

**Women, Population and the
Environment: Markets,
Institutions and the Importance of
Women's Economic Roles**

by

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1995

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Introduction

At roughly 5.3 billion, the population of the world has doubled since 1950 -- an increase, within forty years, of proportions unprecedented in the history of the human race, and one which has given rise to extreme concern regarding its implications for natural resources and environmental damage. This paper argues that, while a reproductive rights approach to population planning can be an important component of environmental protection strategies, more attention must be paid to the relatively neglected role of market and policy failures that affect women as agriculturalists, economic actors, and consumers of natural resources. Women's sustainable management of the environmental resources on which they depend can be supported by improved policies and institutions, including land reform, which take account of women's economic activities, and by strategies designed to improve women's access to agricultural extension, credit, and other productive resources and services. These support strategies receive significantly less attention than does women's fertility. Yet it is through their economic roles that women can most directly affect the environment.

The Environmentalist Perspective on Women and Population

As early as the mid-1960's, when world population stood at just over 3 billion, neo-Malthusians predicted that excessive population growth would lead, within the short span of 15 to 20 years, to worldwide food shortages and a drastic decline in living standards. Their concern was an anticipated scarcity of non-renewable resources and of food because of the limited amount of land available for agricultural production. They argued that if rapid population growth continued, the world would soon run out of the land, energy, and minerals required to feed and maintain people. Many economists challenged these forecasts, however, because of their implicit assumption that population growth would take place in an environment of fixed resources, fixed patterns of use, and limited technological change. They believed that a scarcity of non-renewable resources was unlikely given that prices of such resources would inevitably rise as scarcities developed, leading to a decrease

in demand and, thus, in appropriate rates of extraction. Moreover, technological innovation was expected to provide substitutes for resources that were becoming scarce, reduce the amount of resource inputs needed per unit of output in the economy, and reduce the environmental damage due to production. Indeed, improvements in agricultural production have resulted in a ten percent increase in per capita global food production since 1960 and, during the same period, the worldwide production of wheat -- an important food staple -- has more than doubled (Mann 1993; Sanderson and Mehra 1990). As a result of increased prices of energy and metals in the 1970s, more energy efficient industrial processes, buildings, automobiles, and appliances have been developed. In the industrialized countries, energy use per unit of output has declined steadily since 1970. Japan, for example, has doubled its output since 1973 with no increase in energy use (Panayotou 1993).

Still, while supplies of non-renewable resources have not dwindled, there has been substantial environmental degradation worldwide, and environmentalists are concerned about the implications of population growth for global warming, loss of biodiversity, and other environmental damage. Within this focus, the environmentalist community has begun to highlight the impact of populations in industrialized countries, with their high rates of pollution and consumption of natural resources. Policy initiatives to constrain consumption have been difficult to achieve, however, while an emphasis on the need for population control in the developing countries has been more appealing to the general public and policy makers.

An increasing number of environmentalists feel that this focus on population is too narrow and that it is too often expressed in terms that characterize women in developing countries as mere instruments of fertility reduction (Lohmann 1990; Erikson 1990; Sen 1992). Nonetheless, the reduction of population growth, primarily in the developing countries, continues to be considered a key strategy for preventing environmental degradation.

The Experience of the Population Planning Field

As Sen (1992) notes, this emphasis on population planning comes at a time when those working on population issues have begun to critically assess past strategies for fertility reduction, recognizing the importance of policies and programs that conform to women's needs, and promote women's health, particularly their reproductive health. There is growing recognition that a significant number of population programs focused on demographic targets did not effectively achieve what they set out to do. While in the past, population planners saw evidence of demand for family planning in the Demographic and Health Surveys data showing that half of women of reproductive age in developing countries wanted either to delay or terminate childbearing, these statistics are now being interpreted differently. The high proportion of women who wish to limit fertility yet fail to use -- or use incorrectly -- modern contraception, discontinue use, or resort to dangerous abortions are now seen as reflecting the inadequacy of traditional population planning programs. Even strong family planning efforts, it appears, have produced only modest declines in birth rates, with counted exceptions, where development levels are low. The effect equals that when family planning efforts are limited but development levels are higher. Birth rates decline more rapidly only when development is advanced and family planning programs are strong - - i.e., when there are improvements in women's health, education and employment opportunities, a more equitable distribution of land and other resources and when these are complemented by accessible family planning services (World Bank 1984; Kabeer 1992).

