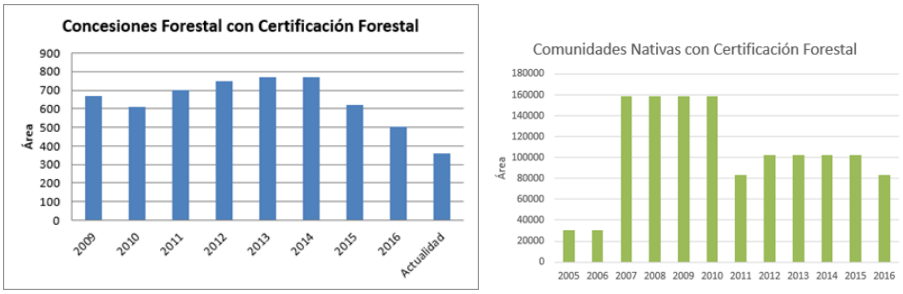
[41] Mithofer C et al. (2018) Unpacking 'sustainable' cocoa: do sustainability standards, development projects and policies address producer concerns in Indonesia, Cameroon and Peru? INTERNATIONAL JOURNAL OF BIODIVERSITY SCIENCE, ECOSYSTEM SERVICES & MANAGEMENT VOL. 13, NO. 1, 444–469 https://doi.org/10.1080/21513732.2018.1432691
[42] Boland H. 2017, 07 July. MPs join calls for Sainsbury's to keep Fairtrade label. The Telegraph. http://www.tele graph.co.uk/business/2017/07/07/mps-join-calls-sains burys-not-axe-fairtrade-label/.
[43] Vidal J. 2017 Jun 27. Move by UK supermarkets threatens to bringFairtradecrashingdown.TheGuardian. https://www. theguardian.com/global-development/2017/jun/24/fair trade-crashing-down-sainsburys-tesco-tea-growers-nairobi
[44] MINAGRI. (2012). Estudio Sobre la Potencialidad de la Palma Aceitera para reducir la Dependencia de Oleaginosas Importadas en el Peru. Dirección de Información Agraria, Dirección General de Competitividad Agraria, Ministerio de Agricultura y Riego – MINAGRI
[45] FENAPALMAPeru. (2014) Estado Situacional de la Palma Aceitera en Peru (PowerPoint presentation)
[46] Pinzon, A. 2018. Sustainable Palm Oil Production in Peru. Global Canopy

in 2012. Exports, mainly to Chile, Colombia and Ecuador, are less than 10% of domestic oil palm production.

Forestry. Total production of about 2.3 M m^3 is estimated based on exports (0.35 M m^3) and the assumption that exports are equivalent to 15% of total production (Mejia et al., 2015 obsit). This implies that 2 M m^3 of annual domestic wood produced is channeled to the national market, which is also supplied by approximately 0.8 M m^3 of imports, thus giving a total domestic demand of about 3 M m^3. Of the total estimated annual production of 2.3 m^3, 1.4 M m^3 is official, thus implying that illegal wood contributes about 40% of domestic production (other reports that suggest that illegal wood is 40% - 62% of total production, Mejia et al., 2015 obsit, Apoyo Consulting, unpublished). Between 2012 and 2016, decreases of about 30% in legal annual production and wood exports, largely due to questions about the source and legality of timber origin, and relatively stable imports, suggest that an estimated 10% annual increase in domestic demand for wood (ADEX, personal communication), is largely being met by increases in illegal wood.

One defense against illegal wood is the use of forest certification, however the area of certified forests in Peru has decreased from appoximately one million hectares in 2013 to 700,000 ha in 2016. During this period, some companies (e.g. Maderas Peruanas S.A.) lost their concessions, while others went broke (Consorcio Forestal Amazónico with 180,000 ha). Figure 5 presents data on certified forest areas during recent years.

Figure 5. Certified forests in forestry concessions and indigenous communities (FSC[47]).



Wood is sourced from 4 centers: Madre de Dios, Pucallpa in Ucayali, and Alto Amazonas and Iquitos in Loreto (Figure 6). The different products and markets related to these centers are shown in Table 7.

National markets consume about 98% of the wood produced (Table 7). Of the wood exported, that originating from Loreto is destined mainly to Mexico and the US, due to businesses of these countries in Loreto. The principal international destination of wood produced in Ucayali is China and is associated with a cluster of businesses in Pucallpa financed with Chinese investments. The destination

[47] FSC .
https://pe.fsc.org/es-pe/nuestro-impacto/datos-y-cifras/datos-y-cifras-2014

https://www.serfor.gob.pe/wp-content/uploads/2016/03/estadistica_certificacion.pdf

of wood produced in Madre de Dios is variable and includes China, the US, and Europe. Approximately 10 businesses account for the bulk of wood purchases and exports.

Figure 6. Commercial circuits of wood in Peru (Mejia et al, 2015).

