

Gender and Sustainability

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Abstract

Sustainability and gender have been prominent on the development agenda since the 1980s, but there has been little systematic study of the links between the two. This review draws on ecofeminist theory, feminist political ecology, intrahousehold literature, and natural resource management case studies and reviews to examine how gender shapes the motives, means, and opportunities for men and women to contribute to sustainability. Particular attention is given to evidence on closeness to nature, focus on conservation, rights to resources, opportunities to exploit resources, and constraints to adoption of sustainable practices. Despite early claims that women are naturally more conserving of resources, the empirical literature, in particular, gives a more mixed and nuanced picture. Conservation is influenced not only by gender but also by a host of tangible and intangible factors, including local ecology, context, and culture, that affect incentives and the ability to adopt sustainable extraction and provision practices.

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INTRODUCTION

Concepts of sustainability have been prominent in international discourse and development policy for at least 30 years. Although definitions vary, one of the most often cited is that of the Brundtland Commission: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (1, p. 43). Although the emphasis is generally on physical or environmental sustainability, many analysts also pay attention to social and economic sustainability (2). The Brundtland Commission’s report (1, p. 43) recognizes that

physical sustainability cannot be secured unless development policies pay attention to such considerations as changes in access to resources and in the distribution of costs and benefits. Even the narrow notion of physical sustainability implies a concern for social equity between generations, a concern that must logically be extended to equity within each generation.

Because sustainability inherently deals with the ability to use a resource over time, discussions of sustainability have focused on intertemporal or intergenerational aspects of equity, with relatively less attention paid to inequality at a given point in time. The literature on sustainability and poverty, however, emphasizes that households endowed with different amounts of wealth may have different incentives to manage resources sustainably—leading scholars to pay greater attention to interhousehold inequality. A substantial portion of the natural resource management (NRM) literature therefore addresses issues of poverty and inequality (for a review, see 3). Nevertheless, questions of intrahousehold inequality related to gender have been less satisfactorily addressed. The Brundtland Commission, for example, dealt with gender in terms of how the status of women affects population growth rates but less in terms of other aspects of NRM.

From the 1980s, theories about women’s inherent connection to nature became popular in debates about the environment and development. Ecofeminist scholars posited that women are, by virtue of their biological relationship to reproduction, more closely linked to nature and thus both more likely to be harmed by its degradation and also more likely to be the ones responsible for its conservation (summarized in 4). However, these theories were questioned for simplifying the relationship between women and nature and for viewing women as a homogeneous group (4, 5). These theories also lacked analyses of men’s relationships with nature and sustainability, critical components of any gendered understanding. Since the 1980s, the body of research on gender and the environment has expanded to include men, the relationships between men and

women, and more nuanced views of women across different cultural, social, and environmental contexts. Both the intrahousehold and feminist political ecology literatures stress the importance of differential control over resources. Although the intrahousehold literature has tended to focus on household and individual well-being outcomes (6–8), there are recent papers that have applied an intrahousehold perspective to study the adoption of sustainable NRM practices (e.g., 9).

The issue of gender and sustainability has two sides: the differential contributions of men and women to sustainability and the differential impacts of sustainability (or environmental degradation) on men and women. In our review, we focus primarily on the first aspect, although the latter is also addressed, particularly in terms of the effect of environmental degradation on motivations for men and women to contribute to sustainability. In part, this focus arises because the available evidence on the latter is limited to the effects of a lack of sustainability (caused by changes in climate and other shocks). The issue of gender and sustainability is also different from gender and environment in that sustainability inherently includes a temporal dimension (sustainable use of resources over time), whereas gender and the environment could be interpreted in a static sense.

Because different types of inequality result in different incentives and abilities to manage resources sustainably, this review is structured around the broad categories of (a) motives and (b) means and opportunities for women and men to sustain the natural resource base. Within the category of motives, we examine issues related to closeness to nature, focus on sustainability, and interests or needs for resources. Means and opportunities deal with access and rights to natural resources and the ability to exploit them or to adopt sustainable practices. We briefly present some of the theoretical foundations, followed by an overview of the framework. The subsequent sections present the evidence on each of these topics, followed by conclusions and implications for policy and further research.

