

SCIENCE AND FOREST CONCESSIONS

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SUMMARY

Can forest concessions be a means to conserve natural state forests? Bolivia has 10 years of experience with forest concessions while Guatemala ventured into its first community concession in 1994. Peru is following these examples and Brazil is going in a similar direction. In spite of these promising initiatives, the processes of forest management in concessions still need to be consolidated.

The paper presents a preliminary analysis of the contribution of concessions to good forest management, discussing how these may contribute to improve enabling conditions on state forest land. Of the four conditions discussed (1) secure tenure over the forest resources, 2) control over the forest operations, 3) an adequate financial environment and 4) access to sufficient information) concessions may positively influence secure tenure, control over the forest operations and, to a lesser extent, secure financial environment. To improve availability of information, however, outside assistance has been necessary.

Bolivia has the longest history of forest management in concessions and currently has more than 8.5 million hectares of forest under management, 5.7 million of which are concessions and approximately 2 million have been FSC certified. In Guatemala 14 concessions exist that cover a total of 512,786 has of forest while in Peru the process has started with 7.5 million hectares in 576 concessions.

Factors that influenced the different performance of concessions in Bolivia, Guatemala and Peru include the costs of forest management, slow and difficult administrative processes, unclear tenancy arrangements, the prices of timber, the quantity of illegally harvested timber on the market, policies that favor certain types of land use, technical assistance, financial incentives, the non-existence of a minimum level of confidence between the actors, and the existence of conflicts between the different interest groups. In most of these factors, Guatemala and Bolivia have shown considerable advances, while the process in Peru shows progress but still needs to consolidate the positive aspects of forest management in concessions. Forest certification has played an important role in consolidating responsible forest management in the concessions.

In Guatemala and Bolivia, science and practice worked hand in hand and in Bolivia even a new forest research institute was established to support forest management. In these countries, direct involvement of scientist in the elaboration and validation of the political processes behind the forest concessions turned out to have been the key for the consolidation of the process. In Peru, however, still little is known about ecological sustainability, economic viability and social impacts of the concessions in their present form. Multidisciplinary, applied research is required to propose economically viable forest management activities and its enabling conditions, according to scale and intensity of operation, objective and experience of concession holder, distance to market, and socioeconomic context.

Keywords: Forest concessions, enabling conditions, adaptive forest management, research, forest certification.

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INTRODUCTION

For many years, forest production and protection have been two fields of operation within the forestry sector with little overlap in its activities. The activities oriented towards production focused on plantations, while those oriented towards protection focused on the natural forests and other types of vegetation. While this has led to very successful forestry development in Chile, Northern Argentina and Brazil, with mixed results in the countries of Central America (Galloway *et al*, 2005) and resulted in large areas under legal protection, it did little to prevent the continuous forest degradation and deforestation in the natural broadleaf forests of the region. At the same time, the timber potential of the natural forests of Latin America, other than for traditional species such as *mahogany* and *cedar*, began to attract the attention of the international markets, largely due to limitations on logging and reduced availability of timber in South East Asia.

In the eighties attention was drawn to improved management of the natural forests. Several forest development and research projects showed that it was possible to harvest the natural forest without causing mayor degradation, as long as reduced impact logging was practiced within the framework of a well-defined silvicultural system that takes into account the potential recovery of the forest after harvest (e.g. Hendrison, 1990). To come to good forest management, however, more is necessary than mere technical knowledge. Poore (1989) mentions as additional enabling conditions: 1) secure tenure over the forest resources, 2) control over the forest operations, 3) an adequate financial environment and 4) access to sufficient information. At the time of his writing, no area in Latin-American ITTO-member countries was thought to be under management, with the exception of approximately 60,000 hectares in Trinidad.

Since then, several countries have adopted forestry concessions as a means to improve the enabling conditions and share responsibility for management and control with the private sector and communities. Of these, most notorious advancement has been made in Bolivia, Guatemala and Peru. Bolivia has the longest history of forest management in concessions and currently has more than 8.5 million hectares of forest under management, 5.7 million of which are concessions and approximately 2 million have been FSC certified (Galloway *et al*, 2005). In Guatemala, 14 concessions exist that cover a total of 512,786 ha while, during the recent process in Peru, 576 concessions were assigned to cover an area of over 7.5 million ha.

In this article, the authors examine the similarities and differences between the three countries and the role of science in the development of the concessions process. This discussion is based on their personal experiences within the three countries, and on published and un-published documents related to mayor USAID funded projects in each country.