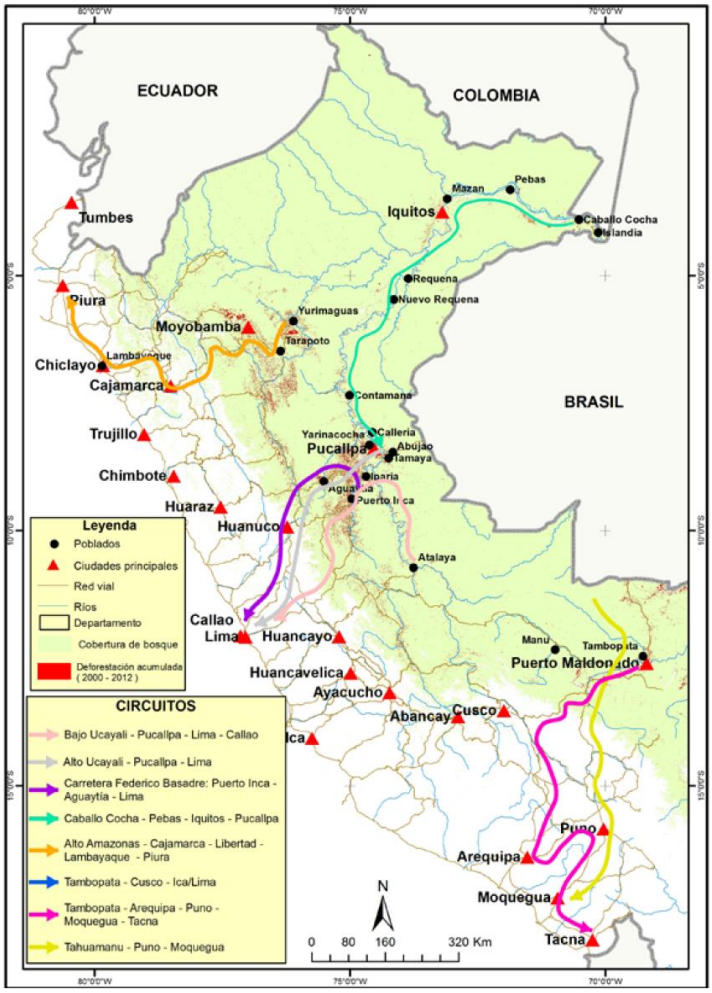


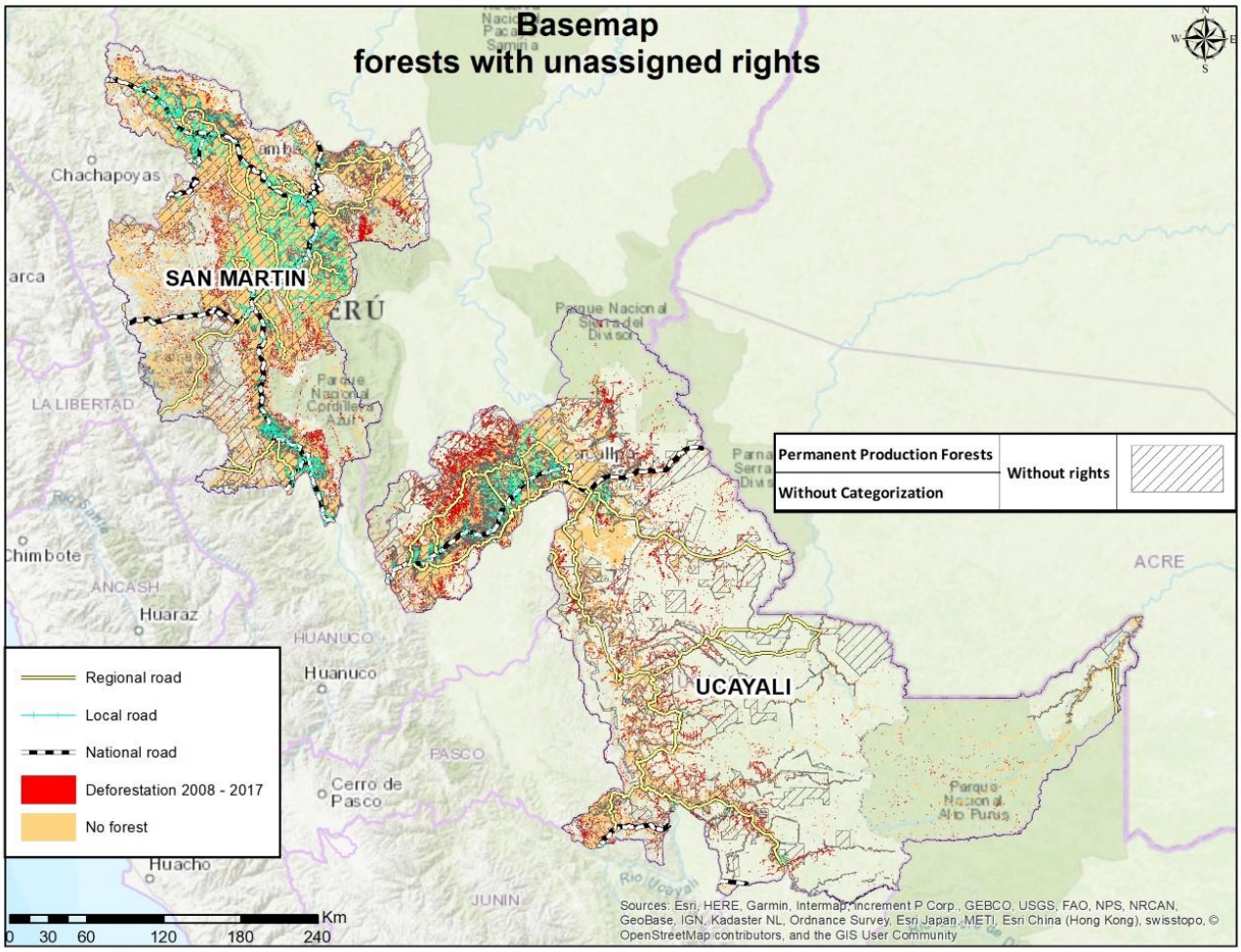
Table 7. Wood transformation and markets related to centers of production.

