



Microcredit, Social Capital, and Common Pool Resources

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Summary. — The paper presents a conceptual scheme for understanding the impact of microcredit—small loans to poor borrowers—on common pool resources. Impacts on common pool resources are posited to occur through changes in household production and consumption, the focus on women, and the social capital created from group training, decision-making, and risk-bearing with the group lending techniques characteristic of many microcredit programs. Enhanced human and social capital can improve environmental outcomes. A nonrandom survey of microfinance organizations suggests increased environmental awareness and potential CPR stewardship through microcredit, but empirical research is needed to demonstrate actual impacts. Published by Elsevier Science Ltd.

Key words — microcredit, social capital, environment, common pool resources

1. INTRODUCTION

Microcredit, extending small loans for income generating activities to the poor in predominantly developing countries, has become one of the most popular development strategies of the last few years. Despite the significant interest and financial support microcredit has received, and a large number of loan recipients who make at least part of their living by exploiting their local common pool resources (CPRs), very little has been written exploring microcredit’s effects on these resources.¹

In this paper we explore how three common characteristics of microcredit programs affect the sustainable use of CPRs—resources that are characterized by high exclusion costs and high subtractability.² First, microcredit extends credit to the very poor to promote microenterprise activity, which may increase production and consumption activities and in turn change the demand for CPRs and the technology for their use. Second, microcredit programs often focus on women, who are the primary users of CPRs in many developing countries. Finally, microcredit often employs group

meetings and group lending techniques, potentially building human capital and strengthening the social capital of the community. This social capital, in turn, can lower the costs of collective action in managing local CPRs.

If the difference between those who have “broken the shackles of a commons dilemma and those who have not” is an *internal* difference, and failure occurs because “participants may simply have no capacity to communicate with one another, no way to develop trust, and no sense that they must share a common future” (Ostrom, 1990, p. 21), then finding avenues such as microcredit that strengthen a community’s social capital may aid in solving the complexity of the commons. It should be noted, however, that enhancement of social capital is generally a salutary by-product of microcredit, not its primary objective. Therefore, there may be more efficient ways to enhance social capital in any given setting.

The goal of the 1996 Microcredit Summit campaign meeting was to find a way “to reach

* Final revision accepted: 27 August 2001.

100 million of the world's poorest families, especially the women of those families, with credit for self-employment and other financial and business services, by the year 2005" (Microcredit Database, 1999). If the Summit leaders reach their goal, providing credit to such a huge proportion of the poor would represent a fundamental shift in development policy.³ This concerns a growing number of people who fear that money is being shifted away from other development programs into microcredit, without fully understanding its impact relative to other measures (Buntin, 1997; Hashemi, 1997; Roth, 1997; Solomon, 1998).

Our primary goal in this paper is to begin outlining microcredit's relationship to, and impact on, CPRs. Our focus is rural microcredit and the associated CPRs: irrigation systems, other water sources, fishing pools, grazing lands and forests.⁴ We begin by examining the consequences of microcredit's unique program characteristics on CPRs: the physical, human and especially social capital effects. We then offer tentative conclusions based on some limited broad-based data from a survey of members of the Microcredit Summit and some examples of how microcredit and environmental resources are being linked in the field.

2. MICROCREDIT AND ENVIRONMENTAL RESOURCES

It is tempting to ignore or dismiss the environmental impacts of microenterprises because of their small size. But there is limited evidence that, per unit of output, the environmental consequences of small enterprises can be more pronounced than those of larger enterprises because of technical inefficiencies in production and waste treatment, and the difficulty of regulating this sector (Kent, 1991).⁵ Moreover, for the millions of microenterprises in aggregate, the cumulative effects may be significant.

Changes in the physical, human and social assets that arise from microcredit activities will affect a community's production, consumption, and management opportunities and decisions around CPRs. Whether the net effects are negative or positive clearly depends on agroclimatic zones, the particular CPR, design of the microcredit program, and other local and nonlocal institutions. The net physical capital effect of increased production and consumption opportunities—including increased demands

on CPRs and increased waste and byproducts compromising the quality of the CPRs—may be negative. We suggest, however, that the human and social capital effects of microcredit may mitigate these damages.

Microcredit's effect on common pool resources begins with three unique characteristics of these programs: extending credit to the very poor, lending primarily to women, and generally employing group lending methods. Table 1 indicates how each of these program components changes an existing constraint that the borrowers live under, and hence can lead to a change in their productive or consumptive behavior. Microcredit affects environmental and common pool resources through changes in the levels, diversity, or regularity of borrowers' income, changes in the role of women, and changes in the cost of collective action. Changes in these constraints lead to behavioral changes that have implications for CPRs.

