



IN THE FIELD

The role of informal contracts in the growth of small cattle herds on the floodplains of the Lower Amazon

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Abstract. In the absence of access to formal credit, informal contracts with independent investors give the small ranchers of the Lower Amazon an acceptable means through which to surmount the high investment hurdle of starting a cattle herd. These contracts – called *sociedades* – allow small ranchers to raise an outside investor's cattle in return for a portion of the offspring and are commonplace in the cattle production systems of the Amazon. But, notwithstanding a vast literature on cattle production in the Amazon, informal contracts have been largely overlooked. This paper presents the results of a field survey and financial analysis for informal contracts on small ranches in the Lower Amazon. In the results, we suggest that informal contracts are an important means of cattle herd start-up and herd production for small ranchers. Internal rates of returns in cattle production under these contracts are in the range of –7 to –12% for the small rancher and 12% for the investor. The net present value of the contract to the small rancher ranges from –R\$1219 to –R\$8599 and from R\$1681 to R\$8845 for the investor, for a 10-year period, depending on herd size. Financial returns contracts are sensitive to the contract design – e.g., to who pays health costs – and to beef prices. The small ranchers have a negative IRR, lose money, and bear all the risk of loss, yet persist in using this form of herd development. We surmise that this is due to the non-financial benefits of cattle ownership and the lack of access to formal credit structures. In conclusion, although outside the formal economy and apparently financially unrewarding, these contracts are an important mechanism by which the small ranchers on the Amazon Floodplains create cattle herds.

Key words: Agricultural credit, Amazon River Floodplain, Brazil, Cattle, Small farm systems

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Introduction

The floodplain of the Amazon River Basin is an area of about 300,000 km² that is periodically inundated by the lateral overflow of the Amazon River. Islands form throughout the floodplain by sedimentation of rich alluvial soils originating from the Andes and Andean zone.

During the high water phase, these islands hold lakes 2–10 m deep, formed by the entrapment of water within the natural levees of higher ground at the edge of the islands. These levees support forests and agriculture, and are focal areas for human settlements on the floodplain (Moran, 1989). Due to the infusion of nutrients from the river and their ability to support large fish

populations and house masses of floating vegetation, the lakes play an important role in the productivity of the floodplain (Goulding, 1980; Sioli, 1984; McGrath et al., 1993; Irion et al., 1997; Furch, 1997; Junk, 1997).

When the water recedes a sediment-rich lake bed is uncovered, exposing natural grasslands used for the grazing of cattle and water buffalo¹ (Goulding et al., 1996). The grasslands are considered common property, with land boundaries based only on river frontage, extending back to the lake edge. This transition between lake and grassland systems makes the floodplain environment a rich and diverse ecosystem (e.g., Salo et al., 1986; Foster, 1990; Gentry and Terborgh, 1990; Worbes, 1997; Kvist and Nebel, 2001; Nebel, 2001). The richness of the system is reflected in the complexity of the floodplain farm systems, which, in addition to cattle, include fishing, market and subsistence gardens, and forestry. But, whereas each of the other activities is governed by the periodic nature of the floodplain, cattle production is a year-round undertaking.

Cattle production of the floodplain, however, still follows the rhythm of high and low water. At low water, the grasslands are exposed and cattle graze freely. As with common access to any resource, however, there is a tendency to overuse – in this particular case overstocking. The cattle are brought into pens each night to avoid thievery and to reduce the chance of accidental death. Once the grasslands become flooded, the rancher faces two choices, either pen the cattle in raised corrals (*marombas*) and provide fodder through a cut-and-carry system, or transport the cattle to upland pastures where they are grazed until the flood recedes. Both options present benefits and problems.

The cut-and-carry system of the penned animals requires that the rancher cut the floating grass, a task that begins at approximately 4 am and lasts until 9 or 10 in the morning. Over and above the physical difficulties presented by the task, in the waist or chest-deep water the rancher is subject to bites and stings from a variety of “nasty” sources. Although more and more in decline, the benefit of the corral system is that it allows the rancher to better control the fate of his animals. The second option available to the rancher is to transport his/her animals to higher ground where they graze on rented pasture. The benefit of this system is that it avoids the obstacles presented in the cut-and-carry of the corral system. Problems arise in the control and care of the herd because landowners generate profits based on numbers of animals rather than weight gain and, once again, the cattle are subject to overstocked pastures.

