

REVIEW ARTICLE

Is timber harvesting of natural forests in Peru sustainable?

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ABSTRACT

No less than 60% of timber production in Peru's natural forests is the result of informal or illegal extractive activities that, by definition, are not sustainable. This article aims to demonstrate that even legitimate timber, such as timber harvested in more than 6 million hectares of forest concessions, does not meet the basic requirements of sustainable forest management. Forestry legislation itself, which does not emphasize forest management, institutional weaknesses and the socioeconomic environment are the main causes. In addition, the cutting cycles and the authorized minimum diameters, among other practices, do not allow the renewal of the resource and increase its degradation.

Keywords: Informality; Forest Management; Sustainability; Legislation

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1. Introduction

It is well known that forest legislation in tropical countries is poorly enforced^[1-3] both because of the weakness of the institutions in charge of enforcing it and its limited adaptation to national and especially regional realities. That has been repeatedly demonstrated in the Peruvian case and with different legal bodies^[4-7]. The consequence is, evidently, a high proportion of illegitimacy existed in the production of goods in the sector, especially timber.

Timber produced without complying with forestry legislation, i.e. that which is illegal or of informal origin¹ comes, in principle, from forests that are not managed or used in a sustainable manner. It is extracted from the forests of various forest management units, namely indigenous and peasant communities, local forests and forests on private lands. The law stipulates that in these types of forests, approved timber mining requires basic management plans, and the general rules for developing these plans are sometimes applied locally, but they are not followed. There is also timber extraction in protected natural areas, productive forests in reserves, community forests and even those forests with timber forest concessions or other uses (conservation, ecotourism, non-timber products). There is also extraction in areas that are deforested for agricultural and livestock purposes in secondary forests.

There are various estimations of the proportion of illegal timber circulating and being traded in Peru. However, there is unanimity that no less than 60% of that timber is not "legal" although there are referen-

¹ The difference between these terms is political or social use. In practice, all those engaged in these activities have violated the law, so there is a great risk of unsustainable exploitation of resources.

ces that cite much higher figures, depending on the criteria or context applied^[5,8-15]. This is to be expected to be known that 96% companies in the forestry sector are mini-companies and that business and labor informality in the sector show rates of 73% and 91% respectively^[16]. The Forest and Wildlife Resources Oversight Agency^[17] reveals that, from 2015 to 2020, the volume of unauthorized trees came from local forests (37%), native and peasant communities (36%), private estates and other modalities (14%), including expired timber concessions^[17]. Obviously, timber used for domestic consumption are mostly illegal, accounting for more than 90% of the production^[16]. Among the exported timber, this proportion is lower because it is subject to stricter supervision and usually comes from forest concessions.

Timber is considered to be of legal origin when it comes from timber concessions, where in principle legislation is complied with and *ad hoc* management plans are implemented. In fact, the illegal share of the amount of unauthorized timber transferred from existing timber concessions averages less than 13%, for example, in 2019, it accounted for only 3.4% of the total illegal volume recorded by Osinfor^[17]. However, Osinfor reports that between 2009 and 2020, more than 618,174 cubic meters of illegal timber was transferred from timber concessions.

Timber forestry concessions were granted on 18.7 million hectares of productive forest^[18], of which a portion is granted to companies through so-called enabling titles and another portion is held in reserve, awaiting to be granted. To operate a forest concession, it is mandatory to prepare and implement a forest management plan following the guidelines of the current forestry law^[19], the regulations for forest management^[20] and the guidelines for management plans in concessions of the Forestry and Wildlife Service^[21], which is evaluated and approved by the regional forestry authority, and monitored and eventually supervised by Osinfor^[22].