FORESTRY CONCESSIONS AS A MEANS TO IMPROVE THE ENABLING CONDITIONS ON STATE FOREST LAND

Secure tenure

The first enabling condition mentioned by Poore (1989) is that of tenure security. Indeed, one of the principal problems in the conservation of natural forests seems to have been the fact that the forest is considered to be publicly owned and a free-access resource. Everybody felt free to extract the existing resources without investing in their replacement since the latter was task of the government. In addition, the same governments generally did not have the financial and human resources to exert any kind of control over the forest operations. In Latin America, assigning the use of these forest lands to private companies or communities through forest concessions, without allowing them to own the forests, may be an appropriate means to maintain the public goods and services, promote investments and share responsibility for the control over their conservation and use. This may, however, not be the case in other tropical countries, where landownership has different structures. In Asia, for example, in densely populated areas and most of the forest privately or customarily owned, forest concessions may create more conflicts of land use than that they might help solve. Particularly when forest concessionaries are not willing to follow the regulations set for their stewardship of the forests, while the state agencies in charge of monitoring and control are unable or unwilling to ensure legal compliance.

The experiences with concessions in Bolivia, Guatemala and Peru show that the potential benefits of systems of concessions have only partially been achieved so far. Does a forest concession improve tenure security? The case of Guatemala shows a clear positive relation: the communities strengthened their user rights over the forests, becoming recognized settlements within the Mayan Biosphere Reserve and thus were able to prevent new settlements from appearing. During that process, the state entity that administers protected areas (CONAP) became an ally in forest management, rather than a policing agency limiting access to forest resources. Several communities made considerable investments in forest management and timber transformation, and since the establishment of the concession areas, forest degradation and deforestation is less in the managed areas than in some of the neighboring national parks (Carrera *et al*, 2006).

In Bolivia and Peru the situation is not as clear cut as in Guatemala. At the time of the granting of concessions, in both countries existed recognized and unrecognized indigenous and farmers communities with their legal and customary land or forest use rights. Unfortunately, these have been poorly documented in some cases, while in many other cases documentation does not coincide with the situation in the field. As a result, many concession areas have been laid over areas with existing legal or customary rights. This happened particularly in Peru, where information on land and forest use rights was very much incomplete and out of date. More than one concessionaire was impeded entry to his concession because either he needed to access his concession via customary owned land or part of the concession overlapped with community claimed forest areas. It is interesting to see, however, how in some cases the granting of the concession rights worked as a catalyzer for the identification and formal recognition of customary rights. This has particularly been the case for concessions that were seeking FSC certification of their management.

Control over forest operations

The control over forest operations in El Petén, in Guatemala, improved considerably with the implementation of the community and industrial concessions, reducing forest fires, forest conversion and illegal logging. In addition, the requirement for FSC certification of forest management and technical support by Non Governmental Organizations (NGO), appear to have had a positive influence over control and conservation. This positive influence has also been identified in a study of 24 Forest Management units (FMU) in Costa Rica by Louman *et al* (2005).

In Bolivia and Peru a similar trend can be seen. In Peru one of the main objectives for the conversion of the previously assigned 1,000 ha harvesting areas to the current concession areas was to reduce the number of forest operations that need to be monitored. However, even now there are too many operations too scattered out over the Amazon area to be able to implement an effective monitoring of all the operations in the field. Some first attempts to monitor the implementation of annual plans showed that approximately 80% of concessions visited in Ucayali, the mayor timber production area of Peru, did not fully comply with the legal requirements. The concessions, however, at least made it possible to start monitoring operations. Under the previous scheme this was nearly impossible. Again, as in Guatemala and Costa Rica, also in Peru forest operations control improves when companies are seeking forest certification. Certification requires them to improve transparency of the operations, comply with all relevant legislation and monitor their operations in order to be able to learn from their own mistakes.

Adequate financial environment

In each of the three countries in discussion an USAID funded international cooperation project provided technical and financial assistance to selected holders of forest concessions. In Guatemala this was oriented towards communities, in Bolivia towards large companies, while in Peru it was initially oriented towards the “average” concession holder, and later to those that had shown greater motivation towards responsible forest management and forest certification. While these projects were able to solve the most immediate financial needs of the concession holders involved, only in Peru an attempt was made to increase access to financial resources in an institutional manner, and this attempt was not able to fulfill expectations of the donor, nor of the potential beneficiaries. On the one hand, loan pay offs were delayed while on the other, the beneficiaries felt that the amounts available did not meet their need to finance equipment and roads.