Thus, it is now increasingly accepted in the population community that the top down programs oriented to demographic targets that were widely implemented from the 1960s onward were inappropriate and perhaps ineffective in the long term. Quantity of family planning acceptors, rather than quality of reproductive health services, was the focus of most family planning programs. Programs were evaluated in terms of numbers of acceptors, contraceptive prevalence rates, and numbers of births averted. Safety was often sacrificed to financial incentives, and extreme and coercive population control methods were implemented in some instances (Dixon-Mueller 1993).

In Bangladesh, for example, financial incentive systems led to sterilization abuses and the neglect of maternal and child health (MCH) services. In Kenya, from 1974 to 1978, family planning programs distributed oral contraceptives almost exclusively, with little or no dissemination of information about other methods. In India, only better-off villagers were given a choice of contraceptive methods while the poor were offered only sterilization (Kabeer 1992). In addition, many clandestine sterilization procedures were performed, without informed consent, on women who visited a government health clinic for complaints often unrelated to reproduction or reproductive health. Men, too, were the victims of unethical population control when, during the 1975/76 emergency, police raids were used to round up 'eligible' men for forced sterilizations (Gwatkin 1979; Banerji 1980).

By the late 1980s, based in part on concern with women's unmet needs, an emphasis on the quality of care provided through family planning programs had gained substantial support. Approaches emphasizing the quality of care, as set out by Bruce (1989), contain six key elements: a broad choice of methods, full information provided to clients, solid technical competence of the providers, good interpersonal relations with the clients, follow-up mechanisms to encourage continuity, and convenience and acceptability of services for clients whether delivered through MCH initiatives, comprehensive health services, or others.

While many population planning and women's health experts agree that these are critical and effective components of family planning measures, others go further and call for more comprehensive reproductive and sexual health services (IWHC 1993) as well as improvements in women's status that are associated with fertility reduction -- including educational attainment and employment opportunities. Women's attainment of at least a primary education is associated with declining birth rates and women's paid employment outside the home appears to have a major impact on fertility (Bulatao and Lee 1983; Cochrane 1979). Access to credit for business or agriculture, improved technologies, tenured land and other productive resources have also been shown to improve women's economic situation and status and, through an apparently complex set of interactions, reduce birth rates.

Advocacy on behalf of such initiatives has become increasingly common and well accepted within the population and development communities. Organizations that once represented somewhat extreme fertility control positions, such as UNFPA, now advocate programs based on an understanding of the inter-relationship between women's status, their economic and social roles, and their fertility (UNFPA 1989). And the United States Agency for International Development (USAID), which has been characterized as supporting population programs oriented to demographic targets, is now emphasizing the importance of women's reproductive health and status (USAID 1994).

Causes of Environmental Degradation

Improvements in women's status and a comprehensive reproductive health approach to better meet women's needs in family planning are of critical importance. Yet arguments on behalf of these strategies often rest on their effectiveness in achieving a reduction in population growth. Improvements in women's education may be discussed in terms of their potential for reducing fertility, for example, and assertions of women's reproductive rights do not necessarily question whether and/or how population and women are central to concerns about environmental degradation. These perspectives do not challenge environmentalists and population planners to attend to the policies and structural conditions that are the fundamental causes of environmental degradation and that perpetuate women's poverty and inequitable status.

The relationship between population growth and environmental change is not simple. In some areas with dense and rapidly growing populations, such as northern Nigeria, environmental degradation has been limited (Mortimore 1993). In other parts of sub-Saharan Africa, population growth has been associated with severe environmental problems (Cleaver and Schreiber 1992). A complex relationship between a country's particular configuration of natural resources and its economic and social policies seems to determine whether or not environmental degradation occurs. Population growth and density are factors that can exacerbate such degradation but there is controversy regarding whether they

are the main cause in the developing countries (World Bank 1992). In many cases, environmental degradation may be more closely linked to market failures and inappropriate policies that lead to inefficient use and mismanagement of natural resources (World Bank 1992; Panayotou 1993; DeWalt, Stonich and Hamilton 1993; Preston 1993).

