

DISCUSSION PAPER

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Fiscal and Legal Incentives with Environmental
Effects on the Brazilian Amazon

by

Hans P. Binswanger

Research Unit
Agriculture and Rural Development Department
Operational Policy Staff
World Bank
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FISCAL AND LEGAL INCENTIVES WITH ENVIRONMENTAL EFFECTS
ON THE BRAZILIAN AMAZON

Hans P. Binswanger

Summary and Conclusions:

1. This report provides a detailed discussion of the major economic policy distortions, tax incentives and legal rules which tend to accelerate the pace of settlement in the Amazon and lead to deforestation of land in premature, uneconomic and/or environmentally unsustainable ways.¹ These incentives are as follows:

2. Brazil's income tax laws virtually exempt agriculture and convert it into a tax shelter. Brazilian investors already have ample reason to invest in land. Long term financial markets are poorly developed and land provides a risk diversification in the face of fluctuating inflation rates. The exemption of agriculture from the income tax adds to this land demand. This greater land demand is felt directly at the frontier where urban investors and corporations compete aggressively for land to establish livestock ranches. But the tax treatment has indirect effects as well, by making it attractive for wealthy individuals to buy land from small farmers in areas of well established settlement. The income tax preference for agriculture is partly capitalized into the land price. Because small farmers or other poor individuals cannot benefit from the tax treatment, they cannot buy land in areas with well integrated land markets, this is

^{1/} This report is an expanded version of my Back to Office Report: Brazil-National Environment Project, Land Policy Issues, dated May 18, 1987.

because their agricultural revenue will be insufficient to pay for the capitalized value of both the agricultural revenue and the tax benefit stream. If they want to acquire land they have to join the pool of migrants who seek farm land at the frontier of settlement.

3. The progressive land tax is intended to reduce the incentives for the accumulation of very large holdings. But the land tax also contains provisions aimed at encouraging more intensive land use on large farms which undermine its progressive nature. An additional side effect of the provisions which reward higher interest is that they encourage the conversion of forests to pasture and crop land in order to reduce the tax liability. This could lead to excessive deforestation of marginal land areas located within large farms.

4. SUDAM, IBDF, and the Grande Carajas Program can single out specific corporate enterprises to receive special tax incentives and other favorable treatment. Of all the incentives discussed in section four of this report, the tax credit scheme provided by SUDAM (via FINAM and BASA) to corporate livestock ranches in the legal Amazon has the largest effect on deforestation. An upper-bound estimate of its effect is 4 million ha of added deforestation, located mostly in the sub-humid forest zones of Mato Grosso and Goias. Research has shown that most of these livestock ranches have a negative economic return (Section V). A similar tax credit scheme is provided by IBDF (via FINOR) to corporations which agree to undertake afforestation. Research on and audit reports of these tax credit schemes show that the recipients are far better at receiving the tax credits than at producing beef or establishing forests. The combined effect of the incentives programs is more rapid deforestation in the Amazon, very modest afforestation in areas of old settlement and a very large fiscal cost which exceeded \$1 billion between 1975 and 1986 for the livestock ranches alone.

Policy should focus on abolishing the tax credit programs, reviewing the other components of the special incentives packages and eligibility criteria, and on coming up with a better way of encouraging afforestation.

5. Subsidized credit is available to SUDAM-approved ranches and private farmers who have title or other land documents recognized by the agricultural credit institutions. While the amounts disbursed in the Legal Amazon pale in magnitude compared to the total agricultural credit volume, they are not an insignificant factor accelerating deforestation.

6. The rules used to allocate public land provide strong incentives for rapid deforestation to solidify claims on land and increase the size of final land allocation during the process of land adjudication (Regularisacao)--(Section IX). A rancher with a tenuous claim will be allocated between two to three times the amount of land cleared of forest and put under pasture, up to a ceiling of 3000 ha per-owner. Moreover, land clearing provides excellent protection against competing claims and against land invasions. Several steps should be carefully considered such as lowering of land ceilings for both individuals and for corporations, and changing the rules of land allocation to remove the incentives for clearing land simply for purposes of solidifying land claims and increasing their size. Lower land ceilings would also have a beneficial equity impact by making more land available for small settlers.

7. Incentives for the forest service to guard forest reserves and enforce a host of other logging restrictions must be improved. This could be done by dividing the forestry fine revenue between the guards and the budget which the forestry service can use to hire additional guards. Similar schemes already appear to exist for the traffic police.