In general, the financial environment is not oriented towards solving the specific needs of forest management companies and communities. Risks of investment in forest management are conceived to be high, partially due to the passed informality and appalling repayment history of forestry enterprises, partially also to the unclear regulations pertaining to forest concessions. In addition, the nature of forest management operations requires relatively large initial investments while repayment of debt depends heavily on climatic conditions and the agility of timber buyers in paying for timber purchased. Unfortunately, either of these is unpredictable in the current local conditions, with rains often interrupting harvests and timber supply, and thus their payment, often delayed due to administrative requirements or poor transport conditions. This has immediate effects on the possibilities for initial investments in forest management (such as an adequate transportation network and adequate harvesting equipment) as well as on the ability of the companies and communities to meet their obligations to the State (such as payment of harvesting rights). The assignment of concessions to forest companies and communities so far has not been able to change anything.

In Peru greater access to financial resources is being sought by incorporating forest concession agreements in the public registry and the State forest service is interested in means to use such concession rights as guarantees for loans. This requires the State to invest in the validation and approval of forest valuation methods as well as training of forest valuers.

Guatemala stands out, not only because it is the only country in tropical America with community concessions, but also because it has a relatively successful history of loans to these community enterprises, evaluating loan applications based on annual operating plans, sales contracts, legal status and financial monitoring of the operations (FAO, 2005).

To meet current financial needs, new concessionaries often seek advanced payment from buyers. This system is very deeply rooted in the forest sector of the Peruvian Amazon and while it has allowed some enterprises to capitalize and become more independent from outside financial resources, it also has created great debts and has forced several concessionaries to either resign from their concessions, sell company shares to their financiers or enter into very inequitable sales arrangements in order to meet their debts. Also in Guatemala such arrangements exist and usually lead to fixed prices for the timber and loss of opportunities to seek better prices (FAO, 2005).

At the start of the new legislation strengthening the concession process in Bolivia, the number of private companies with forest tenure rights dropped from 122 to 88, and the area decreased from 22 million hectares with long term harvesting contracts to 5.7 million hectares with 40 year concession rights. Of the remaining companies, the once that opted for certification were mainly companies with some degree of vertical integration (Darby, 1999). Others, both within and outside Bolivia, have entered into partnerships with the timber industry to achieve such integration. This has been a very interesting alternative, with concessionaries providing the raw material and industry the capital and equipment necessary for the transformation process. It allowed the concessionaries to capitalize, and thus increase their involvement in the entire production process. Examples of this have been seen in Guatemala (FAO, 2005) and in Peru by the authors of this article. Several industrial companies entered in such relations, because they considered the concession process a means to ensure their supply of raw material.

In Bolivia, concessionaries looked at certification as a mayor channel to be able to sell lesser known timber species on the international market, to be able to reduce their dependence on traditional species such as *Mahogany* and *Cedrela* spp and increase the per hectare value of their standing forest. Where such strategies were successful, for example with the sale of "white mahogany" (*Hura crepitans*) doors, the dependence of the companies on outside financial resources was considerably reduced. This strategy, however, requires considerable investments in marketing and, unless outside help is available, most small and intermediate sized companies will not be able to finance such marketing operations by themselves. In Peru, for example, the promotion of a lesser known species on the international market requires establishing the most appropriate uses and right drying and processing procedures (Sybille, 2006), an effort that may cost at least US\$ 50,000 per species.

Access to sufficient information

In order for forest management to be successful, it needs to be based on the best available information. Concessions by itself do not contribute to additional information, but the processes initiated the generation of more detailed information. In Peru, for example, the national institute for natural resources (INRENA) performed regional forest inventories before assigning the concessions, and did extensive analysis of satellite images and available information on forest types, land use rights, etc. More importantly, though, is that the concession process, conceded long term use rights to the concessionaries (40 years in Peru and Bolivia, 25 years in Guatemala), and restricted access to other forest areas. Thus it made the forest companies realize that they no longer can cut and run, but that, in order to have a viable business in the long term, they need to make do with what they have. This means that they have to invest in management and in obtaining the information for that. Thus the serious concessionaries have started to look for means to generate such information.