Cattle production is not a luxury in the floodplain farm system, but in fact an integral component. To the small farmer living in the Lower Amazon floodplain, cattle represent a means of diversifying farm income,

of using non-arable land, and of maintaining a liquid but long term investment. To these small farmers, however, usually subject to severe capital constraints, cattle are a relatively expensive investment and thus difficult to obtain. In order to overcome this investment constraint, and in the absence of formal credit structures, a small farmer will often enter into an informal contract (*sociedade*) with an outside investor.

The most prevalent form of the informal contract is when an independent investor buys cattle and places them under the care of a small rancher. The rancher is responsible for the feeding, maintenance, care, and marketing of the animals. After an approximate period of three years, the offspring from these cattle are equally divided between the owner and rancher. The small rancher, however, is first obliged to return, or to account for, all of the original animals put in his care. He/she, therefore, bears the risk of mortality or loss of animals. There are several variations to the theme of informal contracts, principally when the owner/investor of cattle pays for some or all of the maintenance and transportation costs, in order to reduce the burdens of the small rancher.

Under widely variable macro-economic conditions and in production scenarios fraught with risk the cattle herd of the Lower Amazon continues to grow. Indeed, cattle ranching is the largest land use activity in the Lower Amazon. The informal contracts between small ranchers and independent investors are an important factor in the growth and development of the cattle herd on the Amazon floodplain. Whereas there has long been extensive debate on cattle ranching in the Amazon Basin (e.g., Hecht, 1985; Hecht et al., 1988; Eden et al., 1990; Fearnside, 1993; Mattos and Uhl, 1994; Arima and Uhl, 1997; Faminow, 1997a, b; Faminow, 1998; Walker et al., 2000), the focus is the deforestation of upland areas, and has largely excluded cattle production on the floodplains. This paper hopes to provide a point from which cattle production on the floodplains can be seen as an important land use activity, with attendant economic and ecological implications. We add to the debate on cattle production in the Amazon by showing that the informal contracts between small ranchers and independent investors should be carefully considered in policy programs aimed at the control of land use in the Amazon.

Objectives

The objective of this research is to present the results of a preliminary study of informal contracts. The study focused on the floodplain of the Lower Amazon Basin, which stretches from the Pará-Amazonas State border east to the mouth of the Xingu River. It is an area of approximately 18,000 km², averaging 45 km in width along the banks of the Amazon (Figure 1). The results