Our review focuses primarily on environmental rather than social or economic sustainability. The broad literature on environmental sustainability deals with issues on farms; common pool resources such as forests, water, rangelands, or biodiversity; and global-level issues such as climate change or oceans. Notably, even the concept of environmental sustainability can vary depending on the observer and the scale used (i.e., global or local) (2). Local-level concerns often deal with water quality or soil erosion and global-level concerns with greenhouse gas emissions, although both may address loss of biodiversity. This review's specific focus is sustainable agriculture and common property systems that provide for long-term viability of the resource base by making the best use of environmental goods and services while not damaging them (10). It also focuses more on the local level than the global level. Within the environmental arena, the focus is on NRM and long-term sustainability, not on the impacts of climatic shocks, climate change mitigation, or coping with natural disasters, because we want to emphasize the more active role of women (and men) in everyday NRM, rather than the oft-taken view that women are victims that lack agency and respond only to environmental crises (as summarized in 4, 11). Although we draw on ecofeminist theory, feminist political ecology, intrahousehold, and NRM literature to motivate and structure the review, we emphasize the empirical literature, highlighting case studies and findings from research projects. In doing so, we attempt to provide some conclusions on the current body of evidence on gender and sustainability. Finally, our geographical concentration is the rural areas of the Global South, though we draw comparisons with the Global North when relevant and emphasize that the Global South has distinct regional differences across Africa, Asia, and Latin America.

THEORETICAL FOUNDATIONS

Since the mid-1970s, feminist scholars have examined the gendered attributes ascribed to women and men. They have noted that women around the world have been consistently seen as more

attuned with nature. Conversely, men have been more closely aligned with culture, which is seen as superior to and dominating over nature (12). Others have viewed women as mediating between nature and culture (13). Although this idea of the nature/culture female/male divide has been criticized by many—because it assumes universality and uniformity in understandings and definitions of nature, culture, female, and male—the idea has persisted that women are inherently closer to nature than men are.

In the 1980s, these associations were expanded into studies of the environment, where theories about women's inherent connection to nature became popular in debates about the environment and development. Discourse about development had for many years ignored gender. The WID (women in development) movement in the 1970s criticized mainstream development thinking by arguing that women were being excluded from access to the resources that made development possible and thus argued for women's greater involvement in the development process (14). However, the WID argument ignored the complexities of gender relations and was replaced in the early 1980s by the WED (women, environment, and development) argument that was heavily propagated by nongovernmental organizations (NGOs) and that portrayed women as having a strong affinity for the environment (14, 15). These ecofeminist scholars posited that women are, by virtue of their biology, more closely linked to nature, thinking that gave rise to images of women as Earth mothers (16; see 11 for a summary). As such, women were seen not only as more likely to be harmed by the environment's degradation but also as more likely to be responsible for its care and conservation. As Leach (4) summarizes in her critique, "this is a timeless, perhaps even natural role; subsistence, domesticity and environment are entwined as a female domain; women are victims of environmental degradation (walking ever farther for that wood) but also [are] environmental carers and key fixers of environmental problems" (p. 69). Furthermore, the exploitation and degradation of nature was linked to the historical oppression of women through patriarchal systems. Both women and the environment were portrayed as victims of development. Women were thus understood to have a particularly strong interest in ending environmental exploitation, as doing so would result in their own liberation (16, summarized in 17).

However, these theories were criticized for simplifying the relationship between women and nature, for viewing women as a homogeneous group, and for essentializing the concept of nature itself. Just as women were viewed as a single, uniform group, so too was nature viewed as a vague and general notion that encompasses all ecological and biological needs (summarized in 4, 18). Leach and colleagues make the point that "equating 'the environment' with 'nature' can obscure the historical and continued shaping of landscapes by people" (19, as cited in 18, p. 49). These theories also lacked a comparative analysis of men's relationship with nature and sustainability, a critical component of any gendered understanding. At that time, the literature on gender and the environment also adopted a more static view, not yet addressing the relationship between gender and the long-term management of natural resources (sustainability).