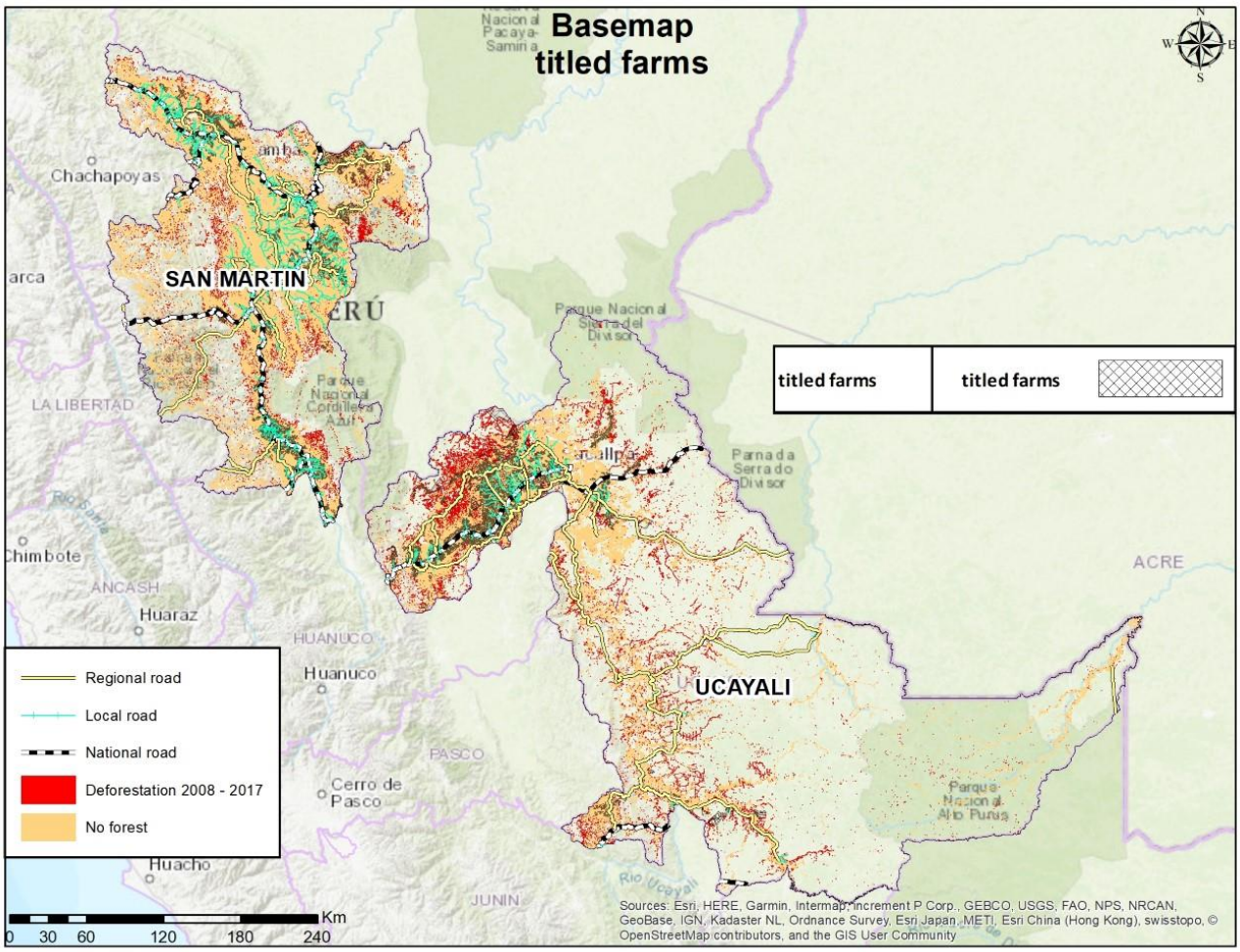
Región	Tipos de bosques	Materia prima	Industria primaria[a]	Industria secundaria y recuperación[b]	Mercados principales
Amazonía Norte Amazonas, San Marín	Bosques naturales	Madera rolliza Madera aserrada	Aserradero local-nacional Madera aserrada dimensionada Secado,	Industria del mueble Cepillado y empaquetado Industria de embarcaciones Comercial, corta y larga angosta Tablones, tablas y tablillas	Trujillo Chiclayo Piura
		Madera aserrada	Aserradero local-nacional Secado, cepillado, moldeado y embalado	Industria de piso Bloques de 6" Frisas, decking o piso exterior, machimbrados piso interior.	Trujillo Chiclayo Piura Mercado internacional
Amazonía Centro Ucayali	Bosques naturales	Madera aserrada	Aserradero local-nacional Comercial, corta y larga angosta	Industria del mueble Industria de embarcaciones Industria de Carrocerías Industria de materiales de construcción. Puertas y ventanas. Escaleras	Lima, Villa El Salvador, San Juan de Lurigancho, San Martín de Porres Estados Unidos, Italia, Panamá
		Madera aserrada	Aserradero local-nacional	Secado, cepillado, moldeado y embalado Bloques de 6" Frisas, decking o pisos exteriores, machihembrados o pisos interiores	China Estados Unidos México República Dominicana
		Madera rolliza	Aserradero local-nacional Industria de tableros y enchapes (triplay) Industria de durmientes Industria de contrachapados	Industria de parihuela Tablones, tablas y tablillas Industria de paqueterías	Lima, Arequipa México, Estados Unidos Ecuador, Puerto Rico Venezuela
	Plantaciones forestales y regeneración	Madera rolliza		Industria de casas prefabricadas (bolaina) Industria de palos de helado	Lima
Amazonía Sur Madre de Dios	Bosques naturales	Madera aserrada Comercial, corta y larga angosta	Aserradero local-nacional	Industria del mueble cepillado y empaquetado Industria de embarcaciones Comercial, corta y larga angosta Tablones, tablas y tablillas	Cusco, Juliaca, Puno, Arequipa Lima
		Madera aserrada Bloques de 6"	Aserradero local-nacional	Industria de pisos Secado, cepillado, moldeado y embalado Frisas, decking o pisos exteriores, machihembrados o pisos interiores	China (Hong Kong)
		Madera rolliza	Aserradero local-nacional	Industria de paquetería Listones	Varios de la costa
	Plantaciones forestales y regeneración	Madera rolliza	Aserradero local-nacional	Aserrado de tablillas	Cusco, Juliaca, Puno, Arequipa Chile