Exploratory inventories, commercial inventories, diagnostic sampling, regeneration studies, permanent sample plots (PSP) and rapid biological assessments are some of the means to achieve information on the forest resources. Market, cost and production studies are ways to obtain financial information, while rapid rural diagnostics are one way to obtain information on the social context of concessions. Most of that information was not available at the time of granting the concessions, and most companies do not have the means or do not recognize the importance of gathering the information.

THE STATUS OF FOREST MANAGEMENT IN THE CONCESSIONS

Forest management is considered to be responsible if it meets internationally recognized standards that evaluate the ecological, social and economic dimensions of forest management as well as the balance between these dimensions. In Latin America, a number of standards have been developed, each with their own specific objective. The FAO promoted standards for monitoring the improvement of forest management at different scales (the Lepaterique process in Central America, Tarapoto in the Amazon region, the Montreal process in Argentina and Chile). CONAP in Guatemala developed a standard for the Maya Biosphere in El Petén to monitor compliance with the concession agreements and in Costa Rica the Ministry of the Environment and Energy developed a standard as a legal minimum standard for forest management operations (CNCF, 1999). All of these have and are contributing to the improvement of forest management in the region. Only one standard is applied and has received wide international recognition as a standard that measures the minimum level of forest management required to be considered responsible: the FSC standard for forest management certification. Both Bolivia and Peru have their respective national standards, based on the Principles and Criteria of FSC and endorsed by FSC. In Guatemala the accredited certifying bodies apply their own, FSC endorsed, regional standards.

Considering the FSC standard as recognition of responsible forest management, it appears that the status of forest management in the concessions is reasonable to good in at least two of the three countries discussed here: In Guatemala, 96% of the forest concession areas are currently certified and one concession has its certificate suspended (Carrera *et al*, 2006; FSC, 2006); In Bolivia 34% of the area in concessions has been certified (Galloway *et al*, 2005; FSC, 2006), while in Peru certification is just beginning to occur, with 0.3% of the concession areas certified (Galloway *et al*, 2005; FSC, 2006), probably reaching the 4% by the end of 2006. In Guatemala, Carrera *et al* (2006) found that the general level of forest management had improved in the three dimensions in comparison to the level of management before certification, although the community concessions still needed to improve in strategic planning, efficient administration and management and incorporation of non timber forest products in their management activities.

Why this difference between the countries? If concessions in general contribute to improve three out of the four enabling conditions, if in all three countries large projects have been funded to strengthen forest management in concessions, then why is a greater percentage of forest concessions certified in Guatemala than in Bolivia or Peru?

Based on an economic model developed by Hyde *et al* (1996), Louman and Stoian (2002) performed a preliminary analysis of the scope for sustainable forest management in the neotropics. They found that, besides the four enabling conditions mentioned by Poore (1989) other factors also affect the viability of forest management. These include the costs of forest management, particularly in distant forests, in countries with slow and difficult administrative processes and with unclear tenancy arrangements; the prices of timber, highly influenced by the quantity of illegally harvested timber on the market; and policies that favor certain types of land use. Louman *et al* (2005) also found that the presence of technical assistance contributed greatly to improved forest management, as well as the presence of financial incentives such as payment for environmental services after harvests, or financial benefits of certification. Finally, Carrera and Prins (2002) indicated that the concession process in Guatemala had a slow start, due to: lack of policies that favor forest management and use; the non-existence of a minimum level of confidence between the actors; deficiencies in technical guidelines and the capacity to implement them; the existence of excessive administrative procedures; and the existence of conflicts between the different interest groups of the Peten area.

Table 1 presents a summary of these factors and a qualitative assessment of the situation in the countries discussed. From the table it appears that in general, in Guatemala and Bolivia there exist an enabling environments for forest management in concessions, created by a joint effort between the different actors. In Peru, on the other hand, the concession process started only three years ago, and as a result, the conditions are still regular to poor, responsible forest management is rare, and the process is not likely to continue without additional support.

Table 1; qualitative assessment of enabling conditions for forest management in concessions in the three countries discussed in the article, at time of writing (2006).

Enabling condition	Guatemala	Bolivia	Peru
Secure tenure	5	3	3
Control over forest operations (illegal logging)	4	3	2
Adequate financial environment	4	3	2
Access to information	4	4	2
Costs of forest management	3	3	2
Distance to forest	3	3	2
Prices of timber other than <i>Mahogany</i> for timber producer	3	3	1
Administrative procedures	3	3	2
Policies that favor RFM	4	4	3
Institutional capacity to administer the forest resources	4	4	1
Presence of technical assistance	5	4	3
Financial incentives to RFM	2	3	4
Confidence between actors	4	4	2
Existence of adequate technical guidelines	4	5	4
Conflicts of interests	4	3	2
Total	56	52	35
Average	3.7	3.5	2.3

RFM = responsible forest management
 Assessment scale 1 (very poor), 2 (poor), 3 (regular), 4 (good), 5 (very good).