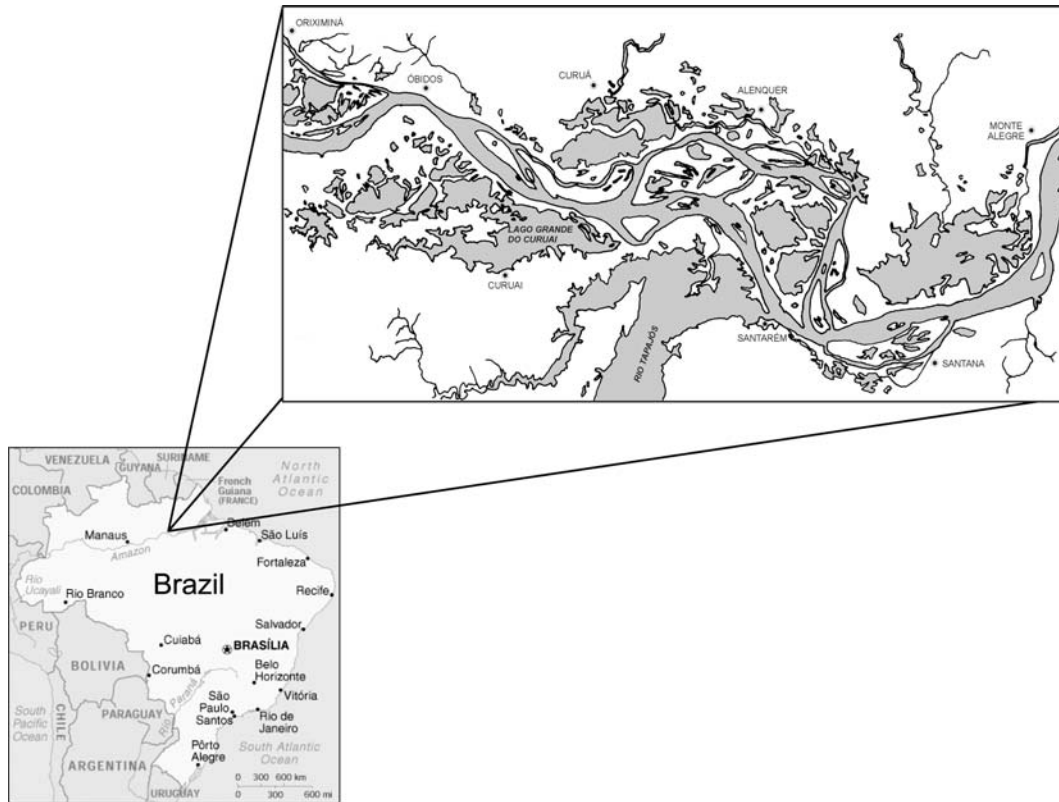


Figure 1. Map of Lower Amazon.

and discussion of the study are split into two sections: The first section presents the results of a survey of small ranchers that provides descriptive statistics of the informal contracts to small ranchers. The second section presents the results of financial analyses of informal contracts both from the perspective of small rancher and as outside investors. A number of recommendations are made concerning the role of informal contracts in the growth of cattle ranching in Amazon floodplain.

Survey methodology

The results of a broad survey on ranching in the Lower Amazon (Sheikh, 1998) raised the question of the role of informal contracts (henceforth referred to simply as contracts) in herd development on small ranches. Subsequently, a shorter, focused, survey, specifically aimed at contracts was designed and implemented. The survey was conducted in 20 floodplain communities located within the three counties of Obidos, Santarém, and Alenquer in the Lower Amazon Basin. A total of 142 small ranchers, with a combined 207 informal contracts, were interviewed.

The objective of this survey was to solicit basic data on contracts from a representative sample of ranchers.

One principal enumerator with a team of two or three assistants conducted all interviews. Ranchers were selected at random for interviews, and were located by visiting floodplain communities by boat and on foot. The sample of ranchers was considered sufficiently broad as to be representative of the small ranchers of the Lower Amazon.

Survey results

Informal cattle contracts were found on 72% of the small ranches in the survey. The average number of contracts was 2 with an average of 15 head apiece ($SD = 27$; $n = 142$). The mean herd size was 45 head ($SD = 68$; $n = 142$ ranches) with an average of 21 head held in contracts. Although the mean percent of head in the contract is 48%, the range was from 0 to 100%, showing wide variability.

Figure 2 shows the distribution of the percent of animals in contract. Two points of interest that stand out are that 27% of the ranches never used contracts, and 30% had all of their animals in contracts. In addition, in herds of less than 10 head, 42% had all of their animals in contracts and 45% had zero animals in contracts (i.e., 87% of the herds with less than ten head). This shows a

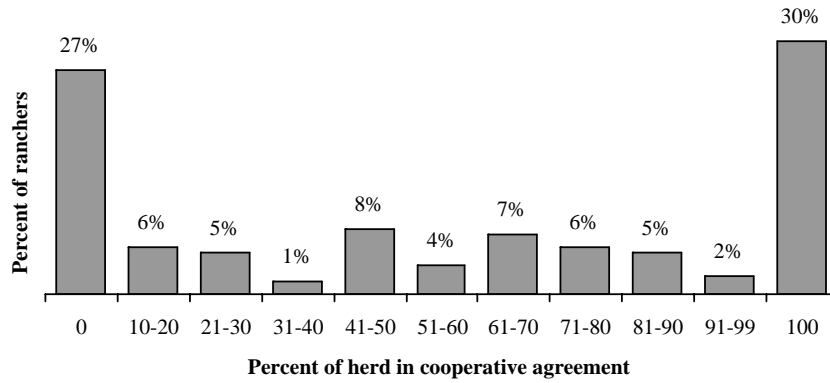


Figure 2. Sociedades as a component of total herd.