8. Some provisions of the income tax code appear to provide incentives to use excessive levels of agro-chemicals and mechanical inputs in agriculture (Section II). However, these provisions and other provisions of the income tax code are so generous that agriculture escapes income taxation even before farmers have to increase the use of inputs to distorted levels in order to reduce their tax liability. Therefore, these provisions are unlikely to have an undesirable environmental effect by increasing the use of mechanical land clearing techniques or of agro-chemicals. However, should the income tax code be revised it will be necessary to pay careful attention to the tax treatment of pesticides and to the depreciation allowances for machines.

9. From this list of incentives and the more detailed discussion in the full report, it is clear that the Bank will have to elevate these issues to a level which goes beyond the individual agencies such as SEMA and IPLAN, as many of the required changes either fall into the responsibility of the ministry of finance, or of MIRAD/INCRA. Moreover, it is likely that the quantitative impact of the policy distortions on the Amazon exceed any positive interventions which the Bank could achieve via settlement projects. Indeed, given the enormous demand pressure in land markets originating from non-farmers, project interventions aimed at bringing order into the process may be doomed to failure from the start.

The objectives of this report is to describe the major fiscal and legal incentives which:

- (a) increase the demand for land for agricultural uses
- (b) increase the rate of deforestation at the frontier of settlement
- (c) provide incentives to convert forest to crop land or pasture in already settled areas.
- (d) implicitly subsidize fertilizers and pesticides

High and unstabled ratios of inflation in the Brazilian economy imply that long term capital markets are poorly developed. The financial investment options are therefore both more limited and more risky than in more stable economies. Both private and corporate investors will find land an attractive long term investment option not only for its expected return but also for reducing overall portfolio risks. Land ownership by non-farmers is therefore much more common in Brazil than elsewhere in the developing or developed world. However, as discussed in this report Brazilian taxation, credit and land polices provide additional strong incentives for investing in land and for acquiring it via deforestation. These issues are reviewed below.

I. The virtual absence of taxation of agricultural income.

- (a) By using a variety of special provisions of the income tax code, it is possible for individuals and corporations to exclude up to 90% and 80% respectively of agricultural profits from their taxable income.
- (b) In addition, individuals who own farms can liberally treat consumption expenditures as agricultural expenses and thus shelter additional income from taxation. (However, neither

corporation nor individuals can offset agricultural losses against non-agricultural taxable incomes).

- (c) The taxable component of corporate profits arising from agriculture is taxed at a rate of only 6%.

Provisions (a) and (c) combined imply that agricultural profits of corporations are subject to a tax rate as low as 1.2%. This compares to a tax rate between 35% and 45% on profits from other sources. Detailed discussions of these two provisions is given in Spindola Silva.

The implication of this tax treatment is that investors will undertake investment projects in agriculture which have a lower economic rate of return than their non-agricultural projects, as this will equalize financial rates of returns net of taxes. The tax treatment will increase the demand for land from individuals in high-income tax brackets and from corporations, implying a faster expansion of agriculture into frontier areas than in the absence of these tax provisions. Moreover, since the supply of land is not perfectly elastic, the income tax references will be partly capitalized into land values.

Since poor people do not get the income stream which arises from this tax preference, their capitalized agricultural income stream is lower than the land price. Therefore, if they own no land they cannot buy it, even if given credit. The primary means for poor people to acquire land is therefore via squatting on public or private land (See Section IX below.) And, if they own land they can do better by selling the land and investing the resources elsewhere. (For a detailed discussion on these issues see Binswanger 1985.)

To sum up, the income tax treatment of agriculture

- o tends to increase the demand for land, to speed up conversion of land for agricultural uses, and to raise the price of land.
- o it tends to increase inequality in land ownership holdings
- o and it increases the pace of migration of poor people to the frontier areas in search of land.

II. Does the income tax code lead to an environmentally relevant increase in the use of fertilizers and pesticides? Agricultural taxpayers can sharply reduce their agricultural tax base by a variety of means.

1. They can elect to be taxed on 10% of their gross agricultural revenues. Fiscal incentives for agro-chemicals have no effect on these tax payers.