The concept of “legitimacy” involves two aspects of forest utilization. The most obvious and conventional one is to consider it as the utilization that obeys the precepts contained in the current leg-

islation. The other refers to the observance of the purpose of the law in force, which as the previous ones, declares (article 10) to be “to promote the conservation, protection, increasing and sustainable use of the forest and wildlife heritage within the national territory, integrating its management with the maintenance and improvement of the services of forest ecosystems and other wild vegetation ecosystems, in harmony with the social, economic and environmental interest of the nation...”.

The legitimacy demanded by the forestry authorities (Serfor and regional forestry authorities) and supervised by Osinfor involves the first aspect, i.e. meeting many important but basically formal requirements, but actually does not take into account the second aspect, although this is the reason for the existence of the law. In other words, even if the existing legislation is strictly observed so that all timber produced is “legal”, the exact purpose of conservation and sustainable use of forest resources will not be achieved.

2. Forestry legislation that disregards forest management

Both the current Peruvian forestry legislation and previous ones have been criticized for their ineffectiveness and complexity^[4,6,7]. However, these analyses have not highlighted the lack of direct relationship of current legislation with the quality of forest management. Indeed, the absolute majority of the articles of the current law^[19] and its regulations simply ignore the fact that the only tool that can ensure the sustainable use of the forest is forest management.

Forest management is the brain and the arm of forest engineering. The management is what, in the forest itself, makes it possible to use it without destroying it, ensuring the longed-for and promoted ecological, economic and social sustainability. It is a set of science based technologies that allow the extraction of timber and other forest assets from forests without destroying them, damaging their future productivity or damaging the environmental services they provide^[23,24]. It is therefore fundamentally through forest management that “the conservation, protection, enhancement and sustainable

use of the forest heritage” can be achieved, as required by law. Everything else, although important and part of forest management² at the national or regional level, is complementary. Forest management applies to both natural and cultivated forests. However, it reaches its maximum importance and complexity in the former and should be applied to productive forests under concessions as well as local, community and other forests stipulated by the legislation.

As anticipated, the current forestry legislation has two categories of articles. A few, such as the one mentioned above, are of a declarative nature, i.e. those commonly constitute the “spirit of the law”, i.e. what is expected to be achieved with its application. In this case, it is the sustainable and social utilization of the resource. The other type of articles, which are the overwhelming majority, are practical and deal with the long series of conditions and formalities required for the exploitation of the resource and for extracting, transporting and marketing timber and other goods, especially in the relevant regulations of the current law. This second category of regulations also has two types. Some are unquestionably important for management at the national level, such as those dealing with partition, management, planning, national inventory, cadastre, modalities of access to the resource, gender issues, indigenous issues, etc. But they are not central or specific to the forest that supposed to be managed. The other types, which make up an important part of the law, are also necessary. Even if they are mere formalities, such as documents that prove the suitability and solvency of those who want to exploit the forest, the diversity of authorizations, the different types of reports, deadlines, payment of fees, amounts of fines and modalities of payment, commitments, etc. In other words, the common denom-

² There is a great deal of confusion between the concepts of forest management, regime and management. Management is the administration of forest resources at the national or regional level. Management applies a regime, i.e. the modality by which the State allows access to the national forest heritage. Both the management and the regime must be defined by national forest policy and enshrined in legislation. Forest management does not depend on policy but on science and experience. Management is carried out in the forest, but it must be protected by legislation.

inator of these articles of the law is that they do not deal directly with forest management, which is the key to achieving the goal of sustainable use of the resource.

The little importance given to forest management is showed by the fact that this subject is addressed in only two of the 157 articles of the law and in only one of the 217 articles of the relevant regulations. It is in these items that hundreds of items are lost, many of which are irrelevant. The conservation, protection, increase and sustainable use of forest resources basically depend on these items. Those articles are very general and, in fact, everything related to ensuring sustainability is derived from the above moderate regulation “Guidelines for the Preparation of the General Forest Management Plan for Forest Concessions for Timber Purposes”.