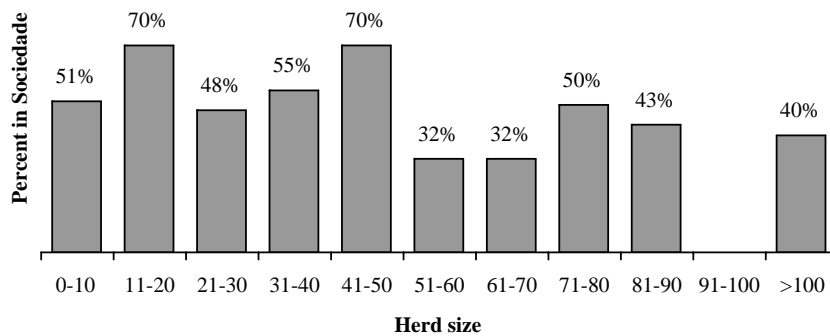


Figure 3. Herd size and sociedadade percentages.

distinct choice of mechanism for herd production for small ranchers. They either entered into a contract completely (100% of animals), or bought and inherited their own cattle (zero animals in contract).

Herd size appears to influence the percent of animals under contract. Figure 3 shows that the smaller herds – less than 50 animals – had an average of 58% of their cattle from contracts. On the other hand, in herds of greater than 50 head only 38% of the animals were from contracts.

Informal contracts appear to be an important means of herd production for small ranchers who have neither

the collateral nor the access to capital institutions for loans. Indeed, none of the ranchers interviewed had ever borrowed money from a bank to start their cattle herd. Instead, 53% said they started their herd through a contract, 22% had inherited their herd, and 25% had bought the animals with their own money. Contracts appear to have a natural decay as ranchers reach their production limits. Sixty-seven percent of the ranchers had started their contracts within the past decade (91–100), and an additional thirty-two percent within the past two decades (81–90) (Figure 4). Beyond that time, the rancher will have been able to create his or her

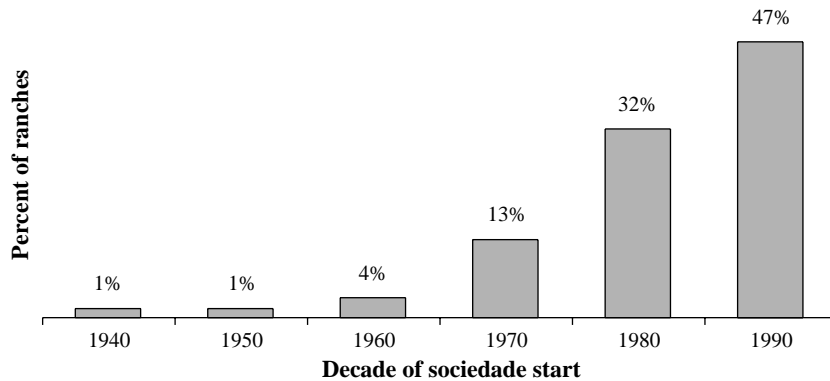


Figure 4. Starting dates of sociedades.

Table 1. Distribution of variable costs in contracts.^a

Variable cost	Rancher pays all (%)	Investor pays all (%)	Other (%)
Vaccination (health)	88%	12%	0%
Transport to TF ^a	80%	11%	9%
Rental of TF ^a	80%	9%	11%
Transport to market ^a	62%	14%	22%

^aAll small ranchers provide land and labor to maintain herds.

own herd and will gradually diminish the number of head under contract. It was originally thought that most of the investors giving cattle to the small ranchers were large ranchers with an excess of cattle. This turns out to be wrong, however, with only 18% of the donors being large ranchers. Of the donors, 46% were members of the rancher's community, and 51% were independent investors from outside the community. The informal contracts from community members, however, tended to be smaller, with an average of seven head, whereas with non-community investors, the average number of head was 17 per informal contract.

Within the contract mechanism, different arrangements are made for payment of the variable costs of herd maintenance. The principal costs include vaccinations, transportation to the high lands pasture (*terra firme*) during the wet season, rental of pasture during the wet season, and transportation to market. The results of the survey show conclusively that the burden of maintenance costs lies primarily with the small rancher. Results in Table 1 show that 88% of the small ranchers pay the vaccination costs; 80% pay the transport costs to the pasture; 80% pay the pasture rental costs; and 62% pay the transport costs to market. As mentioned above, the rancher also bears all the risk associated with death or loss of cattle.