2. If, they elect to be taxed on the basis of agricultural profits, they can, as discussed before, reduce the taxable portion of profits sharply, because expenses on virtually all investments and modern inputs can be multiplied by a factor from between 2 and 6 and subtracted in the same year from agricultural profits. Up to 80% of agricultural profits can be sheltered from taxation via this mechanism. This system of "multiplication factors" provides some incentive for over-investment and over-consumption of pesticides and fertilizers.

However two factors undermine the impact of this incentive on investment and on input use: First the "multiplication factors" are so large that undistorted input use and investments will already reduce the tax base to 20% of agricultural profits for most farmers, i.e. no additional investment or input use will be induced by them. Second, only half of the taxable agricultural income is actually included in total taxable income. This implies that, even without multiplication factors,

the marginal tax rate on agricultural income is only half that on other income. Thus, the additional tax incentive for using agro-chemicals is not very powerful.

Therefore, it can be concluded that the special incentives via the multiplication factor do not materially increase the environmental load of pesticides and fertilizers.

III. The land tax (ITR). The Estatuta da Terra and other legislation provide for a progressive land tax. Farms smaller than 2 modulo (the size of a farm sufficient to support one family is equal to one modulo) pay no land taxes, while farmers larger than 100 modulos are supposed to pay 3.5% of the sales value of their unimproved land (Terra nuda). Apart from direct evasion, the land tax can be reduced by a factor of up to 90%, depending on (1) the degree of utilization of land R and (2) depending on the productivity level of the farm. The formulas used are such that both reduction factors are directly and positively related to R (Spindola Silva p. 247). From the point of view of deforestation the key point is that forest land is considered unused.

A farm containing forests is therefore taxed at higher rates than one containing only pastures or cropland. Conversion of forest to pasture on larger farms will reduce the land tax liabilities, and the land tax system thus provides incentives for deforestation. The major impact of this legislation is likely to be felt in areas which have been settled for a long time and where the enforcement of the land tax is relatively strict.

IV. Capital gains taxation and commodity taxation. (ICM). Neither of these taxes appears to contain provisions which have an effect on the issues studied. A discussion is provided for those interested in detail. Others can ship to Section V.

Real Estate sales are subject to capital gains taxes while long term capital gains (more than five years) on financial assets are not. However, the real burden of the capital gains tax is low. The taxable amount of the gains is reduced by rebates depending on the length of time the real estate is held. The remainder is taxed at the lower of either a 25% flat rate or the marginal rate of the progressive income tax of the individual concerned. I have not found any exemptions from this tax for individuals or enterprises located in the legal Amazon.

The commodity taxation. (ICM) is like a value added tax on agricultural and non-agricultural commodities. It is levied at 17% of the after-tax receipts (i.e. at 20.5% of total sales value) for most states. For sales to the North and the Northeast the rate is only 12%. However, final sales within the North or the Northeast regions restore tax levels to 17% via a mechanism which I do not fully understand. Thus, the differential appears to act as a transfer of tax revenue between regions rather than a distortionary differential affecting economic decisions.

The ICM contains a potential distortion against agriculture for commodities which are exported in raw form: while for industrial products the full ICM is restituted upon exports, this is not the case for raw agriculture products such as soybeans. However, if soybean oil or cakes are exported the tax is refunded. The importance of the distortion is further reduced by the fact that trade in many agricultural commodities is restricted by quantitative controls so that domestic price relatives are

completely delinked from international price relative. Additional work would be required to determine whether agricultural price policies discriminate against agriculture or not.

V. Regional and Sectoral tax incentives. Special programs for regional tax incentives exist .

- o for the legal Amazon (administered SUDAM and by FIDAM)
- o for the Grande Carajas area which contains portions of the States of Maranhao, Para and Goias. (Administered by the Grande Carajas Council)
- o for the Forestry, Fisheries, and Tourisme sector (administered by Fiset)
- o for the northeast (administered by SUDENE and FINOR).

There are five classes of incentives:

- (a) Income tax holidays of up to 10 years (Grande Carajas only, see appendix 1)
- (b) Reinvestment tax credits which approved enterprises in the privileged sectors or regions can use for expansion or modernization investments (limited to 50% of a corporation's liabilities).
- (c) Generalized tax credits which any corporation in Brazil can use to set up, invest or participate in approved enterprises in the privileged regions/sectors (limited to 25% of a corporation's tax liabilities).
- (d) Tax credits for individuals for 45% of their investments into stocks of FIDAM, FINOR and Fiset (limited to a maximum of 6% of an individuals's tax liabilities)

- (e) Exemptions from import tariffs, export taxes and ICM for imports or exports of approved enterprises under the Grande Carajas program only.