Table 1 refers specifically to factors that may influence forest management oriented towards the production of timber. In all three countries, non-timber forest products (NTFP) also have regional importance. Brazil nut (*Bertholletia excelsa*) in the Madre de Dios region of Peru and the North of Bolivia is the most important forest product after timber, while in El Petén in Guatemala, *Chamaedorea* palms and chicle (*Manilkara zapota*) contribute greatly to the income of the communities (Mollineda *et al*, 2001). In Bolivia and Peru the management of these NTFP still have not been fully incorporated in the industrial timber concessions, although in Peru legislation permits special management plans within timber concessions as well as separate brazil nut concessions of up to 1,000 ha each. In Bolivia Brazil nut is also managed separately. In Guatemala on the other hand, in the community concessions, efforts are made to integrate timber and NTFP management.

The community forest concessions also differ from the industrial concessions in that they require land use zonation that identifies the different land uses within the concession. To date, most technical assistance has focused on improvement of forest management for timber management, timber being the most voluminous product, extraction of which may cause greatest environmental and social impacts. However, if other land uses do not improve, population increase in the communities and the lack of control on the harvest of NTFP may reduce forest area and future availability of the NTFP. Recently, CONAP has recognized the importance of adequate management of the NTFP, ecotourism and

agricultural and cattle breeding and has developed a 10 year strategy to strengthen the integration of all these land uses within the community concessions (CONAP, 2005).

THE CONTRIBUTION OF SCIENCE TO THE PERFORMANCE OF FOREST CONCESSIONS

El Petén, Guatemala

In their article prepared for the IUFRO workshop “building bridges between forest science and policies” held in CATIE in 2001, Carrera and Prins analyse the contribution of science to the development of the concession process in Guatemala (Carrera and Prins, 2002). Possibly the greatest contribution of scientists in El Petén was their continuous presence in the process prior to the assignment of the first concession in 1994. During that period they provided a wealth of information on the forest resources, helped to validate forest management methods, and were able to show that responsible forest management technically was possible and economically can be feasible. Scientists continued to support the first concession, continuously validating the application of different techniques and they participated in the elaboration of technical guidelines for the concession process and for forest management.

Particularly this direct involvement of scientist in the elaboration and validation of the political processes behind the forest concessions turned out to have been the key for the consolidation of the process. Together they defined the topics and type of research needed to strengthen the process. During the elaboration of the studies frequent consultation between scientists and policy makers took place, resulting in research products that were directly taken up by the governing body CONAP as official guidelines for forest management and administration of the multiple-use zone of the biosphere. Examples of this are: guidelines for planning of forest inventories, a manual for the implementation of environmental impact studies, a manual for the implementation of reduced impact logging techniques, etc. The fact that the first concession was used as a demonstration area was crucial in showing the usefulness of the studies.

With the expansion of the concession process to the other communities in the area, new research themes were identified, such as: criteria and indicators to monitor forest management; the use and marketing of additional timber species; and the management of non timber forest products as integral part of the concession areas (Carrera and Prins, 2002).

One of the mayor lessons learned during the initial phases of the concession process in Guatemala was the need to find a balance between scientific rigor and the flexibility that allowed adoption of the research results. In the words of the authors: “*projects should be learning projects and implement an adaptive management system to do so*” (Carrera and Prins, 2002 p 40).

Bolivia

In Bolivia the BOLFOR I project was the mayor motor behind the efforts to come to responsible forest management (Darby, 1999). During the nineties, they supported the elaboration and implementation of the new forest legislation (1996), assisted companies through training of their

personnel in forest management activities, and supported the sector by a large number of studies into the ecology of the forest, its commercially most important tree species and its fauna.

The project also supported the development of the national standard for FSC certification and the creation of the FSC national initiative, validating the standard by which forest management in Bolivia should be measured. Concessionaries considered the standard as a good means to “bolivianize” the FSC certification system and make it more acceptable to them. The role of scientists in this forum for discussion on the criteria of sustainability was basic to the acceptance of the standard, and also influenced the development of the national forest regulation. Because of their research they were able to bring to the table strong arguments for or against certain norms. Since these scientists were also considered to be neutral (i.e. not to personally benefit from one or other norm) their arguments often facilitated discussions and helped achieve consensus. Through their participation in the standard working group, the final standard can be seen as the application of scientific knowledge (Darby, 1999).