Market Failure

Market failure occurs when imperfect markets generate prices that do not reflect the social costs and benefits associated with goods, leading to their inefficient allocation. The conditions that lead to market failure are especially common in the natural resources sector. They include poorly defined property rights, absence of markets (or unpriced resources), extensive externalities, public goods, and lack of full information (World Bank 1992). Insecure, poorly defined or unenforceable rights discourage payment for, investment in, and conservation of resources because individuals have no assurance that they can cover the costs involved in careful management of the resource -- through its lease or sale, for example. Farmers with insecure tenure, or limits on length of tenure or use rights, are less likely to invest in planting tree crops, for example, because it is unclear whether they will be able to recover the costs and enjoy the benefits of that investment. Lack of secure and enforceable property rights are associated not only with agricultural land in many countries, but also with water resources, public forest land, and coastal zone resources.

An absence of resource pricing or markets also discourages conservation. Given a price of zero, individuals are signaled that there is no scarcity of the resource, and they will tend to use it freely. In many countries a price of zero (or very close to zero) is associated with irrigation water -- a scarce natural resource -- because governments decide to provide it free of charge or at a nominal fee. As a result, sedimentation, soil salinization and waterlogging occur because farmers close to the irrigation canals over-irrigate while other areas receive too little water. In a study of irrigation systems in Pakistan, 73 percent of farmers surveyed had insufficient water for irrigation. Yet the FAO estimates that half the area served by the Indus Basin canal system is waterlogged, saline, or both (Panayotou

1993). Another example of the absence of a market is the unregulated use of the environment for waste disposal typical in many developing countries.

Extensive externalities associated with natural resources also contribute to their inefficient use. Externalities, or spillover effects, occur when an individual's actions or investment decisions have negative or positive effects on others who do not control or participate in those actions or decisions. When these effects bring neither costs nor benefits -- neither penalties nor payments -- for the individual who generates them, they are not taken into account in that individual's decision to use or invest in resources. This gap between the private and social value of resources leads to less than optimum investment in resources with positive spillover effects, as when owners of forests have no incentive to maintain them for their beneficial impact on air quality and therefore log them. It also means more than optimum use of resources with negative spillover effects, as when farmers have no incentive to limit their use of pesticides that harm fishermen's catches through runoff into marine estuaries.

Many environmental resources are not managed efficiently because they are public goods. This means that no individual may be excluded from enjoying them. Their consumption by one individual does not diminish their availability to others. These characteristics provide no incentive for private production since consumers will not be willing to pay for something they cannot, in any event, be denied. Examples include the air we breathe, scenic views, and biodiversity. Since the free market will fail to provide such goods, they must be provided by governments. Without a market mechanism to guide investment, however, public goods may be over- or under-produced. Typically financed by general taxation, the production of these goods may depend on the interests and influence of particular constituencies and pressure groups rather than the preferences and willingness to pay of all consumers.

Finally, lack of full information regarding costs and benefits of resource use, as well as limited planning horizons, will lead to inefficient use and mismanagement of resources.

Without accurate information regarding the benefits of maintaining a multiple-use forest, for example, logging it today may appear to be a more profitable investment. The use of gill nets may appear to be the best approach to fishermen who are concerned about maximizing their incomes now but are unaware of how such methods will dramatically reduce their future catches. Much harm was done through the use of chlorofluorocarbons (CFCs), for example, before their link to ozone depletion was discovered and publicized.