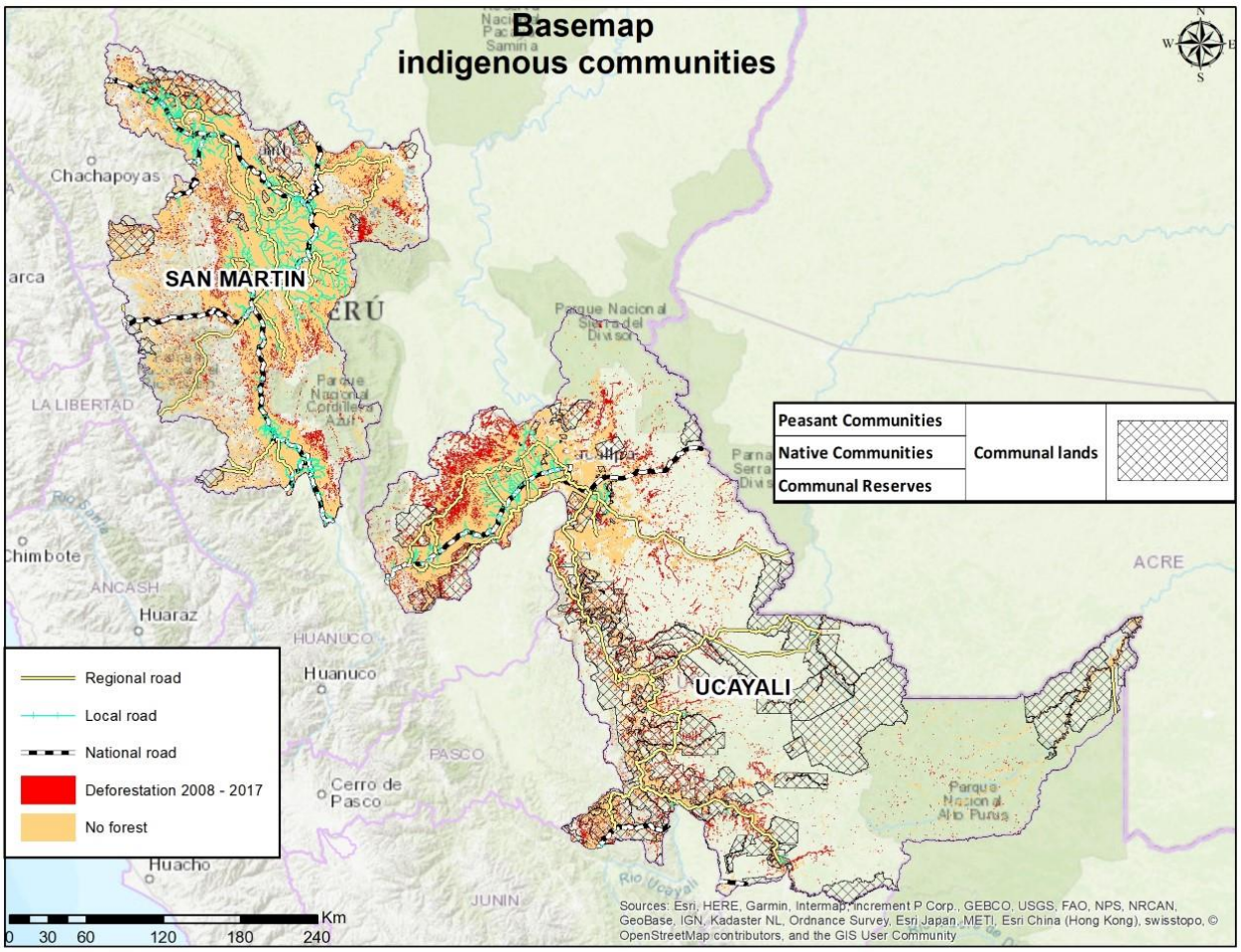
Fuente: Elaboración propia con base en (Falconí, 2004; MINCETUR, 2005; WWF-Perú, 2005; WWF-Perú, 2005; Gironda, 2008; AIDER, 2012).

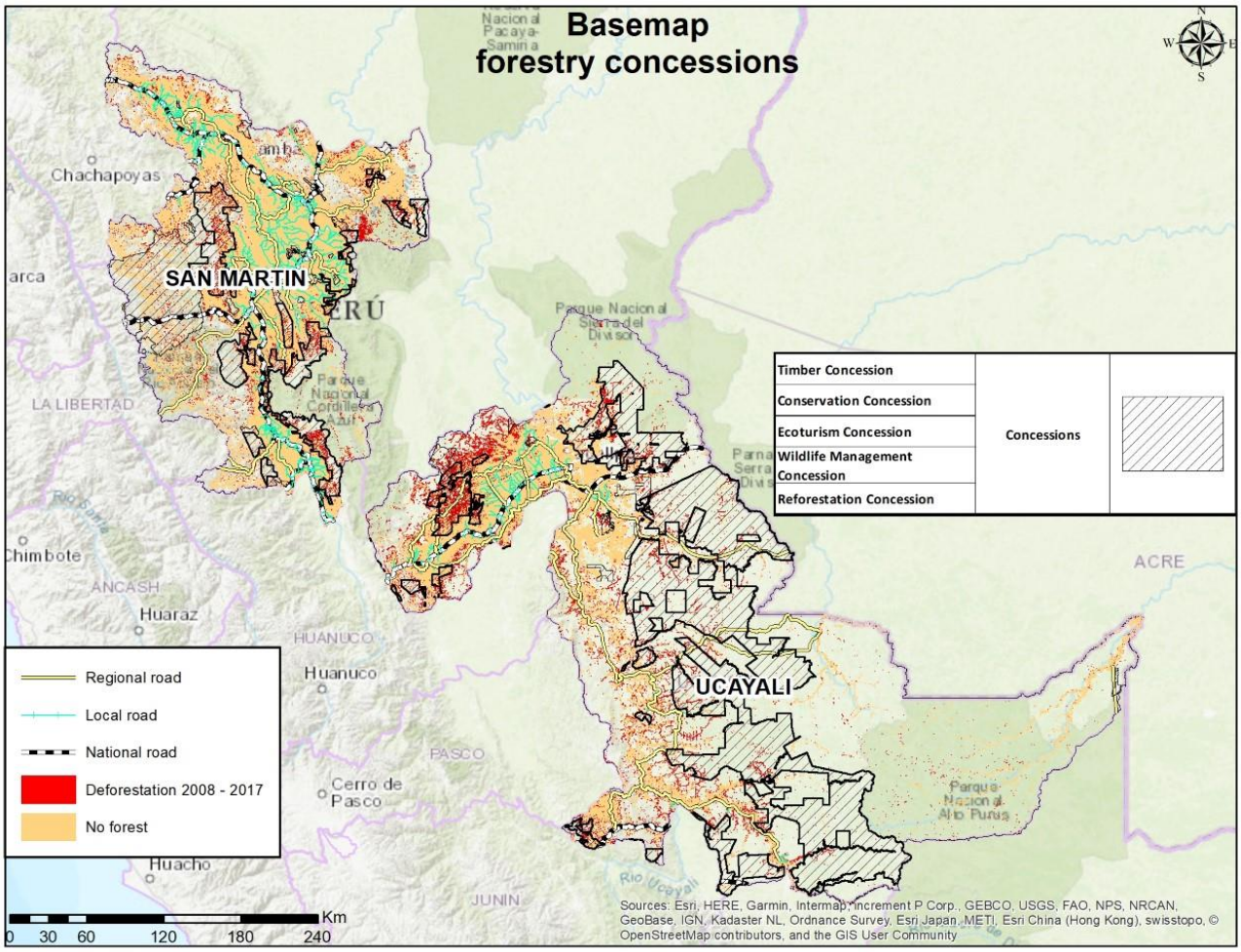
Nota: a) Aserrío, reaserrío, desbobinado, corte plano con cuchilla fija, chipiado, torneado de madera en rollo, secado y preservación. b) Estructura de madera, cobertura de madera, carpintería de obra, pisos de madera, muebles, envases, empaques, embalajes, parihuelas, carrocerías, embarcaciones.