(a) *Credit extension to the poor: financial and physical capital effects*

Extending credit has environmental resource consequences through both the type of capital investment undertaken and the potential changes in borrowers' income. Credit allows microentrepreneurs to invest in small-scale capital such as sewing machines, looms, bicycles, rickshaws, livestock, tools, and other supplies. Microenterprise activity, if successful, can increase, smooth and diversify the borrower's income and increase ownership.⁶ The result may be an increase in resource use and waste production, but also an increased demand for environmental quality and a lower discount rate—the rate at which borrowers are willing to trade off present for future consumption—which has beneficial effects on natural resource stewardship.

(i) *Increased income and ownership*

The evidence is weak, but growing, that microcredit raises the income and/or assets of at least some participants.⁷ As income increases, we expect the quantity, composition and timing of economic activity of the poor to change. Changes in activities afforded by increased income have effects on the environment that may change over time, and be positive or negative. For rural, largely natural resource-based, subsistence economies, growth involves either the extensification of agriculture, intensification of agriculture, or new farm or nonfarm activity.

Table 1. *Relationship of microcredit to CPRs*

MFO characteristic \Rightarrow	Δ in constraint \Rightarrow	Δ in behavior	Examples of CPR implications
Credit extension (<i>physical capital</i>)	\uparrow Income/ownership	\downarrow Discount rate/ \uparrow stewardship	More sustainable/organic techniques—less chemical use, water and land pollution
		\uparrow Demand for environmental quality	Improved sanitation
	\uparrow Income diversity	\uparrow Resource use	More disposal of waste on common lands, water ways and airways
			Extensification of agriculture—more deforestation
			Intensification of agriculture—more chemical use, water and land pollution
	\uparrow Income regularity	\downarrow Demand for insurance	Less holding of excess livestock and use of grazing lands
Focus on women (<i>social & human capital</i>)	\uparrow Reproductive control	\downarrow Fertility	Less resource degradation and depletion
		\downarrow Resource use	
Group lending (<i>social & human capital</i>)	\downarrow Costs of collective action	\uparrow Cooperation	More investment in common lands and water systems
	\uparrow Knowledge	\uparrow Management of CPRs	Improved monitoring and enforcement

In some cases additional income from microcredit activities relieves the pressure to farm new lands, while in others it affords the ability to do so. In general, clearing new land for crops or raising livestock—rather than using existing land more intensively—increases deforestation pressures, the use of marginal lands, and environmental impacts from migration. Deforestation implies a loss of timber, bark, saps and pharmaceuticals, loss of species habitat, soil erosion, and in watersheds, increased runoff of rainwater leading to soil loss and clogging of water reservoirs and irrigation systems. Tertiary lands are often more marginally productive, suffer more from soil erosion—especially if they are on hillsides—and require more fertilizer and water which in turn pollute and deplete CPRs.

In Madagascar, access to member-based financial institutions encouraged agricultural intensification by increasing lowland rice yields and upland soil fertility. Increased access to capital, however, also increases upland farming opportunities, though on net an increase of 1% of households involved with microfinance organizations decreased upland use by 0.36% (Zeller *et al.*, 2000). Agricultural intensification, while reducing pressure on forests and grasslands, is often achieved by increased chemical fertilizer use, purchased through credit, which may have its own environmental consequences

including soil and water contamination and increased demands on irrigation and other water systems.

Rural farm and nonfarm microenterprises may increase the demand for resources supplied by local CPRs, such as water, timber for fuelwood, or land for grazing. The negative impacts include generating more, and more toxic, waste (Dasgupta & Göran-Mäler, 1994, p. 7), the severity of which depends on scale, the absorptive capacity of the environment, and the infrastructure and services to deal with it. Processes and products may contaminate local CPRs, especially water and forest systems. Examples of environmentally harmful farm-based microenterprises include chemical-intensive agriculture, livestock slaughtering and aquaculture because of inappropriate use and disposal on public lands and waters of the hazardous chemicals. Nonfarm activities financed by microcredit that may put particular pressure on local CPRs include small-scale mining, metalworking and electroplating, tanning, textile dyeing and craft enterprises, brick production, foundries for food processing, wood processing, cotton ginning, or chemical production, small-scale transportation and road-stand restaurants.⁸

More positively, rising incomes tend to be correlated with a greater demand for environmental quality through improved household

infrastructure including sanitation and cooking facilities, greater access to safe drinking water, increases in contraceptive use, and changes in fuel use (Dasgupta & Göran-Mäler, 1994; Reardon & Vosti, 1995). The impact of changes in fuel use depends on the fuel and fuel burning technology used. Switching from biomass or coal to electricity, for example, may reduce the destruction of forest sinks and CO₂ emissions.⁹

On the production side, increased income may also promote resource stewardship through increasing property rights, access to more environmentally benign technology, and lowering discount rates. Women and the poor in particular have often been denied access to credit, because they lack land collateral. Increased land and other resource ownership can create incentives to practice better long-run stewardship. It can also allow the flexibility to smooth consumption and expenditures to achieve better returns or improved practices. Lower discount rates may increase borrowers' willingness to use organic fertilizers and pesticides and to practice integrated pest management that can reduce both the demand on CPRs and the toxins that threaten the quality of those resources.