It also draws attention to the fact that, in addition to being out of line with the sustainability goals already emphasized by Anderson *et al.*^[25], Article 207.2 (w) and other provisions of the regulation refer to the only very serious infringement explicitly referring to forest management plans. If this point is taken seriously, the management plan formulated with false information or only low-quality information should become an important reason and decisive factor for any authorization or authorization failure.

It happens, to put it another way, that the much sought after and much cited sustainability is demonstrated by effective forest management, not legal texts, extensive documents, colorful maps, articles or books. These are indispensable, but not sufficient. They are of little use if the trees in the forest are improperly cut down and if the resource is not able to regenerate and recover to serve the next generations. Achieving this goal depends on the quality of the management plan and its correct implementation, namely management. The rest are of secondary importance.

3. What is the approved quality management plan?

The more degraded the developed forest is, the worse the management plan is, or if the manage-

ment is done well, the less the plan is implemented. The issue of the quality and application of management plans in tropical natural forests, especially from the point of view of their sustainability, has been discussed worldwide for decades^[26-31]. It has also been treated for Peruvian conditions, from economic or sociopolitical approaches^[32-34] or from a diversity of technical and management angles^[9,35-40]. Although a variety of results have been achieved, a common conclusion of these publications is that the efforts to transform forest management into reality have encountered great obstacles, and obviously no significant results have been achieved. Even in the case of timber concessions, since 1975, they initially focused on and hoped to make good use of natural forests in the name of forest logging contracts.

The following discussion on the quality of management plans deals only with those applied to timber concessions, since those applied to other forest categories are too general and elementary and, with some exceptions, if they were applied, they would not be a guarantee of sustainability. Plans to manage timber concessions cover a wide range of qualities, from those reasonably established in accordance with the Serfor guidelines to those that have been plagiarized or forged to some extent. It is evident that, in cases where the standards are not respected, the sustainability of the resource is not assured. However, as we will see, strict implementation of existing rules cannot ensure the protection of forest resources.

As revealed by evidence that gathered by Kometter^[40] and recorded since 2009 by Osinfor, practically all forest management plans submitted to the forestry authority, and most of those have been approved and implemented in theory, have several or most of the following shortcomings: (i) forest inventories are insufficient, partial and, frequently, poorly done or falsified; (ii) identify all homogeneous cutting tracts or quarters of equal size or with boundaries defined by straight lines, despite the fact that the timber resource (available quantities) is never equally distributed and that there are areas that cannot be exploited; (iii) cutting cycles or

turns³ with insufficient time to replenish the resource; (iv) diameters of trees to be cut that are smaller than what is necessary to replenish the resource; (v) selective extraction, targeting only a few commercial species or those with the highest market value, while wasting others; (vi) high impact logging and skidding or small scale transport practices (within the forest); (vii) almost total absence of silvicultural practices, including maintenance of seed trees; (viii) lack of measures to control encroachment and deforestation and other illegal practices, such as hunting in the sections or logging quarters under restoration; (ix) enormous volume of waste both in the forest and in primary processing; (x) non-existent or very low quality permanent infrastructure; (xi) lack of on-site demarcation of protection areas within the concession and, frequently, they are often overexploited or illegally exploited in the concession area; (xii) disconnection between extraction and the respective industry. But this list only mentions the main issues, and it should also be noted that the quality of the management plan is independent from how it is implemented. An excellent management plan is of little use if it is not or only partially implemented.

From all of the above, which together define the technical quality⁴ of a management plan, two elements are key to determine the sustainability of the utilization: (i) a cutting cycle that provides the necessary time for the uncut trees (i.e. those below the harvestable diameter) to reach that diameter in the next cycle; (ii) minimum cutting diameters that allows the retaining of a stock of trees in the forest that will be ready to be harvested in the next cycle. Both values allow determining the factors that regulate cutting intensity.