Policy Failure

When free markets fail in the efficient allocation and use of natural resources, it may be appropriate for governments to intervene. To be beneficial, however, intervention must improve the outcome achieved by the free market. And the benefits of intervention must outweigh the costs -- including the cost of distortions to other sectors of the economy. This is not often the case, however, since governments typically intervene in markets to achieve social equity, national security, or macroeconomic management rather than to correct market failure. And these interventions, whether or not related to natural resources and the environment, often have unintended and unforeseen side effects on the environment. Fertilizer subsidies to encourage adoption of new high yielding crop varieties, for example, have typically led to overuse and the contamination of off-site water resources due to runoff. Government development of infrastructure has also led to unanticipated effects on the environment. Road construction, for example, has encouraged large influxes of population to the newly serviced areas. In the absence of well-defined property rights, deforestation has often resulted.

Four types of policy failure occur with regard to natural resources (Panayotou 1993): distortions of otherwise well-functioning markets through taxes, subsidies, regulations, or public projects with negative impacts that outweigh their economic returns; failure to take account of significant environmental effects of policy interventions that are otherwise warranted; intervention that aims to correct a market failure but actually leads to an

outcome that is worse; and lack of intervention when intervention is required to improve the functioning of a failing market.

Development assistance agencies, as well as governments, frequently contribute to such policy failures through projects and macroeconomic reform that may not be founded in appropriate micro-level conditions such as well-functioning markets. Most commonly, market and policy failure work together to discourage sustainable management of resources. In many countries, land management (or lack thereof) provides a classic example of the combined effects. The problem begins with lack of secure ownership, either because the land is untitled or because it is jointly owned with no cohesion among the owners. Lack of secure ownership in and of itself diminishes the expected profitability of investments required to increase productivity and thus discourages such investments. Rigid credit policies, with stiff collateral and other requirements, add to the difficulty by forcing farmers of untitled land into the informal credit market, handled by moneylenders and middlemen, with its high interest rates and limited supplies. This makes farm investment more unprofitable and therefore less likely. Finally, insecurity of land tenure and lack of affordable credit tend to push farmers toward annual crops with a quick return at the expense of long term productivity (since that productivity may never be captured should eviction occur). It also encourages expansion into new lands, such as easily accessed public forests where the government's property rights are not enforced, rather than sustainable management of existing lands.

The environmental impact of market and policy failures can be powerful, as in the case of the Brazilian Amazon region. In the 1960s, the Brazilian government decided, for reasons of national security and economic growth, to encourage the development of the Amazon. Incentives were put in place to encourage ranching and the conversion of forest to pasture land. The incentives included tax holidays, export tax exemptions, investment tax credits, and credit offered at 12% interest while market rates were at 45%. During the 1970s, close to 10,000 square kilometers of forest were cleared annually by wealthy investors who stood to gain returns equal to 250% of their initial investment. This rapid conversion

of forest land did not occur as a result of encroachments by growing populations of the poor and landless. In fact, the conversion occurred as Brazil's population growth rate fell, and the incentive programs actually discriminated against the poor because of the rise in land prices that they caused.

In other countries, too, reductions in birth rates, in the absence of appropriate policies and markets, have done nothing to halt environmental degradation. In Thailand, for example, population growth has fallen dramatically from over 3% in the late 1960s to under 1.5% today. During the same period, however, over one million hectares of forest were cleared in the once undisturbed lower northeast region. In this case, while Thailand's overall population growth was limited, the development of a highway through the forested region -- without the establishment of clear property rights over the land -- led to a devastating influx of population to this formerly pristine area. The clearing of the forest and large-scale development of irrigated agriculture have resulted in massive environmental degradation, including salinization and soil erosion. These have now made both forestry and agriculture unsustainable (Panayotou 1993).

Conversely, in a number of countries, rapid population growth over the past twenty years has been associated with maintenance of environmental quality when systems of tenure bestow clear property or use rights. In Papua, New Guinea, for example, annual population growth is at least 2.3%, and population is most concentrated in the highlands. Yet, despite rapid population growth, a wet climate, and a primarily agricultural population, the highlands remain fertile. Moreover, only 6 million of 46 million hectares of forest have been converted to other uses -- a strikingly lower rate of conversion than in most developing countries. This success is the result of a communal tenure system that provides clear ownership: individual families have the right to farm plots indefinitely, but the clan holds the right to trade them. Since all clan members are entitled to farm, hunt and collect berries and fruit, individuals have little incentive to sacrifice future value for immediate returns. Instead, they use the forest in a sustainable, productive way (Panayotou 1993). The

environmental impact of population growth and density, then, is clearly conditioned by the market and policy context in which it occurs.