(ii) *Income diversification*

Diversifying income can be an important result of microcredit, particularly for the rural poor who are dependent on agriculture and are subject to weather fluctuations and crop cycles. Income can be diversified through savings or other financial services offered by the member-based financial organizations (MFOs), additional farm activities such as new crops, and new or expanded nonfarm activities. Again, the CPR consequences depend on the activity. For example, credit can provide the opportunity to diversify by increasing livestock holdings, which can lead to overgrazing and pressures to deforest. Conversely, credit and insurance services could reduce the need to hold insurance in-kind, traditionally accomplished by carrying excess livestock, and reduce pressure on these same CPRs (Dasgupta & Göran-Mäler, 1994).

(b) *Focus on women: social and human capital effects*

As a group, MFOs overwhelmingly focus on extending credit to women, though some studies suggest that women do not fully control their loans.¹⁰ The environmental consequences of increased income or property rights for

women may be more pronounced than for men because women begin with more limited rights but often have a major natural resource stewardship role. In most developing countries, women are responsible for gathering fuelwood and nontimber forest products, and collecting water. They are responsible for cooking and household sanitation. This daily work contributes to a unique and intimate relationship with environmental resources and a knowledge and sophisticated appreciation about local ecosystems. This includes understanding the varied functions of different forest resources, the multiple uses of crops, soil features, water flow, and health care for small livestock (World Resources Institute, 1994–95, p. 46).

Women's roles also mean they suffer the most from deforestation and desertification, and have a particular incentive to maintain or improve their local environment and CPRs. This incentive has translated into some of the most creative conservation initiatives worldwide. Women's groups have organized to collectively lease and revive exhausted cropland, offer leadership in water supply and management, plant trees, construct terraces, and provide education about a variety of resource conservation opportunities (World Resources Institute, 1994–95, p. 54).

MFOs that require regular group meetings can strengthen these initiatives and offer women the opportunity to share their own knowledge and best practices. MFOs that offer financial, business, technical, reproductive and other training may add to the human capital of the borrowers and the community.¹¹ The value added may be particularly high for women, otherwise unexposed to training, and women in cultures who otherwise have few or no opportunities to leave their home. Evidence on human capital formation is weak, however, as program performance measures commonly focus on other program outcomes. It is logical to assume that the relevance of training in entrepreneurial skills will have enduring value only if entrepreneurial opportunities exist for credit recipients.

There is some evidence that microcredit programs may contribute to reduced fertility (Schuler & Hashemi, 1997). This may stem from the higher opportunity cost of bearing children for a successful female microentrepreneur, relative to a woman employed only in household or farm activities and where the child may be a more important source of labor. In addition, as women's income rises, child

mortality rates usually drop, lessening the need or desire to bear as many children.

There may, however, be a more direct avenue of influence from microcredit to reproductive control that would explain cases like Bangladesh where fertility rates are plummeting though mortality rates are not. Some MFOs also provide, indeed encourage, family planning education as part of their program and regular meetings. It may be that their new economic power, new information, or new support system allows women to take more control over childbearing decisions.¹² Grameen Bank borrowers, for example, are far more likely to practice contraception than the national average (Mukerjee, 1998; Zwingle, 1998, p. 42), but further research is needed that carefully includes control groups before strong conclusions are drawn.

The environmental resource implications of reduced fertility are reasonably unambiguous: fewer children usually mean less resource consumption and less waste. If fertility is declining because of increasing income, however, it may be that while total consumption is falling, per capita consumption is rising. As always, the net effect also depends on how the composition of activities changes, not simply the level.

(c) *Group lending: social and human capital effects*

The least explored outcome of microcredit is the production of social capital arising from group-based microfinance programs (van Bastelaer, 1999). Social capital is “the institutions, the relationships, the attitudes and values that govern interactions among people and contribute to economic and social development” (World Bank, 1988, p. 2). Interest in social capital’s role in economic growth has been growing since the work of Coleman (1990) and Putnam (1993).