Herd population dynamics

To analyze financial returns to cattle production we examine three production perspectives. First is that of a regular breeding herd whereby the rancher buys cows and simply lets the herd grow. The second is that of the receiver of the cattle in the contract, i.e., the small rancher. And third is the financial analysis for the investor, or cattle donor, in the contract. For each of these perspectives, a herd's population is projected using set technical coefficients; and an internal rate of return and net present value are determined. The analysis is run for a period of 10 years, during which a breeding herd can be adequately developed, and 3 three-year contracts can elapse. Before the financial

analyses are presented a number of technical coefficients are explained.

Technical coefficients

Calving rate: The calving rate is the proportion of cows that bear live calves during the year. This percentage figure is applied to the number of cows present at the beginning of the year. In this analysis, this number has been determined at 60% (Sheikh, 1998), with male and female calves equally represented. Calving rates commonly vary between 50% and 90% and are greatly affected by management and environmental conditions. In the harsh physical environment of the *várzea*, and the poor management apparent in many of the systems, a calving rate of 60% is to be expected.

Growth: It is expected that the bulls will go to market at the end of 4 years at an average live weight of about 350 kg (taken from abattoirs in Santarém, Pará during the entire year 1997). This translates into a dressed weight of approximately 175 kg on the hook.

Bull/cow ratio: The bull to cow ratio varies according to management practices, but is usually in the range of one bull per 10 cows, up to one bull per 30 cows (Sheikh, 1998). In this case, we have chosen one bull per 20 cows. A higher ratio may increase calving percentages, but will also put additional pressure on the pasture resource.

Mortality: Some of the animals are expected to die during the period assigned. A higher mortality is expected during the first year – in this case 20%, than in subsequent years. Years 1–2, and 2–3 suffer only 4% losses. Cows are included in this figure and this is used as a proxy for culling.

Terra firme expenses: It is assumed that the animals will be transported to the *terra firme* during the wettest months. *Terra firme* land must be rented at a rate of five *reis* per animal per month. It is expected, but variable, that the animals will stay on the *terra firme* for three months at a cost of R\$15 each. Transport to the *terra firme* is done at a cost of two *reis* per head for the round trip. All management costs are included in the rental price.

Labor: The labor requirements for managing herds are difficult to estimate. In herds between 1 and 50 head, it is assumed that labor cost does not vary. When the herd increases above 50 head, additional labor is included at a rate of one worker per 100 head, or proportion thereof. Labor is not used for the months that the cattle are on the *terra firme* because the rental cost of the *terra firme* includes the labor. The labor cost per worker is estimated at R\$150 per month, which was equivalent to the minimum wage at the time of this study.

Table 2. Health budget for cattle production.

Affliction	Description	Cost (R\$)
Aftosa (hoof and mouth)	1 dose, 2 times per year at 0.80 per dose.	1.60
Pneumonenteritis (diarrhea)	2 doses each calf at 0.16 per dose.	0.32
External parasites – ticks	Triatox – R\$11 for 200 ml which dilutes into 100 l of water – dose of 3l per animal.	0.33
Antibiotics	Terramicina – 50 m for R\$10	8.00
Internal parasites	Ivomec – R\$20/50 ml	2.00
Vitamins	ADE – R\$15 per 40 animals, 3 × per year.	1.13
Salt and minerals	Fozbovi, R\$34, Sal grosso R\$7, total R\$41 for 75 kg (R\$0.55/kg) estimated application 0.01 kg/hd/day (3.65 kg/hd/year) (Sheikh 1998)	2.00
Manquiera (black leg)	R\$4.50 for 50 doses, 1 × per year	0.09
Brucellosis	One shot for calves.	1.00
Total	Per head per year	16.47

Health: The annual health budget for each animal has been estimated at R\$16.47 and is based on results of an earlier survey (Sheikh, 1998), and recommendations from a current survey of agricultural stores. Table 2 depicts the health requirements and costs.