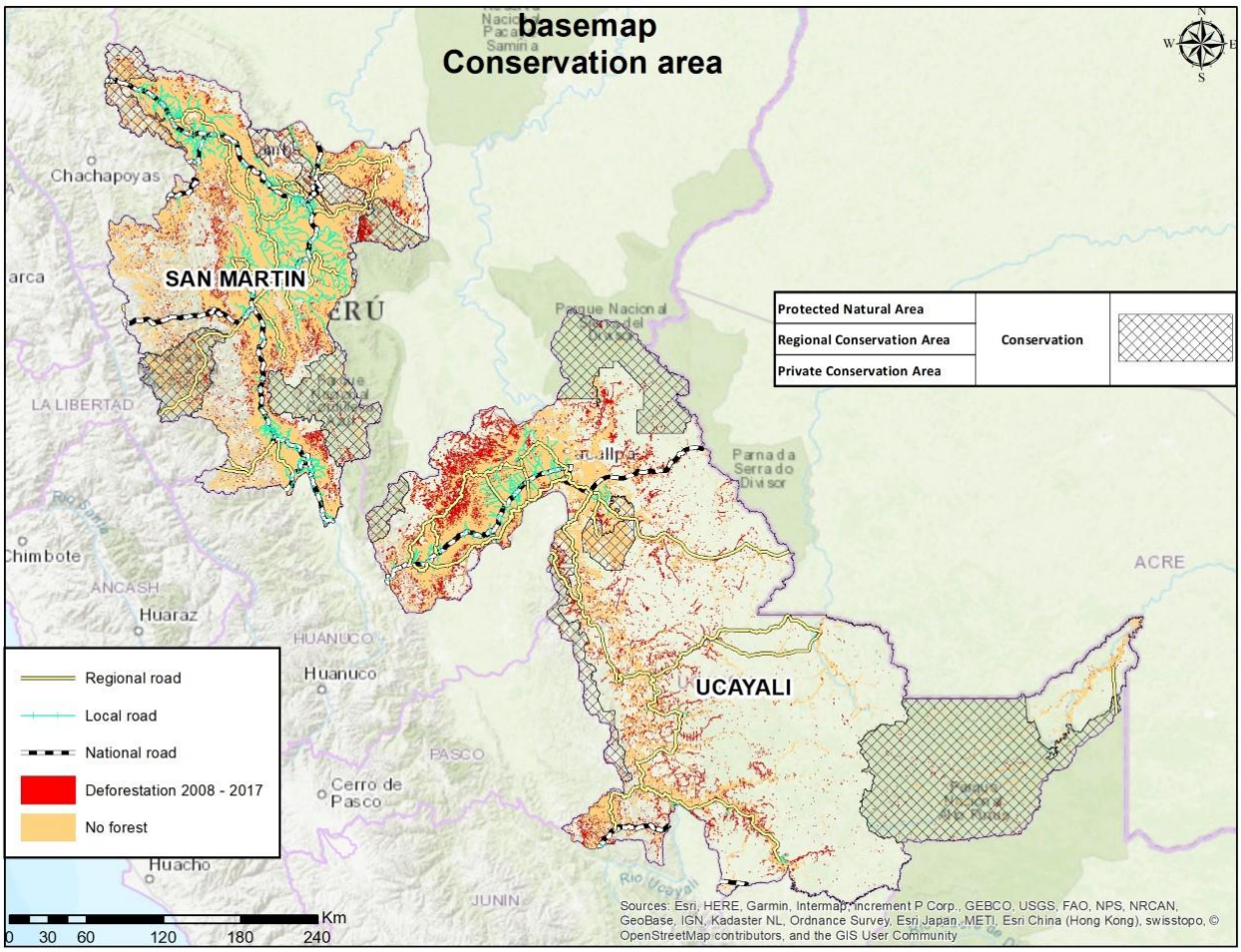
Annex 3. Deforestation (2008-2017) by land tenure category