Each of these incentives programs is available to farms whose projects have been approved by the administering entity. The approval process contains a variety of safeguards some of which are intended to protect the environment.² The following points about these preferences are important.

Income tax holidays and tax credits for modernization are not relevant for agriculture and livestock corporations, as they already escape the income tax via the general provisions of agricultural taxation discussed in section I. It is therefore incorrect to assume that these provisions are an additional factor for speeding up deforestation at the frontier.

Only to the extent that forest or agricultural products are utilized by non-agricultural corporations will measures (a) and (b) have an impact on deforestation. Examples are the expansions of charcoal production for a tax exempt pig iron factory or production of logs for a tax exempt lumber company. In the non-agricultural sectors income tax holidays are perhaps the least distortionary form of tax incentives. Unlike tax credits they cannot induce investments into enterprises which are not expected to produce a pretax profit.

Tax credits (measures b, c and d) on the other hand can induce investments with a negative expected profit. Of the three tax credits schemes, generalized tax credits available to corporations all over Brazil

^{2/} For example, pig iron factories under the Grande Carajas program will be required to produce 25% of the charcoal they use from forest programs which they own.

(measure c) is the most important. The mechanics of the system is described clearly in Browder and in Nascimento, and will not be discussed in detail. The tax credit system allows any corporation in Brazil to use up 25% of its tax liabilities to invest directly in approved enterprises or to acquire equity in such corporations. An approved enterprise located in the Amazon, on the other hand can finance up to 75% of the planned investments from such tax credits funds. The balance of 25% of total investment must come from the parent company's own resources. Investments in approved enterprises can therefore occur even if they have negative rates of return to overall invested resources, because investors will be primarily concerned with this rate of return to owned funds. Attempts at policy reform should focus sharply on this set of tax credits.

Reinvestment tax credits will only be relevant for non-agricultural enterprises which have positive taxable profits. Tax credits for individuals to invest in stocks of the investment funds FIDAM, FINOR and FISET (measure e) appear to be less important because few investors appear to take advantage of the personal communication of Lytha Spínola Silva.

VI. The impact of the regional tax incentives on livestock production and deforestation in the legal Amazon. A number of authors have studied these issues and their findings are summarized here. By September 1985, 527 livestock projects had been approved by SUDAM (Gasques and Yokomizo), representing slightly less than half of the investments in dollar terms approved under the tax incentive scheme. (Nascimento, p.29). By 1983, the total investment in the SUDAM approved ranches had already reached nearly \$1 billion (in 1982 \$). The livestock projects are mostly located in areas of Cerrado and of semi-humid forests. The average size of the already implemented ranches is 23600 ha, i.e. the incentives program favored very

large enterprises. These enterprises occupy a total area of 8.4 mio ha of which 4.2 million ha was to be developed as pasture. This is the upper bound estimate of the deforestation caused by the incentives program in Cerrado and semi-humid forest land (deforestation in humid forest zone must have been minimal.). Much of the pasture area created has already been abandoned and the area is reverting to a secondary forest (All data from Gasques and Yokomizo).

The program has not been effective in terms of creating viable livestock enterprises in the region. Gasques and Yokomizo carried out a sample survey of enterprises and show that:

- o Realized livestock production is less than 16% of anticipated production.
- o The average rate of implementation of the projects is less than 40% of planned implementation.
- o Many enterprises which have not met the program targets have received certificate of implementation allowing them continued access to tax incentives.
- o While actual implementations has been less than 40%, disbursement of tax incentives has been close to 100% and exceeded it in many ranches.
- o The ranches have generated virtually no ICM revenue. The ICM revenue generated are less than 4% of tax credit funds received in all cases studied.

The reasons for the poor performance have been analyzed by Browder, based on a sample survey of ranches. Total invested resources in the ranches had a negative net present value. An analysis by Norgaard et al of cattle ranches in the Eastern Amazon (based on coefficients assembled from the literature) shows similar result:

- o Without real appreciation of land, no form of traditional ranching has a positive real rate of return in Eastern Amazon.
- o Without over-grazing, real land values must appreciate at the rate of 30% before the investments become economically viable.
- o Even with improved pasture technologies a real appreciation of land of between 15% to 30% per year is required to make the rate of return to overall investment resources positive.
- o Ranches receiving the SUDAM incentives can have a positive return to private investment resources in the absence of real appreciation of land.
- o Investors can maximize their private returns by using over-grazing. They cannot improve their returns by investing in pasture improvement.