Scientists also contributed to the knowledge on the probability of sustainability of natural forest management in Bolivia. Some of these studies were relatively critical of responsible forest management (RFM), arguing that costs of silvicultural treatments and opportunity costs of leaving harvestable trees in the forest to ensure future regeneration are too high to make RFM an attractive land use option (e.g. Howard *et al*, 1996; Reid and Rice, 1997).

CIFOR also played a role in the forestry sector in Bolivia, although its role was more direct at other forms of access to the forest use rights, such as the Local Social Associations (Asociación Social del Lugar, ASL), and at analyzing the impacts of decentralisation of the forest sector (e.g. Pacheco, 2006). Although these studies indicate the strengths and weaknesses of the decentralization process in Bolivia, they are still too new to be able to tell what their effects have been on the forest sector in Bolivia.

The program for forest management in the Bolivian Amazon (programa para el manejo de los bosques de la Amazonia boliviana, PROMAB) also contributed with research on forest and species ecology, as well as with information on social issues (PROMAB, 2006). Its location in Riberalta, its orientation towards small and medium sized forest producers, and the publication of most of their research results in English rather than Spanish may be reasons for their relatively little impact on the forest sector in Bolivia.

Currently, the Instituto Boliviano de Investigación Forestal (IBIF, Bolivian Institute of Forest Research) addresses a number of issues in support of forest management. They evolved from the BOLFOR I project and now maintain as their main lines of research: forest ecology and management, biodiversity monitoring in managed areas and fire ecology (IBIF, 2006).

Peru

In Peru, science played a much less prominent role in the design and implementation of the forest concession process. The legislation was based on the Bolivian experience, and once it was decided to implement the law, the scale of its implementation and the changes needed to shift from the previous

system to the concession system were so great, and required so much negotiation skills, that very little time was available to analyze the needs of the system under the particular Peruvian conditions, and even less so, in the environmentally and socially different regions. A lot of the results of previous research in Peru, done in the eighties and nineties, were not readily available and little appreciated, possibly due to the local character of the research. On the other hand, CIFOR was contacted to propose the technical guidelines for management and harvesting of the concessions. The resulting documentation (Sabogal *et al*, 2004; INRENA, 2004 and INRENA/CIFOR/FONDEBOSQUE, 2004) was largely based on experiences and scientific studies in other countries of Latin America, but not completely understood nor internalized by technical professionals from INRENA, nor by independent advisors of concessionaires.

Since the process initiated, however, several studies have been started with support of USAID, WWF and the companies: Over 70 PSP have been established with the objective to get a better understanding of the forest dynamics in the different forest types of Peru (personal observations); studies were done to establish the best procedures to process lesser known timber species (Sybille, 2006), cost studies were done (Victor Gonzalez, pers. comm.), CIFOR coordinated an interinstitutional effort to compile the results of previous silvicultural research (Nalvarte *et al*, 2004) and works on recommendations for a monitoring system.

CONCLUSIONS

Responsible forest management appears to be feasible in Latin América but for that certain enabling conditions would need to exist. Forest concessions may facilitate the establishment of such conditions, above all in terms of security of tenure, control over forest operations and access to finance, but by themselves are not sufficient to do so.

Forest certification has played an important role in the discussion and identification of factors that inhibit or promote forest management and helped the concessionaires and assisting organizations to focus their efforts on resolving the most urgent problems. In combination with adequate legislation it helps promote sustainable forest management in all three countries discussed.

Scientists have played a pivotal role in identifying enabling conditions and ways to resolve them. They also functioned as facilitators in the discussion on what should be the minimum standard for forest management, legal or for certification. Through the provision of methods for and the implementation of monitoring activities as well as the analysis of monitoring results, they continue to contribute to improvements in forest management and the concession processes.

Although scientists have contributed and continue to contribute to forest management in concessions, there does not seem to be a structural relationship between scientists and forest management operations or forest administrations. Investigations often are the result of particular personal interest rather than a structured analysis of the needs of the forest managers and administrators. In the three countries discussed, only Bolivia has a forest research institute that may on a regular basis provide responses to current problems.

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