In Peru, these two elements are in line with the

³ Both terms refer to the number of years that must elapse before the trees grow to the minimum diameter appropriate for felling. Rotation, however, implies not returning to the felling section management modalities, such as polycyclic management, which differentiates between the time required for the recovery in the meantime, and is used in contemporary artificial forests or in natural forests when unified management is applied. The concept of cutting cycle is applied in other of different species groups.

⁴ The quality of a management plan also depends on social and economic parameters. The environmental ones should, in principle, be included among the so-called technical ones.

Serfor guidelines (the aforementioned guidelines), which allow very short cutting cycles and very small minimum cutting diameters. Indeed, following a worldwide trend that responds to a large extent to the growing demand for timber and the interest of loggers, cutting cycles are becoming shorter and shorter. For example, Malaysia, like other Asian and African tropical countries, has transitioned from the unified management of its forests with rotation of more than 60 years to the current short-term cycle of 20 to 30 years^[41]. Several tropical countries, including Peru, have followed the same trend, applying polycyclic management plans. It is worth recalling that Peruvian regulations based on laws 14552 of 1963 and 21147 of 1975 required cycles of no less than 40 years. An important recent study^[40], including that conducted at the global level^[30,31], demonstrated that in the Peruvian rainforest it is impossible to achieve general replenishment of the resource with cycles of less than 30 years and that the best ecological and economic profitability is obtained with 40-year cycles.

At this point it should be noted that polycyclic forest management, based on the fact that each tree species has a different growth rate, which is also variable in each site and also has different uses, including smaller timber, offers great advantages for the forest user in terms of the market^[24,42]. Ensuring that the forest user has a good profitability is very important, but, logically, this is viewed with great concern by many specialists, who believe that such short cutting cycles do not guarantee the sustainability of the resource, let alone maintain the environmental services^[27,43-46]. Furthermore, although well known, low-impact logging techniques are generally not applied, generating much damage to soil, natural regeneration, non-targeted trees and interference with wildlife. Finally, the supervision of the implementation of polycyclic management plans is more complex than that of conventional management plans. That is, if polycyclic management plans are accepted, they must be particularly well evaluated and monitored.

The same study by Kometter^[40] revealed that the minimum authorized cutting diameters were 70% to 80% below the minimum recommended for each

species. Worse, the application of these diameters does not take into account the factor that these diameters are applied without taking into account that the growth of each species at each location is different, and that it is illogical to apply a unified value for the entire forest. He also found that more than 60% of the wood that has commercial value remains in the forest, mainly because the extraction costs are very high and the prices of these woods do not compensate them, resulting in a tremendous waste of wood and unnecessary damage to the forest. The same author found that the cutting intensity determined according to the extraction balances ranged from 5.3 m³/ha in Loreto to barely 3.1 m³/ha in Madre de Dios, and 4.2 m³/ha in Ucayali, ratifying the low efficiency of harvesting. In all regions, the amount of wood harvested was far lower than the forest potential, wasting species and recoverable volume again, and correspondingly increasing the negative impact of cutting. It should be added that, according to current regulations, the fees are paid per unit area, not per tree species of different quality. Doing so is simpler, but it devalues the resource and encourages waste.

In addition, the current regulations create dangerous differences between "general management plan", "intermediate forest management plan" and "annual operating plan" which, curiously enough, can be triannual. The management plan is an indivisible unit. The existence of "annual" but three-year operational plans, as expected, determines that it is the only plan to monitor in the field, which shows that the nature of long-term, sustainable management is not important.

In other words, as anticipated, even if the current regulations are complied with, as Osinfor tries to confirm with great effort^[10], the much sought-after sustainability would not be achieved and, on the contrary, forest resource degradation would continue to expand, with serious implications in terms of reduction of environmental services, loss of biodiversity and, for example, increased risks of invasions and forest fires due to extraction routes.