Social capital can be conceived of as networks of horizontal and vertical linkages. Horizontal linkages are generally those positive social networks that contribute to the overall productivity of a community, such as volunteer associations. Coleman added the notion of vertical linkages “characterized by hierarchical relationships and an unequal power distribution among members” (Grootaert, 1998), and allowed for social capital to produce negative as well as positive associations, depending on its function; a given form of social capital that is valuable in facilitating certain actions may be

useless or even harmful for others (Coleman, 1990, p. 302). Olson (1982) and North (1990) employ a more encompassing view of social capital to include informal and formal institutions that govern how individuals relate.

It is fairly well understood how microfinance programs use the existing networks of horizontal associations to lower some information and other transaction costs (Besley & Coate, 1995; Conning, 1998; Morduch, 1999; Stiglitz, 1990; Stiglitz & Weiss, 1981). van Bastelaer (1999) also notes the importance of hierarchical relationships, including relationships among borrowers and lenders that become personal through regular meetings and/or that create traditional patron–client relationships and the need to demonstrate allegiance, and the relationships between MFOs and local or national governments.¹³

Less understood is how MFOs create new social capital. Microfinance programs use existing social capital, particularly in their group-lending techniques, but arguably also create social capital through meetings and other services.

Microfinance has the potential to enable collective action, the coming together of the community, and more sustainable community-based organizations... In as far as microfinance interventions allow to invest in education and training, members of the community can acquire skills that will allow them to locally design, develop and manage community projects (Schrieder & Sharma, 1999, p. 74).

In villages where members meet weekly as a condition of borrowing, the additional costs of collective action for other village undertakings, many of which are CPR-based, are significantly lower. Communication among participants greatly increases the chances of successful collective action. Ostrom *et al.* (1994, p. 167) have shown in a series of experiments that given the right institutional framework to communicate “players successfully used the opportunity (1) to calculate coordinated yield-improving strategies, (2) to devise verbal agreements to implement these strategies, and (3) to deal with nonconforming players.” van Bastelaer (1999) also argues that social capital is created when MFOs like the Grameen Bank and its replicators require all members to repeat the same behavior every week, such as reciting the list of decisions that accompany group membership. This routinization creates a corporate culture, or cultural habit. Such cultural habits, in combination with strengthened allegiances

among borrowers and their families, reduce incentives to behave in ways detrimental to the common good, and that would be perceived as nonconforming. As with communal equipment and supplies in a modern office, this behavior would be applied to CPRs in the rural setting.

As Ostrom and others have noted, it takes effort and energy to create social capital. Group-based microfinance can lower the costs of monitoring and enforcing existing rules and norms, and also the costs of crafting new rules—investing in social capital (Ostrom, 1990, 1992). Regular meetings, repeated interaction, and common credit goals can facilitate the communication, knowledge about fellow actors, common understanding about the incentive structure, and trust prerequisite to collective action (Ostrom, 1994, p. 532). By nature of its credit activities, microfinance enhances incentives for cooperation by increasing the anticipated payoffs.

It seems less likely that microfinance meetings *per se* would be used to determine collective choice rules, as much as they would be used to monitor and amend the day-to-day operational rules governing CPR use (Ostrom, 1994). This is because the microfinance participants may only be a subset of the local CPR users, and because in many cases they are likely to be women. But as is often the case, if the women are the primary users of the local CPR, microfinance activities may provide a conduit for changing the operational rules of the CPR among these users and the value system surrounding their use.

3. EVIDENCE ON MICROCREDIT AND ENVIRONMENTAL IMPACTS

We know of no data that track both household-level microcredit activities and ecological and CPR measures for the same population. These data are expensive and difficult to obtain. To get a sense of whether larger-scale efforts may be useful, we began by e-mailing surveys to 765 members of the Microcredit Summit. 147 organizations responded, including seven donor agencies. Because of the variety of MFOs worldwide, their informality and their turnover rate, there is no accurate inventory of MFOs, no way of knowing how representative the Summit members are of this population of MFOs, and no knowledge of how representative our sample is of the Summit membership. As such, these findings should be interpreted as

indicators of potential impacts for these respondents.¹⁴

Of the respondents, 82% (121) classified themselves as nongovernmental organizations (NGOs) or nonprofits, 13% (19) as public and 4% (6) as private organizations. The average of female borrowers across all programs was 76%, with 27 organizations lending 100% to women and two organizations having fewer than 15% female borrowers. Among other questions, participants were asked whether they used group or individual loans and the environmental impact (if any) of the microfinance activities in their area. The data provide perceptions of both the effects of microcredit on the environment and the importance of MFOs for social cohesion for these 147 organizations.