Cattle prices: Cattle prices for purchase and sale are tied; it is assumed that there are no specialized breeding bulls and that their cost is equivalent to the market rate. Cow prices are equivalent to the bulls. With a four-year growth cycle, it is assumed that the value of the animals increase by one quarter each year. For example a calf is valued at 25% the bull price, 1–2-year-olds at 50%, and 2–3-year-olds at 75%. Values for the calf, heifers, and steers are important when the final value of the herd is assessed; otherwise they are not sold. Cattle prices are based on the wholesale value (dressed). In the analysis the price ranges from R\$1.80 to R\$2.20 per kg, giving an approximate range of R\$315–R\$385 per animal at market.

Herd projection model

The analysis is conducted over a 10-year period, during which the growth of the herd must be estimated. In this study, a spreadsheet model is developed, using the technical coefficients, to project herd growth over the period. The model is a variation on a herd development model described in Gittinger (1982). Since the concern here is the comparison of three production alternatives (a breeding herd, a rancher receiving contract animals, and an investor), no attention is paid to land area limitations. Herd size is allowed to increase, subject only to the technical coefficients. We include the breeding herd option in this analysis because it is the standard cattle production option to which we can compare the contract system.

The increase of the breeding herd is as rapid as possible and is a straightforward projection subject to the technical coefficients. The informal contract, however, is slightly more complicated. For the first three years, the contract functions essentially the same as a breeding herd. At the end of three years, however, the offspring from the animals are divided equally between the investor and the small rancher and the original (beginning) number of animals is returned to the investor. The investor leaves these cattle in contract with the small rancher, i.e., the cattle do not go anywhere the contract is simply renewed. Any deaths that occur are a cost to the small rancher. During the 10-year period the contract is renewed three times. After the end of each 3-year period, the small rancher receives 50 % of the offspring and begins his own breeding herd. The small rancher now has two herds, his contract herd that is continually going through a repetitive cycle, and his breeding herd, generated from the offspring of the contract and its own natural growth. The small rancher earns income from selling male animals after four years of which he has two sources – the offspring from the contract and the offspring from his own herd. Table 3 shows the herd population dynamics for the small rancher with a 50–50 informal contract. It shows that if a rancher takes 30 animals under contract, at the end of 10 years it is possible to create his own herd of 78 head.

The third section is that of the investor. The investor has upfront costs of cows and bulls, and receives, as income, 50% of the offspring at the end of every 3 years. At the end of 10 years he also retains the value of his original herd, all losses and deaths being the responsibility of the small rancher. In all cases, the financial analysis below accounts for all variable costs and benefits associated with cattle production and includes the terminal value of the herd at the end of 10 years.

Table 3. Herd dynamics for informal contracts (rancher): starting herd 30 head.^a

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cows	30	30	30	30	30	30	30	30	30	30
Calves	18	18	18	18	18	18	18	18	18	18
Calves1–2	0	14	14	0	14	14	0	14	14	0
Animals 2–3	0	0	14	0	0	14	0	0	14	0
Steers 3–4	0	0	0	0	0	0	0	0	0	0
Bulls	2	2	2	2	2	2	2	2	2	2
Contract herd	50	64	78	50	64	78	50	64	78	50
Earnings (own herd)			24			24			24	
Own herd cows				3	7	11	15	20	27	34
Calves				2	4	7	9	12	16	20
Calves1–2				9	2	3	14	7	10	13
Animals 2–3				7	9	2	10	14	7	9
Steers 3–4				3	4	4	4	5	7	7
Bulls				0	0	1	1	1	1	2
Own herd total				22	22	24	49	54	61	78
Total herd	50	64	78	71	86	101	99	118	139	128

^aThe average number of animals in the contract is 15 and the average number of contracts is two – therefore the use of 30 as an example.

Financial analysis

Two indicators of financial viability are used in this analysis; the Net Present Value (NPV) and the Internal Rates of Return (IRR). To permit the comparison of costs and benefits that occur at different stages during an activity that spans more than 1 year, all activities must be discounted to present values. The present value of a future sum is calculated by dividing it by $(1+r)^n$, where r is the discount rate and n is the number of years. The net present value of any activity is the present value of the stream of future revenues minus the present value of the stream of future costs and is calculated using the following equation:

$$NPV = \sum_{t=0}^n \frac{(R_t - C_t)}{(1+r)^t},$$

where R_t is the revenues generated in year t , C_t the costs incurred in year t , r the discount rate, n is the number of years. Any positive value for the NPV indicates that the activities have a return above the opportunity cost of capital. In this case both 5 and 10% are used as the discount rate to proxy the opportunity cost of capital.