4. Management and regime errors that affect forest management

It is impossible to hide the magnitude of the failure of the current forest management and concession regime. The growing deforestation, the unacceptably high proportion of illegal timber in circulation and the dominance of informality in the activity are clear evidence of this. But this lack of good results extends, as seen, to timber forest concessions, which, in the last laws, was considered a central element of the solution to achieve the objectives of activating the forestry sector, but according to some opinions, it is also largely responsible for the problem of informality^[9,32,34].

In fact, seventeen years after the start of the timber concession model on supposedly productive forests, which actually had not been studied and whose true potential was unknown^[34], and after 827 of them had been granted, covering 11.2 million hectares, only 427 (56%) remain in force, covering 6.3 million hectares^[47]. The reasons for the invalidation of the qualification certificate are various, including the presentation of false information in the management plans and/or in the annual operating plans, declaring larger volumes than the existing ones to justify timber extracted elsewhere by them or by third parties is legitimate, and the unauthorized extraction or mobilization of timber. But there are also a series of other causes, such as changes in land use and, of course, non-compliance with the investment commitments agreed upon in granting ownership and non-payment of harvesting rights. In fact, many of the concessions are simply abandoned.⁵

This is not to say that according to the principles of forestry engineering, it is technically and economically infeasible to produce wood from tropical natural forests in a sustainable manner. There is evidence that it is indeed, or at least can be proved to some extent, especially in the more disciplined colonial times of Africa and Asia^[26,48,49]. But

⁵ For example, Amazon forest Consortium (CFA) is a large forest franchise with good technology, including certification and international market. But it accumulated an unpayable debt, so its owners preferred to abandon the concession, leaving personnel, infrastructure, equipment and machinery in the forest. Personal communication from R. Kommeter^[40].

to achieve it under the socioeconomic context now predominant in Peru and other tropical countries, confronts the lack of a series of requirements or conditions. Several studies analyzed these problems at the global or regional level^[26,46,50] as well as at the national level^[33,39,51-53].

In other words, although absolutely essential, it is not enough to have good management plans that are fully implemented. There is an environment that conditions the application of management and that, in Peru, is very unfavorable to it. This environment includes: (i) profuse, confusing, complicated, inadequate legislation that is difficult and costly to implement and, worse, provides rigid and inadequate guidelines for forest harvesting; (ii) serious institutional deficiencies at the level of national and regional forestry authorities, including fragmentation of responsibilities and inability to enforce the law, which to some extent originated from the unnecessary complexity of the sector's legal body; (iii) low academic level and lack of professional competence in the various public forestry institutions, resulting in inadequate rules and the approval of poor quality forest management plans; (iv) widespread malpractice and corruption; (v) lack of technical and capital assistance and difficulty in obtaining credit, so a large number of "grants" are used; (vi) lack of incentives for formalization; (vii) inefficiencies or deficiencies in business management; (viii) inadequate transport and marketing infrastructure, as well as lack of financing and qualified technical assistance.

Added to this is the extreme informality that, as described above, dominates forestry activities and is, to a large extent, a consequence of rural poverty and the lack of alternatives for a considerable number of Amazonian inhabitants dedicated to timber extraction. This is a problem that the forestry legislation has not solved in its five versions. A formula has been found to give these loggers the opportunity to abide by these rules and carry out sustainable logging.⁶ In addition, the dominance of

⁶ Forestry laws 14552 of 1963, 21147 of 1975, 27308 of 2000, decree law 1090 of 2009 and the current law, 29763 of 2011, all created subterfuges to avoid dealing with the problem of informal small-scale extractors. Under the names of "contracts of up to one thousand hectares for small extractors", "reforestation

informality or, if you prefer, illegitimacy creates a context of unfair competition that no business can overcome, even if it is a large one. This is a major cause of the lack of profitability of attempts at legal forest harvesting, especially in timber forest concessions.

Another traditional problem in the attempts to achieve true forest management in Peru and other tropical countries is the invasion of farmers who, taking advantage of the logging infrastructure, invade the rest areas where they cut and burn the recovering forest, without the state providing police and legal support to the concessionaires. This has already caused the failure of forest management in private and public forests (national forests), which is often used as an excuse by concessionaires to not comply with management plans^[54-56].