Respondents were asked, "Are there any sustainable natural resource or environmental requirements or conditions of lending associated with your program?" Thirty-seven percent (55) of the respondents said yes, while 54% (79) said there were none. The interpretation of "requirements" varied. Some organizations reported strict conditions, for example, that "agricultural loans are conditional upon the abstinence from use of chemicals, conditional upon the strict maintenance of resources i.e. no deforestation is allowed (for) as a condition of a loan, (and there are) conditions pertaining to the disposal of waste." Some lending conditions included "building a pit latrine" or "planting a tree" such as appear in the Grameen Bank's (and its replicators') 16 decisions, or local variations such as "We distribute tree saplings, fruit plants and encourage promotion of sanitary, personal and household environment improvement." Other organizations reported that loan applications directly asked about "environmental impacts" and that applicants had to prove that their project or loan would not have detrimental effects: "Joint project loans (group lending) for food processing are based on the condition that the location of the machine and the design of the structure minimize waste and do not damage surrounding soil," and "Participants are required to have in place soil conservation practices and to plant appropriate trees and erosion control barriers. Participants must be knowledgeable about use of manure and compost." "Most of the borrowers have to present activity for loan to group, (the) group rejects activities those are not favorable to local social or environmental practices." Other MFOs did not focus on the project *per se*, but required certain

behaviors from borrowers: "Members must have a solar stove for use at least once a week; The birth of every child must be commemorated with the planting of a tree seedling in the compound or in the family farm." Still others reported priority lending for organic agriculture, mushroom growing and afforestation projects to protect the environment, but they did not mention conditions on other lending: "Activity that applies natural plant and non-chemical pesticide will be given first priority." Finally, some MFOs mentioned educational efforts such as "Environmental awareness campaigns to which clients are exposed" and "We try to educate women not to harm natural resources as using wood to cook their food in high mountain areas. Instead we show them how to use solar ovens and stoves." Given the baseline level of knowledge among the borrower population about long-term environmental implications of their actions, even an informal education effort may lead to substantial behavioral changes. This supposition needs to be measured through observation and environmental monitoring.

There are other examples of MFOs and microenterprises concerned with producing "green" products or technologies. Grameen Shakti is dedicated to providing renewable energy sources, such as solar PV, biogas, and wind turbines to villages in Bangladesh that are without electricity. Likewise, the Solar Based Rural Electrification Concept (SO-BASEC) in the Dominican Republic and Honduras uses microcredit to promote solar-based renewable energy. The Asia Institute of Technology pro-

motes biotechnology-based microenterprises such as mushroom and bioorganic fertilizer production that reduce the harm to watersheds. These energy technologies and eco-tourism activities can reduce demands on local forests for fuelwood. Efforts to improve agricultural techniques and reduce chemical use place watersheds and other CPRs at less risk.

Respondents were also asked whether they believed there was a discernible impact on the environment or natural resource use from the credit they provided. Their responses are summarized in Table 2. Of the total respondents, 48% (71) said yes and 43% (64) said there was none. Of the 79 MFOs with a 50% or higher rural clientele (as opposed to urban or peri-urban), 65% (52) said that they felt that there was an environmental impact and 33% (26) felt that there was none.

Of those MFOs that reported some sort of discernible impact, the type of impact reported was both negative and positive. Not surprisingly, there was a greater percentage of rural MFOs responding "yes" to environmental impacts involving farming techniques—in particular those that can generally be construed as positive. There was less difference around perceptions of water, irrigation and deforestation effects.

Of the top four impacts "more water use" suggests a primarily negative environmental impact, while the other three are generally positive: less deforestation, increased organic farming methods, and increased crop rotation. More water use may reflect increased economic activity that may dominate any positive changes in managing common water resources. Less

Table 2. *MFO responses to impact of credit on environmental resources*

	Rural % "Yes"	Total % "Yes"
<i>Potentially positive for environment</i>		
1. Less deforestation	63	54
2. Increased organic farming methods	50	44
3. Increased crop rotation	40	39
4. Increased use of integrated pest management	33	24
5. Less water use	13	14
<i>Potentially negative for environment</i>		
1. Fuel use has increased	29	
2. More deforestation	12	13
3. Decreased crop rotation	9	7
4. Increased chemical fertilizer use	23	21
5. Increased chemical pesticide use	21	27
6. More irrigation	38	38
7. More water use	42	42
<i>Ambiguous</i>		
1. Fuel source has changed	38	

deforestation is consistent with the findings of Zeller *et al.* (2000) that access to credit correlates with reduced agricultural extensification, possibly from enabling borrowers to diversify into nonfarm activities, intensify their current agricultural activity by purchasing fertilizer or other inputs, or better manage the forest commons. As with water, we cannot discern from these data what changes microcredit programs may have elicited in CPR management. Increased organic farming and crop rotation is consistent with the proposition that increased income and ownership may lower a borrower's discount rate between present and future consumption.