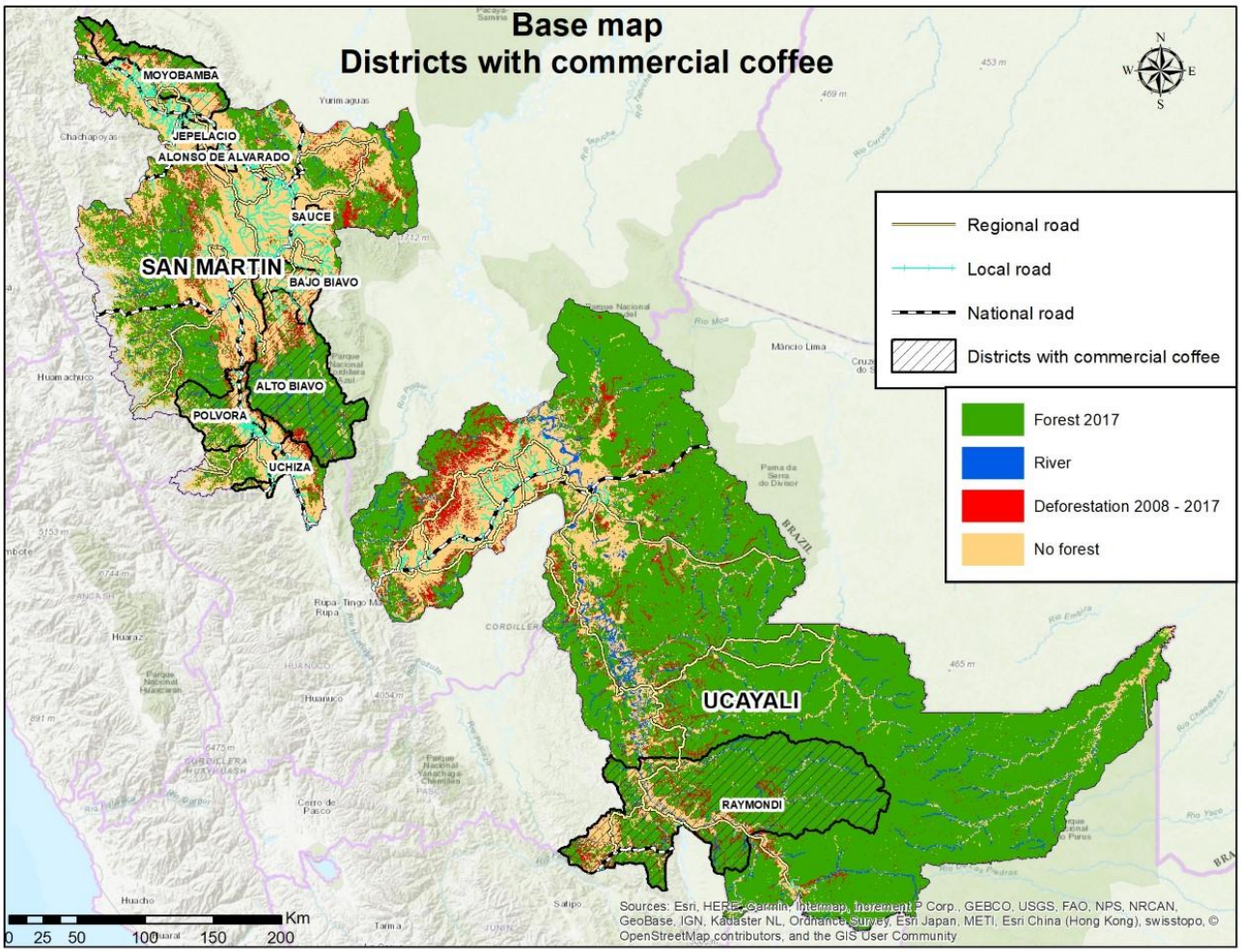

Basemap
titled farms
SAN MARTIN
UCAYALI
Chachapoyas
LA LIBERTAD
Huaraz
ANCASH
Huanuco
HUANUCO
PASCO
Cerro de Pasco
Huacho
JUNIN
ACRE
titled farms
titled farms
Regional road
Local road
National road
Deforestation 2008 - 2017
No forest
Km
0 30 60 120 180 240
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