Policy Support for Women's Sustainable Management of the Environment

The powerful roles of policies and markets in determining environmental degradation or maintenance suggest that interest in women should focus not only on women's fertility but also on the market and policy context within which women behave as economic actors, agriculturalists, and consumers of natural resources. Like men, women have a stake in positive environmental outcomes that ensure their future livelihood. They differ from men not in their economic and social interests, but in the roles they play and the constraints they face.¹ These factors should be taken into account in policymaking because they affect the way women respond to market conditions and policy changes that, in turn, determine the state of the environment.

Women as Agriculturalists

In spite of rapid urbanization, two-thirds of women working in developing countries are in the agricultural labor force. Estimates based on censuses, national surveys, and United Nations data show that they provide most of the agricultural labor essential to food and cash crop production in the developing world. In many parts of Africa, for example, women are the primary food producers, contributing on average 70 percent of the labor for food production (Cloud 1986). In South Asia, women do almost all the work in transplanting rice and participate to varying degrees in fertilizing, sowing, planting, weeding, and harvesting (Ahmed 1987). The United Nations claims that, overall, women farmers grow at least 50 percent of the world's food (Sivard 1985).

¹ Some discussions of women and the environment emphasize women's special relationship with the environment and their intrinsic knowledge of natural resource uses and management. This may be the case, offering a particularly valuable resource via women. Women need not have any better knowledge of environmental management than do their male counterparts, however, in order to be the appropriate focus of environmental support strategies.

Although women's participation in agriculture varies across regions, they are typically involved in some degree of decision-making regarding environmental resources. In Sub-Saharan Africa, women agriculturalists are likely to be farm owners or managers and the principal decision-makers in agricultural production. In Kenya, 36 - 40 percent of farms are managed by women (Staudt 1978; Moock 1976). In Botswana, in over 30 percent of farm households, women make the decisions concerning when to plow and what type of seed to plant.

Women are the agricultural decision-makers in other regions of the world as well. In Peru, for example, 21 percent of the peasant women in one study were farmers on their own account, and 46 percent of the women were either in charge or second in charge of crop production (Deere and Leon 1982). In Jamaica, a rural woman is typically responsible for agricultural production until her husband -- at about age 40-- leaves his job in the urban areas. Then, husband and wife assume joint management of the farm. In Nepal, a study of eight villages found that women make 42 percent of household agricultural decisions and participate jointly with adult males in another 12 percent of the decisions (Acharya and Bennett 1981).

Women agriculturalists are critically dependent on the environment and, given their decision-making roles, they can play an important part in sustainable management of land and other resources.

Women's Other Environment-Dependent Economic Activities

Women play a significant role in other economic activities that depend on the environment and natural resources. In much of South Asia and in the dry belt of Sub-Saharan Africa, from Mauritania to Ethiopia, women play important roles in livestock production. More than half the world's pastoralists are concentrated in Sub-Saharan Africa and, among them, women typically own and manage small livestock such as goats, sheep and

chickens. For these women, management of water and pasture resources for sustainable use is vitally important (Mehra 1993).

Women are also heavily employed in the production of forest-based wood and non-wood products. In Malaysia, 60 to 70 percent of production-line workers in private veneer and plywood mills are women. In Thailand, 20 percent of workers in the forest industry are women. Women also derive income from two activities related to forest products: harvesting fruits, nuts and medicinal herbs for direct sale; and collecting raw materials such as vines, bamboo, gums and resins to be processed and then sold. In Mali, for example, women dominate small-scale retail sales of gathered fuelwood and of charcoal processed from it. Many of the large-scale charcoal traders in Bamako, the capital city, are also women (FAO 1988). In the Sahel, the *karite* nut is a wild crop of considerable economic importance for women who harvest and process it into oil (shea butter) and dough for sale in local markets. The refined oil, sold by men, is a major export of some West African countries (Cloud 1986).