The results are fully consistent with the low rate of implementation of the projects and with the high rate of abandonment of pasture within projects. Legislation has recently been passed which limits eligibility for SUDAM approval to ranches established in the Cerrado, where deforestation would be minimal. I have been assured, however, that these regulations are not fully enforced.

VII. Impact of fiscal incentives to afforestation (FISSET/IBDF). Tax credit funds have also been available for afforestation from the Fundo de Investimentos Setoriais (FISSET). Firms approved by IBDF are eligible to receive tax credit funds for afforestation similar to those granted to firms approved by SUDAM. FISSET's performance, as well as that of FINAM and FINOR are discussed in detail in the DIARIO OFICIAL of Jan. 12, 1987, Section 1. (see attachment 2). Here it is shown that the FISSET program suffers from severe implementation difficulties as well.

The main point about fiscal incentives for the cattle ranches and for the afforestation is that both programs are not cost-effective in achieving their stated goals of increasing livestock production on the one hand and increasing of afforestation on the other. It is likely that the subsidy program for ranches via FIDAM has reduced forest area by far more than has been created by the Fiset incentives.

VIII. Credit system. Just like the income tax preferences for agriculture, subsidized rural credit will tend to increase the demand for land, leading to a more rapid expansion of crop and pasture land. And the subsidies will be partly capitalized into land values, reinforcing the regressive impact of the income tax system analyzed in section 1.

In addition, as discussed in Binswanger 1985, subsidized credit probably reduces employment and tenancy opportunities in agriculture via its impact on accelerating mechanization. Thus, the system clearly increases the supply of potential settlers to frontier areas.

The direct impact of the credits given in the Amazon region itself is hard to estimate. Central Bank data on disbursements of credit does not show data separately for the Legal Amazon. The North region, comprising the Legal Amazon less Goias, Maranhao and Mato Grosso receive less than 3% of rural credit. However, this under-estimates the relevant credit volume as settlement has been particularly active in Goias and Mato Grosso. Nationally livestock borrowers received about 20% of the credit disbursed. The SUDAM approved ranches are all eligible for subsidized credit. Undoubtedly therefore the credit subsidies have accelerated the deforestation process. As abolishing credit subsidies is a central (but very elusive) goal of the policy dialogue with Brazil, additional study of

the issue is not required. But the policy dialogue needs to ensure that special provisions for the legal Amazons do not survive, even though quantitatively the credit volume going to the region is relatively small.

IX. Rules of land allocation and settlement patterns. The rules for allocating public land (terra devoluta) controlled by states and by the Federal Government vary somewhat. Only those of the federal government are reviewed here.

It is a mistake to assume that there are larger areas of unclaimed land readily available for settlement in the Amazon. By the time roads are constructed, most federal or state land is claimed by some individual or corporation, however doubtful the claim may be. These claims are bought and sold. Claims can be converted into legal titles by individual--specific legal procedures. For example, projects approved by SUDAM or the Grande Carajas program are given special preferences and priorities in land titling. On the other hand land titles may be conferred to all holders of strong claims in a sub-region by the process of "regularization."

How can individuals acquire and solidify rights which have a high chance of later being regularized? The right known as direito de posse states that a squatter or posseiro who lives on unclaimed public land (terra devoluta) and has used it "effectively" for at least one year and one day has the right to acquire a usufruct right over that land with size of one rural modulo (100 ha in Amazonia). If the posseiro fulfills the condition of effectively using the land and living on it (cultura efetiva e morada habituel) for more than 10 years (recently shortened to 5 years) he has the right to acquire title. Land rights can arise also from squatting in private land for a sufficiently long time without being challenged by

the owner (follow up on details of length of time and other conditions). Direito de posse has been formally recognized since 1850, law 601, but goes back to criteria of settling land disputes in colonial times. (Nascimento, p.278).

These rights may appear to favor the establishment of relatively small farms. However in lands under federal control claims up to 3000 ha can be solidified by these provisions and the attendant administrative procedures. In the Grande Carajas area which I visited, GETAT (now merged with INCRA), uses the following rules:

A claimant who lives on an area of land gets first preference to obtain title for between three times the area which he or she has cleared of forests. The claimant does not get the title automatically but has to buy the title in a public auction. But claimants are apparently never challenged in that bidding and the minimum price set by GETAT is nothing but a nominal fee.