5. Discussion and conclusions

It is no news that it is very difficult to practice forest management for timber production that is both truly sustainable and economically profitable in humid tropical natural forests. This is clearly demonstrated by the small percentage of “sustainably managed forests” in the statistics periodically published by organizations such as FAO or ITTO and analyzed and confirmed by countless authors^[26,27,29,31,43,46,50,57,58]. Although all cases in which the statistics of the international agencies mentioned above indicate percentages or cases in which sustainable management would exist, these statistics also come from unreliable governmental information, and the experience involved has not even reached a complete rotation or short-term cycle. The same has been pointed out by Dourojeanni^[35,36] in the case of initially promising trials in Peruvian (Iparía, von Humboldt), Venezuelan, Surinamese and Brazilian national forests, all of which failed after one to two decades, that is, before completing even a short cutting cycle. Contreras-Hermosilla^[50] summarized this reality very clearly: “No tropical forest has been managed for long periods of time and nobody knows for sure whether even the best management practices are

contracts” or “local forests”, the door was always left open to illegality.

truly sustainable.”

However, as mentioned, these same agencies and also some authors continue to believe that truly sustainable and economically profitable timber forest management is possible^[41,59]. They often pin their hopes on options such as forest certification^[60], “low impact” logging^[61], “sustainability criteria and indicators”^[62,63] or “log traceability”^[64] which, unfortunately, are all complex and costly options and, although interesting, have not proven to be conclusive. For example, it is noted that certified Peruvian logging concessions on the border with Brazil have been repeatedly denounced for encroaching on Brazilian indigenous reserves^[65,66]. In addition, more than one assessment of the implementation of sustainability indicators shows that their level of requirements is too high^[37]. On the other hand, many authors^[27,29,43] argue with solid arguments that the sustainable utilization of tropical rainforests for timber purposes, especially if it is intended to be economically profitable, is simply so difficult that it becomes a utopia.

This is why a growing group of authors considers that the truly sustainable forest management of the future requires a profound revision of the theory and practice of concessions^[30,31,67] or, more likely, that it will be very different from the current one and will ultimately depend on the effective retribution of environmental services and the so-called secondary forest products and uses. Moreover, it will have more viability if it is developed by indigenous peoples and local communities on a small-scale, more intensive and careful but more valuable basis, and is often closely related to agriculture, while secondary vegetation management, reforestation through agricultural crop concentration or agroforestry will be carried out at the same time^[28,30,68]. And these types of forest harvesting are not of interest to current loggers, especially those who hold logging concessions. In other words, the future of timber production in Peru, as in other tropical countries, will not depend essentially on the harvesting of natural forests. In fact, futuristic exercises for natural forests are not promising^[69].

Likewise, as highlighted by several authors^[6,40,42], the preparation of management plans

cannot be subjected to inflexible guidelines applied bureaucratically. Each region of the country, each forest type, each species, each management objective, each economic context or each regional infrastructure reality, not to mention the social context, requires adapting the management plan, including cutting cycles and minimum diameters, among other parameters. Good quality management plans imply a very meticulous and considerable effort on the part of those who elaborate them and those who approve them, and an even greater effort on the part of those who implement and supervise them.

In other words, the future management of the Amazon's natural public forests, if it is to be sustainable, can hardly be carried out through concessions and private companies. In them, short-term economic interests dominate absolutely and there is no interest in absorbing the costs of environmental services that, in fact, are the responsibility of the state.

Thus, in the author's opinion, it is likely that, in the future, the private sector will have to hand over forest management of natural public forests to the state^[54] and dedicate itself to its function, i.e. extracting, transporting, processing and marketing the timber produced in those forests, although most of it will come from plantations. This is a win-win option.

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Conflict of interest

The author declared no conflict of interest.

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