The IRR is also called the financial rate of return, and is basically the discount rate that makes the NPV of the incremental net benefit stream equal to zero. It is the maximum interest rate that an activity could pay if it were to recover its investment and operating costs and still break even (Gittinger, 1982). In this case, we are considering only operating costs. The mathematical statement associated with IRR is as follows: The IRR is the discount r such that:

$$\sum_{t=0}^n \frac{(R_t - C_t)}{(1+r)^t} = 0,$$

where R_t is the revenues generated in year t , C_t the costs incurred in year t , r the discount rate, n is the number of years. In this case the IRR can be compared to any given cost of capital value. For example, if the current cost of borrowing money, the bank interest rate, is greater than the IRR of the financial activity, then it does not pay to borrow money to conduct the activity. In comparison between the two measures, if the value for the IRR is less than the discount rate used in the NPV calculation, the NPV value will be negative. These two measures provide different, but complementary, perspectives – basically, the NPV shows the overall earnings, and the IRR shows the repayment potential of the activity.

For both of these indicators of financial viability, the analysis is run with the small farmer paying all costs, and then with changes in the costs system such that the investor pays for health costs of the animals.

Financial results and discussion

The results in Table 4 show the NPV for the three options for a range of starting herd sizes (10–50) and a discount rate set at 5%. In the case of the rancher, it is quite clear that, from a purely financial perspective, this is not an attractive proposition. Starting with 10 head under contract, the rancher will lose approximately R\$1219 after 10 years. This worsens as the starting contract size increases to 50 and the rancher loses an

Table 4. Net Present Value^a for herds from 10 to 50, for the rancher, the breeding herd and the independent investor.

Starting herd	Net present value		
	Rancher (R\$)	Breeding herd (R\$)	Investor (R\$)
10	-1219 ^b	1693	1681
20	-3487	1905	3406
30	-5416	2466	5175
40	-7157	2864	6988
50	-8599	3579	8845

^a All production costs incurred by rancher, including 100% of health costs.

^b At the time of the survey, the exchange rate was approximately R\$2 to US\$1.

Table 5. Internal rates of return^a for herds from 10 to 50, for the rancher, the breeding herd and the independent investor.

Starting herd	Internal rates of return		
	Rancher (%)	Breeding herd (%)	Investor (%)
10	-7	8	12
20	-12	7	12
30	-11	6	12
40	-11	6	12
50	-10	6	12

^a All production costs incurred by rancher, including 100% of health costs.

estimated R\$8599. The other two options – breeding and investor – appear profitable earning up to R\$3579 and R\$8845, respectively, with a starting contract herd of 50 head.

Table 5 shows the IRR analysis and the trend is similar. The IRR for the rancher is between -7 and -12% whereas the other two options are positive, with between 6 and 8% for the breeding herd,² and 12% IRR for the investor.

These results, combined with the results above showing the near universal use of contracts, suggest that,

regardless of the risk associated with the production and the very low return, contracts serve a purpose in the small farm systems of the Lower Amazon. There must be a non-financial benefit to cattle production in contracts. In cash poor systems such as those found on the floodplains, the cattle contracts may provide a means – albeit an expensive one – of creating equity. Cattle herds provide liquefiable assets in case of emergencies and perhaps also provide indefinable status among the community members (Pichón, 1996). Furthermore, after 10 years, this model suggests that, with a starting contract of 30 head, the rancher can have his own herd of 78 head. Once in that position, and perhaps even before that, the rancher will transition to the economics of the breeding herd, and the contract will, for him, be a thing of the past. That herd can then be passed on to family members as an inheritance – remember that 22% of the ranchers inherited their herds. None of this negates the fact that creating a cattle herd comes at a cost to the small rancher; what then can be done to make this contract agreement more equitable? In some 12% of the contracts the investor pays the maintenance costs.