In Mato Grosso, Goyas, Para and Maranhao these or similar rules have resulted in the majority of public land being allocated to either individually owned ranches or to large corporations. Small farmers have difficulties in finding land for squatting. This is because corporations and large ranches have a major advantage over poor individuals in the rush for land: they have the capital to build their own access roads into the forest. This enables them to lay claim on land much farther away from major state or national highways than small settlers. The latter can typically not lay claim to land more than a few kilometers from public roads, as they could neither market products nor have access to health or education facilities.

In Rondonia the situation is somewhat different in those areas allocated by INCRA to land settlement projects, as all agricultural land is divided up into small plots. Nevertheless for the entire legal Amazon area the bulk of deforestation is accounted for by large private and corporate ranches.

The rules of land allocation encourage rapid deforestation on individually owned ranches, as the final amount of land which is given title in regularization is a multiple of the area of forest converted to pasture. In addition, clearing land provides protection against small squatters and land invasions, as these groups simply do not invade land already converted to pasture. Some informants alleged that it may be sufficient to clear land of the original forest, only to let secondary forest grow back, as irrevocable user certificates are issued after one year of occupation. I have not been able to judge the importance of this phenomenon, however.

Deforestation often occurs so rapidly, and in advance of provision of adequate infrastructure, that the existing stock of high quality timber is simply destroyed, rather than being conserved for later logging operations. In other regions, where better infrastructure leads to higher stumpage prices, loggers may contribute to the deforestation. For example, it is possible for a cash-constrained "land-owner" to trade the standing timber to a logging company in exchange for land clearing services paid for by the logger.

Small scale squatters are frequently accused of contributing in a major way to the deforestation. While this may be of local importance in several regions, it is probably less of a problem than the ranchers. If small farmers want to claim 1 modulo of land, they have no legal or procedural

incentive to clear land beyond the area needed for their shifting cultivation operation. However, within the allocated modulos, the shifting cultivation system will reduce forest area rapidly. It is easily shown that shifting cultivation is the least-cost way of producing ones subsistence requirement, whether cost is measured in terms of labor, in terms on purchased inputs or in terms of total cost. Primary forests will be destroyed in the process, and replaced by pasture or secondary forest. Physical degradation problems are minimal because soils are covered by vegetation for all but short periods during the first few growing seasons, and because initially the highest quality soils are chosen. However, as under all shifting cultivation systems, soil fertility declines, and weed infestations become a serious problem after the first one or two seasons. The small farmer then shifts to clear another plot of land.

It is unrealistic to assume that small farmers can be induced to keep a small proportion of their land under permanent agriculture, while leaving the remainder under forest. The only way to reduce forest destruction is to reduce plot sizes allocated to small farmers and set land aside elsewhere in large and well guarded forest reserves. The World Bank projects in Rondonia now attempt to do this by creating small reserves in proximity of the settlers. But small local forest reserves will be invaded by other shifting cultivators, and are hard to guard by the forest service.

The major changes in allocation rules which require further study are as follows:

1. Lowering the ceiling of land which can be allocated to a single owner during regularization from 3000 ha to no more than perhaps 300 ha of total land owned anywhere. This will still enable families to establish larger ranches by distributing ownership among several members.

2. Introduce a land ceiling on corporate land holdings or reduce it where it already exists.
3. Change the definition of cultura efetiva which is used to regularize land to include forms of managed forest exploitation.
- X. Improving incentives for forest guards. Forest guards of IBDF are small in numbers, poorly paid and have to do risky jobs in guarding forest reserves or in enforcing regulations limiting logging of, for example, the Brazil Nut tree. The enormous distances and low population densities impose additional difficulties. It is not surprising, therefore, that forest laws and regulations are easily escaped, in the large by applying political pressure to the service, and in the small by bribing the forest guards. However it would be easy to provide both the forest service and the guards with improved incentives to enforce the rules by giving them a financial stake in the fines levied on violators of the rules. For example, letting the guards keep 30% of the fines, with the remainder adding to the budget of the forest service rather than the general revenue, would provide positive rather than perverse incentives. Traffic police already operate in a similar way, so a precedent exists..