The processing and sale of forest products is a significant source of income for rural women and underscores the importance for them of policies that discourage deforestation and encourage multiple use of forests.

Household Production and Natural Resources

Women also rely on natural resources to meet a multitude of household obligations for which they are responsible. These obligations include collecting fuelwood, fodder, and water for the household; maintaining household cleanliness; and disposing of waste.

Fuelwood collection is a task principally, and sometimes exclusively, performed by women and children. The actual time and effort required to collect fuelwood varies according to the availability of trees. In most cases, it is strenuous and time-consuming. In parts of the Sahel, women may spend 3 to 4 hours per day, walking as much as 10

kilometers, to collect fuelwood (Agarwal 1986). In Niger and Burkina Faso, firewood collection takes more than 4 hours a day. In Gujarat, India, women and children spend the equivalent of 200 to 300 days per year gathering fuelwood (Magrabi and Verma 1987).

As forests shrink, rural women have to go further and spend more time to obtain fuelwood and fodder. Thus, it is common for women and children in parts of the Sahel to travel more than 30 miles to collect firewood (Tucker 1986). The cost is high since the workload of women in economic and household production is heavy in some places. It is often heavier than that of men and may require a 15-hour work day. Long hours spent collecting fuelwood mean less time for other necessary and productive work.

The problems women face gathering fuelwood are similar to those they face fetching water because it, too, is becoming more difficult to obtain, either because sources are drying up or because of pollution. Again, in attempting to fulfill their household obligations, women have an interest in policies that limit deforestation and promote more efficient allocation of scarce water resources.

Constraints on Maintaining the Environment

Although their roles and responsibilities make environmental resources a great concern for women, their ability to contribute to sustainable environmental management is constrained by policy and market failures related to land ownership, agricultural extension services, financial regulation, and limited information.

Land Ownership

Despite their extensive work in agriculture, women seldom hold title to land they farm because of former colonial policies, land reform legislation, and land resettlement schemes that have awarded land titles to the presumed male heads of household. This assignment of private ownership has undermined women's traditional usufruct and has set

up ambiguities and insecurities that did not previously exist (FAO/SIDA n.d.). In Lesotho, for example, only men have the legal right to administer property. Women cannot enter into contracts for farm equipment, labor, or agricultural loans despite an 85 percent female agricultural labor force (Bennett 1979). A study in Kenya found that only about 6 percent of land was registered in the name of a woman, either alone or jointly with a son (Pala 1976). Inheritance laws have similarly disenfranchised women because they tend to favor male heirs (Westergaard 1982). In some parts of Africa, inheritance laws have nullified traditions that allowed women access to land farmed by their mothers (Dey 1981; Bennett 1979). Civil inheritance laws now favor sons when "female" land is handed down from generation to generation.

Such insecure ownership or use rights prevent women agriculturalists from making long-term investments in land improvement. Instead, women (and men) who farm insecurely-held land have an incentive to plant annual crops and are unlikely to let fields lie fallow or plant tree crops that help replenish the soil and prevent erosion.

Limited Access to Agricultural Extension

Numerous studies have shown that women's access to agricultural extension is more limited than that of male farmers (Staudt 1978; Knudson and Yates, 1981; Berger, DeLancey and Mellencamp 1984). Extension services have typically failed to provide services to women for a number of reasons. First, extensionists do not view women as good potential clients because their holdings tend to be smaller, of lower quality, and more distant from the homestead than those of men. In addition, a woman's time is typically limited not only by household responsibilities, but also by requirements that she spend time on cash crop production in male-managed fields in addition to working her own fields. This reduces the likelihood that women can either meet with extensionists or attend extension meetings. Finally, in many countries, it is culturally inappropriate for women farmers to work with male extensionists. Yet, also because of cultural norms, female extensionists, who must travel alone in remote areas, are the exception rather than the rule.

This limited access to extension means that women farmers are less informed about sustainable agricultural techniques and may learn about such methods only second and third hand from male household members. This seriously reduces the accuracy of the information they receive and/or their ability to effectively utilize it.