We therefore examine how the financial results with changes in the allocation of health costs. Health costs – vaccinations, antibiotics, and supplements are, in most cases, paid by the small rancher (e.g., in 88% of informal contracts), and indeed represent a large portion of the maintenance costs associated with individual animals. Table 6 presents the results of cost sharing between the small rancher and the investor. In this case, it is clearly shown that alternative contract arrangements are beneficial to the rancher. If the maintenance costs (R\$16.47 per year) are split between the rancher (70%) and the investor (30%) the returns to the rancher are dramatically improved to an IRR of between -1 and -4%. The investor IRR declines to 7–8%. Further reallocation of maintenance costs to a 50:50 split brings the rancher IRR up to between 6% and 13% and the investor down to around 4%. It appears that the equitable distribution of costs is 55% for the rancher and 45% for the investor, which results in both earning around 5% IRR. This alternative arrangement, and

Table 6. IRR with alternative contract specification – health costs are distributed 70:30, 60:40, and 50:50.

Health cost distribution	70% rancher 30% investor (%)		60% rancher 40% investor (%)		50% rancher 50% investor (%)	
	IRR – R	IRR -I	IRR – R	IRR -I	IRR – R	IRR -I
Starting herd						
10	4%	7%	8%	6%	13%	4%
20	-1%	7%	3%	6%	7%	4%
30	-2%	7%	2%	6%	6%	4%
40	-1%	7%	2%	6%	6%	4%
50	0%	8%	3%	6%	7%	4%

subsequent benefit to the small rancher, could also be accomplished with variations in the other major costs – pasture rental and transport.

Finally, we see that earnings are subject to cattle prices, a factor beyond the control of either the rancher or investor. In our analysis in Table 5, we use a price of R\$2.00 per kg and we see a return of –11% for the rancher. A sensitivity analysis shows that if the price drops to R\$1.80 per kg, the returns drop to –17%. The price increase required to break even under the conditions of 30 head starting herd and no maintenance cost sharing is to R\$2.88 per kg (a 44% increase).

Conclusions

This paper presents the results of a survey and financial analysis conducted on informal contracts on small ranches in the Lower Amazon. Informal contracts have existed for some time in the floodplains and are an important means of herd start-up in the face of a lack of accessible formal capital. The most common form of the contract is one in which an outside investor places animals in the care of a small rancher. After a period of three years, the offspring from the animals are divided between the two participants. The small rancher bears the risk of mortality and the investor bears the cost of capital.

At least 72% of the ranchers interviewed ($n = 142$), with herd sizes ranging from 1 to 450 were in some form of informal contract. The average size for an informal contract is around 15 head, and the financially optimal starting size is about 10 head. Most of the small ranchers (88%) pay the costs of maintenance in the contract, and the financial analysis shows that this is where the rancher could gain in contract negotiation. Internal rates of return for small ranchers paying all costs range from –7 to –12%, and investors around 12%. If, however, investors are asked to pay some of the maintenance costs, the distribution of income would be more equitable in these contracts. For example, with the investor paying only 30% health costs the rancher IRR increases to between –1 and –4%. It is therefore possible to find equitable contract arrangements, but they are perhaps elusive due to the power of the investor in determining contract format.

We also compare the contract system to the alternative of a breeding herd program. In this case the breeding herd generates sufficient returns to justify the borrowing of money from formal credit institutions (assuming they were to become available at some future time) at a loan rate of between 6 and 8% and, in fact, the return that a small rancher will earn once he/she has established a herd through a contract.

This study is an early attempt to gather information and analyze the system of informal contracts that allow the cattle herd of the Lower Amazon to continue to flourish despite a lack of access to formal lending institutions. It is perhaps important to note here that the increase of the cattle herd in the Amazon Floodplain is not due to government land use incentives – as is the case in many other areas of the Brazilian Amazon – but rather to the flexibility and suitability of cattle ranching, from both a financial and utility perspective. Cattle ranching is an important aspect of the complex farm systems that exist on the floodplains. Any effort to modify and control land use in the Lower Amazon must acknowledge the presence of cattle production and understand the informal contracts that support the growth of the herd.

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Notes

1. On the floodplain the most common grasses consumed by cattle are from the genera *Paspalum*, *Echinochloa*, *Hymenachne*, and *Oryza*. The upland grasses are mostly introduced species, primarily *Brachiaria* spp.
2. This shows that the rancher, if formal capital were available, would be able to repay a loan of between 6 and 8% and breakeven. This figure is below current loan rates in Brazil which fluctuate between 10 and 20%.

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