While the net environmental effects of microenterprise activity may still be negative, such positive overall results suggest that, in some respects, microfinance programs may contribute to sustainable CPR use. Some MFOs mentioned other environmental effects not on our list including: more organic fertilizer use, increased forestland, and increased waste management through composting. The MFOs themselves may recognize some effects; a little over a quarter of the total respondents listed improving the environment as one of their most important impacts.

The MFOs were also asked, "What are the most important impacts of the credit and other financial services your organization provides?" Out of the following list, they were asked to rank all of the impacts that they felt applied to their organization (with 1 being most important, 2 being the second most important, etc): develop financial skills, create jobs, improve incomes, reduce fertility, improve the environment, create business skills, and improve social cohesion. Fifty percent (74) listed social cohesion as one of the most important impacts they felt their financial services provided. Of these respondents, 35% felt it was the first or second most important impact of their program.

Though these results are limited, anecdotes that support microcredit's role in building social capital and the importance of that social capital in managing the commons abound in the field. Collective action can increase the provision of public goods such as irrigation, crop insurance, and sanitation. It is also vital for improving the management of CPRs, such as grazing lands, groundwater basins, fisheries, and forests. In the Western Forest Complex in Thailand, for example, group meetings facilitated by Population and Development International (PDI) were used to report on forest

burning activity and coordinate village responses to support deforestation measures. In the Philippines, Bayan Microfinance reports a correlation between microcredit activity in a village and the cleanliness of public spaces.

Microcredit and the environment are frequently coupled within conservation NGOs or development NGOs with a conservation agenda. For example, PDI is trying to discourage deforestation by using microcredit to promote alternative, resource-sustainable livelihoods, such as more soil-friendly and organic crops, harvesting nontimber forest products, and aquaculture. In an effort to preserve Cao Hai Lake in Guizhou, China, as a migratory bird refuge, conservation officials are using microcredit to finance livelihoods that reduce pressures to drain the lake (*New York Times*, May 18, 1999). Conservation International hopes to reduce deforestation and poaching by increasing the value of forests as tourist sites. They use microcredit to encourage local craft makers to supply gift shops in Ghana's Kakum National Forest Preserve. Also in Ghana, TechnoServe is exploring microcredit as a means of controlling inventory of the shea nut to reduce elephant killing. In Bangladesh, the research organization UBINIG is helping farmers in the Tangail district reduce their dependence on pesticides, begin composting for fertilizer, and practice mixed cropping aided by seed banks. Myrada, based in Bangalore, India, has a mission to "recreate a self-sustaining habitat based on a balanced perspective of the relationship between natural resources and the legitimate needs of people." They organize credit management groups of the rural poor, manage micro watersheds, and reforest arid areas. The East-West institute has recognized the possibility of using microcredit with CPRs in Vietnam to:

draw upon the growing body of knowledge about management of common property resources to develop institutional mechanisms to facilitate acquisition and development of blocks of barren hill land by small groups of poor households. The already-demonstrated ability of small groups composed of kin and close neighbors to co-own buffalo suggests that similar small face-to-face groups might also be able to successfully manage tracts of hill land held as common property. Loans might be given at preferential rates to such groups, for example. If organizational methods similar to those pioneered by the Grameen Bank in Bangladesh were employed, the default rate on such loans might be lowered to an acceptable level (Cuc, Gillogly, & Rambo, 1990, p. 125).

4. CONCLUSION

We argue that there are important connections between microcredit programs and environmental resources—in particular, common pool resources. Some of these connections are through the physical and human capital created by microfinance activities. But there are also opportunities for creating social capital to lower the costs of collective action and hence the costs of managing common pool resources. Very little effort has been put into testing and monitoring these connections as they relate specifically to environmental outcomes in rural settings.

Results from our survey of Microcredit Summit members suggest that some MFOs have intentionally linked their financial services to environmental resource goals and that many more MFOs may be having inadvertent effects upon the environment. Nonetheless there remains much to be understood about the connection between microfinance, the environment, and managing CPRs. In particu-

lar, the centrality of social capital to the success of microcredit suggests a powerful means by which microcredit may improve common property management. The system of group borrowing through mutual guarantees is based on a recognition of strong cooperative behavior and mutually reinforcing positive incentives. There is some evidence of its effectiveness for the two primary objectives of microcredit programs: income and production enhancement. If directed toward management of CPRs, it may be equally effective.

Our goal has been to offer a conceptual scheme that hypothesizes some of these relationships, which we hope also argues for the importance of seriously measuring these impacts. In this scheme, we have identified a variety of links through which the environment might be affected by the use of microcredit among poor, rural populations. The evidence regarding the strength and direction of these relationships is still very thin and must be augmented before strong conclusions can be drawn.