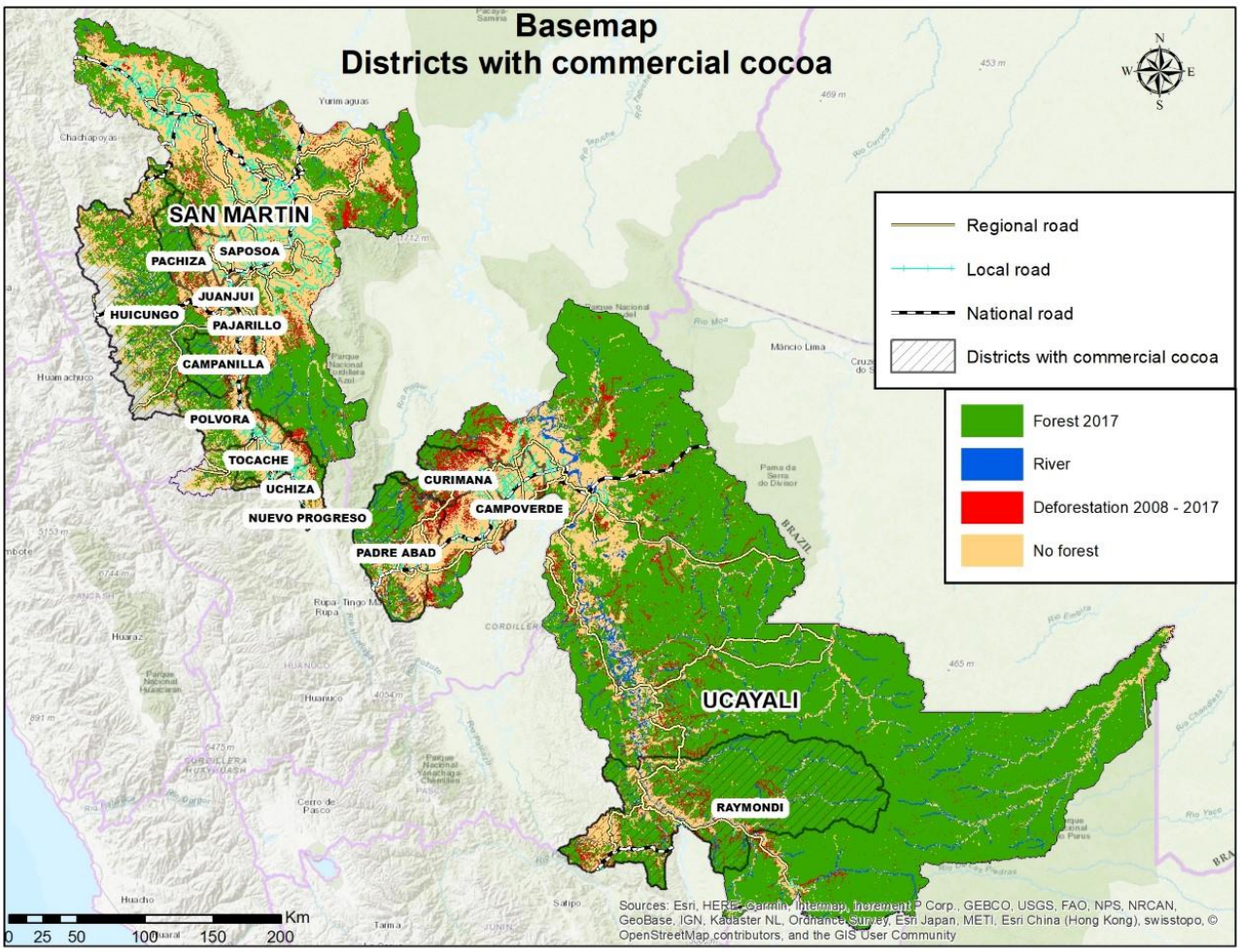

Basemap
indigenous communities
SAN MARTIN
UCAYALI
Chachapoyas
LA LIBERTAD
Chimbote
ANCASH
Huaraz
HUANUCO
Huanuco
PASCO
Cerro de Pasco
Huacho
JUNIN
ACRE
Parque Nacional Cordillera Azul
Parque Nacional Alto Purus
Peasant Communities
Native Communities
Communal Reserves
Communal lands
Regional road
Local road
National road
Deforestation 2008 - 2017
No forest
0 30 60 120 180 240
Km
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

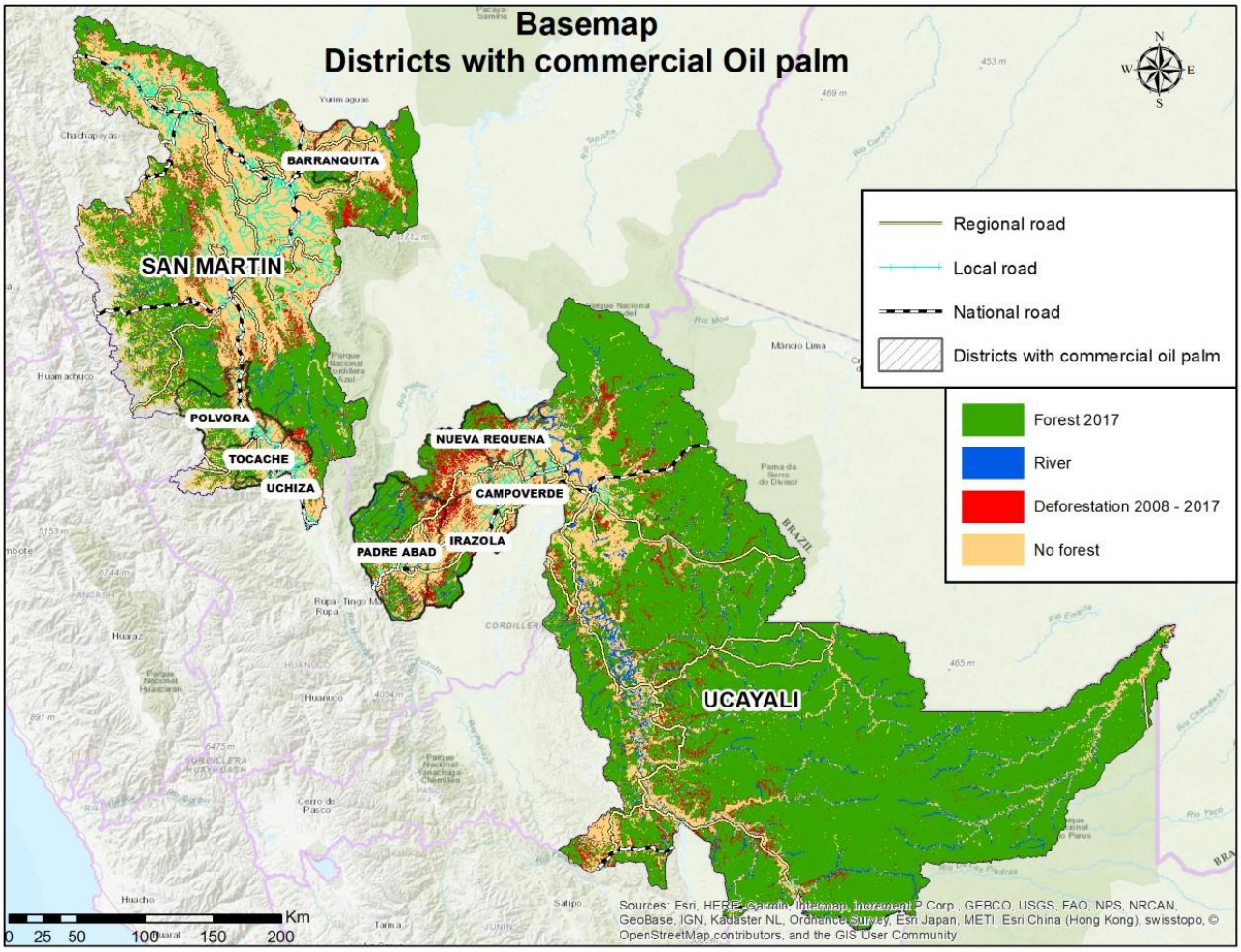

Basemap
forestry concessions
SAN MARTIN
UCAYALI
Chachapoyas
LA LIBERTAD
ANCASH
Huaraz
HUANUCO
Huanuco
PASCO
Cerro de Pasco
Huacho
JUNIN
ACRE
Timber Concession
Conservation Concession
Ecoturism Concession
Wildlife Management Concession
Reforestation Concession
Concessions
Regional road
Local road
National road
Deforestation 2008 - 2017
No forest
0 30 60 120 180 240 Km
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