Limited Access to Credit

Credit is one of the most urgent needs of the small farmer and is often vital for purchasing inputs, additional labor, or draft power that may be required to implement innovative, sustainable agricultural methods. Yet women's access to credit is extremely limited. Title to land is often required as collateral and, as discussed above, women often do not hold title to the land they farm. Credit offered through agricultural cooperatives may not reach women because of their limited participation in such cooperatives; male members with larger holdings concentrating on cash crops are the norm. Studies have shown that women farmers typically receive only 10 to 15 percent of funds distributed through agricultural credit programs and banks -- even in countries where women's participation in agriculture is extremely high (Staudt 1982; Fortmann 1982; Muntemba 1982; Lassen 1980; Knudson and Yates 1981).

Lack of Information

Aside from limited access to agricultural extension, women may also face limitations in acquiring information on how to maintain and improve the environment through non-agricultural activities. Women's illiteracy rates are high and their educational attainment low; their participation in male-dominated community organizations is limited; and their time is constrained by their dual household and market production roles. Thus, they are less likely to receive information about harmful forest product collection techniques, fast growing tree crops as an alternative to fuelwood collection, and other innovative and sustainable methods for meeting their needs while maintaining environmental resources.

Toward Sustainable Solutions

To achieve sustainable management of the environment, policy must re-establish the link between resource scarcity or value and resource prices. This means disassembling inappropriate subsidies, perverse incentives and failed institutions. For women, these include insecure land tenure, ineffective extension systems, regulated and uncompetitive credit markets, and organizations in which their membership is *de facto* limited. Specifically, women will benefit from support for their economic roles and management of the environment that includes:

1. **Land reform that does not vest title in the presumed male head of household but instead recognizes women's role as agriculturalists.** Registration and reform schemes that tie land title and/or usufruct to an individual's responsibility for decisions on production and land management must be developed and implemented in order to ensure that women have secure property rights.
2. **Extension services that reach women.** These services must be restructured to provide incentives (or at least not disincentives) for extensionists to work with women farmers (and smallholders generally). More channels for informing and involving women farmers must be used including local women's groups, non-governmental organizations that work with women, and programs that work with women in related development activities. Efforts must also be made to increase the supply of female extensionists where women's contact with males is restricted.
3. **Improved access to credit.** Deregulation of interest rates and other methods of promoting competition among lenders must be implemented to increase the likelihood that women and other small borrowers will gain access to credit. In addition, alternative lending programs featuring flexible collateral, minimal written application requirements, solidarity group lending, and options for frequency of

repayment should be instituted so that women can make long term investments in land and sustainable agricultural techniques.

4. Recognition of women's household responsibilities in collecting fuelwood, obtaining water, and providing for household sanitation in formulating policies on property and use rights for resources that are now open-access such as publicly owned forests and water sources. The importance of fuelwood as well as non-timber forest products, both for women and for national economies overall, must be assessed and policies that favor multiple-use management of forests introduced. Water rights and water users associations that include women must be established.

5. Outreach through organizations that reach and represent women. To more fully involve women in environmental awareness strategies, information about how they can maintain and improve the environment through activities that depend on environmental resources should be made available through channels that reach women. These include, as discussed above, local women's groups, non-governmental organizations that work with women, and programs that work with women in related development activities.

6. Utilization of women's knowledge about environmental resources. In some cases, because of their dependence on environmental resources, women are important sources of knowledge about conservation techniques, tree species and their uses, and products that can be obtained in the wild. Efforts should be made to elicit and utilize such knowledge in developing projects to improve sustainable management of the environment.

7. A more complete and accurate reflection of women's environmental management contributions and their concerns in public education campaigns. Women are not merely passive victims of environmental degradation nor unknowing contributors to deforestation or population pressures. Like men, women are concerned about the

environment and struggle with skewed resource prices and incentives that subvert their efforts to manage rather than mine resources. Their depiction in strategies to raise environmental awareness should reflect the breadth and depth of their roles and demonstrate realistic methods to address their needs and concerns.

Improvements in these areas will support women's management of the environment. A greater focus on these issues is critical because it is through their productive work that women most affect, and are affected by, the environment.

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