NOTES

1. For a review of the empirical literature, see Sebstad and Chen (1996), and Zeller and Sharma (1998).
2. Exclusion costs are the costs of limiting appropriation of the resource. Subtractability refers to a reduction in the resource's yield (Ostrom, Gardner, & Walker, 1994, p. 6).
3. Many microcredit advocates stress that MFOs can become financially self-sustaining, eliminating the need for donor funds. This is part of an industry debate between the "institutionalists" and the "welfarists." See, for example, Morduch (1998) and Woller, Dunford, and Woodworth (1999).
4. Many of the world's poor live rurally, particularly in Africa and Asia, and some microfinance organizations such as the Grameen Bank concentrate their microcredit programs in these areas. In doing so, they generally focus on small livestock production, fishponds, home gardens, food processing and alternatives to crop production in forested areas. All of these production techniques have implications for CPRs.
5. The evidence is limited to a World Bank study on India and USAID study with data from Indonesia.
6. While the fungibility of microcredit loans has raised some serious concerns about their long-term effectiveness in promoting sustainable livelihoods, for the rural poor in particular it is difficult to separate out production and consumption decisions, since labor is the main productive asset and adequate nutrition is essential to work. The environmental implications, however, do depend on whether loan funds are used for productive activities, or channeled into consumption.
7. For a summary of the results of several impact studies see Sebstad and Chen (1996), Schrieder and Sharma (1999), or Anderson and Nugent (2000).
8. See Kent (1991) for specifics on the environmental consequences of some of these small enterprises.
9. This depends on how the electricity is generated, though.
10. There is also speculation that some forms of domestic violence may be increasing. See Hashemi, Schuler, and Riley (1996), Goetz and Sen Gupta (1996), Khandker (1998) and Rahman (1999).
11. For a discussion on the educational and other human capital effects of microcredit, see Schrieder and Sharma (1999).

12. One senior Grameen Bank official explains, "A woman who is not earning any cash cannot tell her husband that she doesn't want to get pregnant... But suppose she is repaying a 3,000-taka loan and is hoping to get a 6,000-taka loan? Now she can tell her husband, "If I get pregnant my group will not recommend 6,000 takas because in three or four months' time I'll be heavily pregnant." Now, she has a bargaining position." (Bornstein, 1997).

13. For example, the Grameen Bank's close relationship with the Government of Bangladesh is maintained

through government officials who sit on Grameen's board. Evans (1996) writes about the synergy between local government and a Grameen replicator in Vietnam, though most microcredit programs in Vietnam also work through the powerful Vietnam Women's union.

14. Nonetheless, there is little reason to believe the sample is nonrepresentative in any particular direction with respect to awareness of environmental issues.