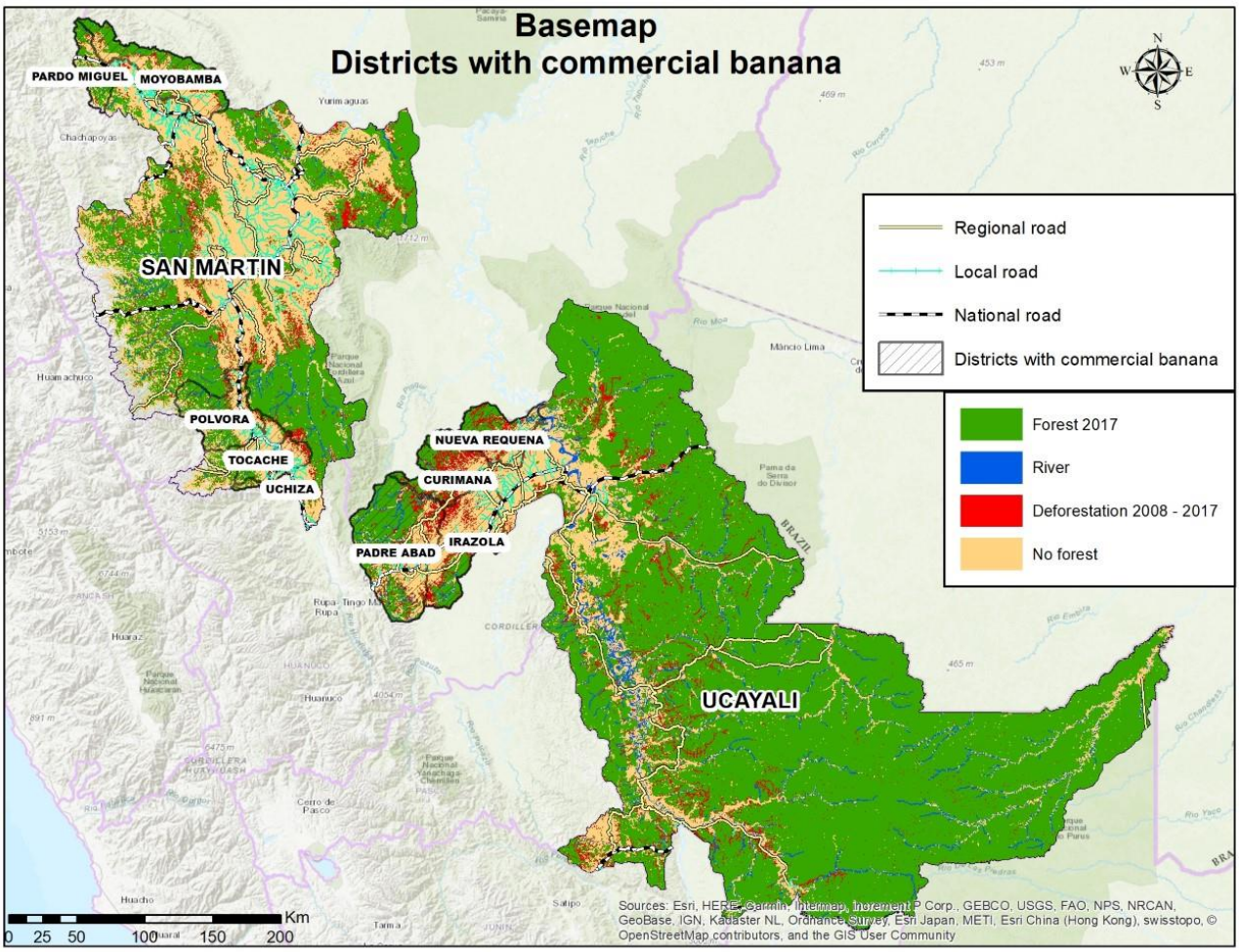

basemap
Conservation area
Chachapoyas
SAN MARTIN
LA LIBERTAD
ANCASH
Huaraz
Chimbote
HUANUCO
Huanuco
PASCO
Cerro de Pasco
Huacho
JUNIN
UCAYALI
ACRE
Parque Nacional Cordillera Azul
Parque Nacional Sierra del Divisor
Parque Nacional Alto Purús
Río Ucayali
Protected Natural Area
Regional Conservation Area
Private Conservation Area
Conservation
Regional road
Local road
National road
Deforestation 2008 - 2017
No forest
0 30 60 120 180 240
Km
N
S
W
E
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Annex 4. Districts with large areas of coffee, cocoa, oil palm, and plantain




Basemap
Districts with commercial cocoa
SAN MARTIN
SAPOSOA
PACHIZA
JUANJUI
HUICUNGO
PAJARILLO
CAMPANILLA
POLVORA
TOCACHE
UCHIZA
NUEVO PROGRESO
CURIMANA
CAMPOVERDE
PADRE ABAD
UCAYALI
RAYMONDI
Regional road
Local road
National road
Districts with commercial cocoa
Forest 2017
River
Deforestation 2008 - 2017
No forest
Km
0 25 50 100 150 200
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community


Basemap
Districts with commercial Oil palm
N
W
E
S
Regional road
Local road
National road
Districts with commercial oil palm
Forest 2017
River
Deforestation 2008 - 2017
No forest
BARRANQUITA
SAN MARTIN
POLVORA
TOCACHE
UCHIZA
NUEVA REQUENA
CAMPOVERDE
IRAZOLA
PADRE ABAD
UCAYALI
Km
0 25 50 100 150 200
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community


Basemap
Districts with commercial banana
PARDO MIGUEL
MOYOBAMBA
SAN MARTIN
POLVORA
TOCACHE
UCHIZA
NUEVA REQUENA
CURIMANA
PADRE ABAD
IRAZOLA
UCAYALI
Regional road
Local road
National road
Districts with commercial banana
Forest 2017
River
Deforestation 2008 - 2017
No forest
N
S
W
E
0 25 50 100 150 200
Km
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community