REFERENCES

- Anderson, C. L., & Nugent, R. E. (2000). Microcredit: Effects on rural poverty and the environment. In *State of food and agriculture* (pp. 45–68). Rome: United Nations Food and Agricultural Organization.
- Besley, T., & Coate, S. (1995). Group lending, repayment incentives and social collateral. *Journal of Development Economics*, 46, 1–18.
- Bornstein, D. (1997). *The price of a dream: The story of the Grameen Bank*. Chicago: University of Chicago Press.
- Buntin, J. (1997). Bad credit: Microcredit yields macro-problems. *The New Republic* (March 31).
- Coleman, J. S. (1990). *Foundations of social theory*. Cambridge: Harvard University Press.
- Conning, J. (1998). *Outreach, sustainability and leverage in microfinance lending: A contract design approach*. Presented at NEUDC Conference, Economic Growth Center, Yale University.
- Cuc, L. T., Gillogly, K., & Rambo, T. (1990). *Agroecosystems of the midlands of Northern Vietnam: A report on a preliminary human ecology field study of three districts in Vinh Phu Province*. Honolulu: East-West Environment and Policy Institute.
- Dasgupta, P., & Göran-Mäler, K. (1994). *Poverty, institutions, and the environmental resource base*. World Bank paper no. 9. Washington, DC: World Bank.
- Evans, P. (1996). Government action, social capital and development: Reviewing the evidence on synergy. *World Development*, 24(6), 1119–1132.
- Goetz, A. M., & Sen Gupta, R. (1996). Who takes the credit? Gender, power, and control over loan use in rural credit programs in Bangladesh. *World Development*, 24(1), 45–63.
- Grootaert, C. (1998). *Social capital, the missing link?* World Bank Social Capital Initiative working paper no. 3. <http://www.worldbank.org/poverty/scapital/wkrppr/wrkppr.htm>.
- Hashemi, S. M. (1997). Building up capacity for banking with the poor: The Grameen Bank in Bangladesh. In H. Schneider (Ed.), *Microfinance for the poor*. Paris: Organization for Economic Co-operation and Development.
- Hashemi, S. M., Schuler, S. R., & Riley, A. P. (1996). Rural credit programs and women's empowerment in Bangladesh. *World Development*, 24, 645–653.
- Kent, L. (1991). *The relationship between small enterprise and environmental degradation in the developing world with emphasis on Asia*. Prepared for the Office of Small, Micro and Informal Enterprises, USAID. Bethesda, MD: Development Alternatives Inc., September.
- Khandker, S. (1998). *Fighting poverty with microcredit*. Washington, DC: World Bank.
- Microcredit Database. (1999). Microcredit summit. <http://www.microcreditsummit.org/summit/into.htm>, April.
- Morduch, J. (1998). *Does microfinance really help the poor? New evidence from flagship programs in Bangladesh*. Cambridge: Harvard University, HIID.
- Morduch, J. (1999). The microfinance promise. *Journal of Economic Literature*, XXXVII(4), 1569–1614.
- Mukerjee, M. (1998). The population slide. *Scientific American*, 32(1). Available: <http://www.sciam.com/1998/1298issue/1298scitit4.html>.
- North, D. C. (1990). *Institutions, institutional change, and economic performance*. New York: Cambridge University Press.
- Olson, M. (1982). *The rise and decline of nations: Economic growth, stagflation and social rigidities*. New Haven: Yale University Press.
- Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge: Cambridge University Press.
- Ostrom, E. (1992). *Crafting institutions for self-governing irrigation systems*. San Francisco, CA: Institute for Contemporary Studies Press.
- Ostrom, E. (1994). Constituting social capital and collective action. *Journal of Theoretical Politics*, 6(4), 527–562.
- Ostrom, E., Gardner, R., & Walker, J. (1994). *Rules, games, and common pool resources*. Ann Arbor: University of Michigan Press.
- Putnam, R. D. (1993). *Making democracy work: Civic traditions in modern Italy*. Princeton: Princeton University Press.

- Rahman, A. (1999). Microcredit for equitable and sustainable development: Who pays? *World Development*, 27(1), 67–82.
- Reardon, T., & Vosti, S. A. (1995). Links between rural poverty and the environment in developing countries: Asset categories and investment poverty. *World Development*, 23(9), 1495–1506.
- Roth, J. (1997). *The limits of micro credit as a rural development intervention*. Unpublished dissertation, Institute for Development Policy and Management, Manchester University.
- Schuler, S. R., & Hashemi, S. M. (1997). The influence of women's changing roles and status in Bangladesh's fertility transition. *World Development*, 25(4), 563–575.
- Schrieder, G., & Sharma, M. (1999). Impact of finance on poverty reduction and social capital formation: A review and synthesis of empirical evidence. *Savings and Development*, 1, 67–91.
- Sebstad, J., & Chen, G. (1996). *Overview of studies on the impact of microenterprise credit*. Washington, DC: USAID Assessing the Impact of Microenterprise Services (AIMS), June.
- Solomon, L. (1998). Micro-credit's dark underside. *World Press Review*, 45(8), 33(1).
- Stiglitz, J. (1990). Peer monitoring and credit markets. *World Bank Economic Review*, 4(3), 351–366.
- Stiglitz, J., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *American Economic Review*, 71(3), 393–410.
- van Bastelaer, T. (1999). *Imperfect information, social capital and the poor's access to credit*. College Park: IRIS working paper no. 234.
- Woller, G. M., Dunford, C., & Woodworth, W. (1999). *Where to microfinance*. Draft. Salt Lake City: Marriott School, Brigham Young University.
- World Bank. (1988). *The initiative on defining, monitoring and measuring social capital*. Social Capital Initiative working paper no. 1. Located at <http://www.worldbank.org/poverty/scapital/wkrppr/wrkppr.htm>.
- World Resources Institute. (1994–95). *World resources 1994–1995*. New York: Oxford University Press.
- Zeller, M., Lapenu, C., Minten, B., Ralison, E., Randrianaivo, D., & Randrianarisoa, C. (2000). Pathways of rural development in Madagascar: An empirical investigation of the critical triangle between environmental sustainability, economic growth and poverty alleviation. In B. Minten, & M. Zeller (Eds.), *Beyond market liberalization: Income generation, welfare and environmental sustainability in Madagascar*. Aldershot, England: Asgate.
- Zeller, M., & Sharma, M. (1998). *Rural finance and poverty alleviation*. Washington, DC: International Food Policy Research Institute.
- Zwingle, E. (1998). Women and population. *National Geographic* (4), 36–55.