Since the 1980s, the body of research on gender and the environment has expanded to include men, the relationships between men and women, and more nuanced views of women across different cultural, social, and environmental contexts. In reaction to ecofeminism, a variety of other strains of thought emerged. One such strain was "feminist environmentalism," a term coined by Bina Agarwal (17) to emphasize the need to understand women's and men's relationship with nature as rooted in their material reality and how gender- and class-based interactions with nature structure knowledge about nature, the effects of environmental change, and responses to it. The "feminist political ecology" school of thought focused on three key themes: gendered knowledge of the environment; gendered environmental rights and responsibilities, including access to resources; and gendered politics and grassroots activism (20; summarized in 21 and 22). It shows how culturally defined gender roles structure access to different types of knowledge, space, resources,

and social-political processes (20, 23, 24, as cited in 22). Different resources, used in different spaces, may require different kinds of knowledge; for example, household water usage requires a knowledge that is different from agricultural water usage and that is often undervalued and gendered (25). Women may be seen as having greater knowledge of household drinking water because of its importance in the domestic domain and thus may find it easier to assert their priorities in this area, but they may find it harder when it comes to irrigation water. Men, in contrast, may enjoy relatively easier access to irrigation services both because of long-standing ideas about men being more likely to be farmers and because of land ownership norms that preclude those who do not own land (usually women) from water rights (14, 22).

The intrahousehold literature in economics has also dealt extensively with gender differences in use, control, and ownership of resources and how these contribute to greater bargaining power within the household by increasing the value of outside options relative to staying within the household (26). Some of this work has looked at implications for adoption of sustainable farming practices, although it has dealt less with common property or environmental issues (for the latter, see 27).

Much of the literature on NRM has not dealt extensively with gender issues, but it does provide more precise definitions of resource rights and an important understanding of the management of private and common property, which are relevant to this review. Particularly important are the notions of appropriation and provision (28): Sustainability requires limits on extraction or exploitation of the resource (appropriation), as well as investments in maintaining or expanding its regeneration capacity (provision). Much of the commons literature has considered collective institutions to design, implement, and enforce appropriation and provision rules, and recent studies have examined the roles of women and men in these institutions, as noted below.

CONCEPTUAL FRAMEWORK

To answer the guiding question regarding men's and women's contributions to the sustainable use of local resources, as laid out above, we structure our review around the issues of (a) motives and (b) means and opportunities. The categories are depicted in **Figure 1** and move from more intangible aspects (which tend to be stressed in ecofeminist literature) on the left to more tangible aspects (which are stressed in the feminist political ecology, intrahousehold, and NRM literature) on the right. Rights to resources are placed in the middle because of their central influence on both motives and means and opportunities. We briefly discuss these categories, then present the empirical evidence that supports, refutes, explores, and expands upon the argument for each:

- Closeness to nature: Ecofeminists argue that women are closer to nature than men in a variety of ways, including biologically, socially, materially, and ideologically.
- Focus on sustainability: Ecofeminists have argued that women are more likely than men to be focused on sustainability and conservation because of an inherent drive and a desire to conserve.
- Rights to resources: Although the first set of factors, drawn primarily from ecofeminist theory, implies that women are less likely to exploit resources because of their inherent motivations, women may have fewer resources to exploit in the first place. We examine the links between use, control, and ownership bundles of rights that men and women hold and their appropriation and provision of natural resources.
- Means and opportunity to exploit resources: The opportunity to exploit or conserve resources can be understood as whether individuals view it as worthwhile to take the action required to use the resource, as well as whether this action is sanctioned. This depends on decision-making power, bargaining power, and the political and legal environments that

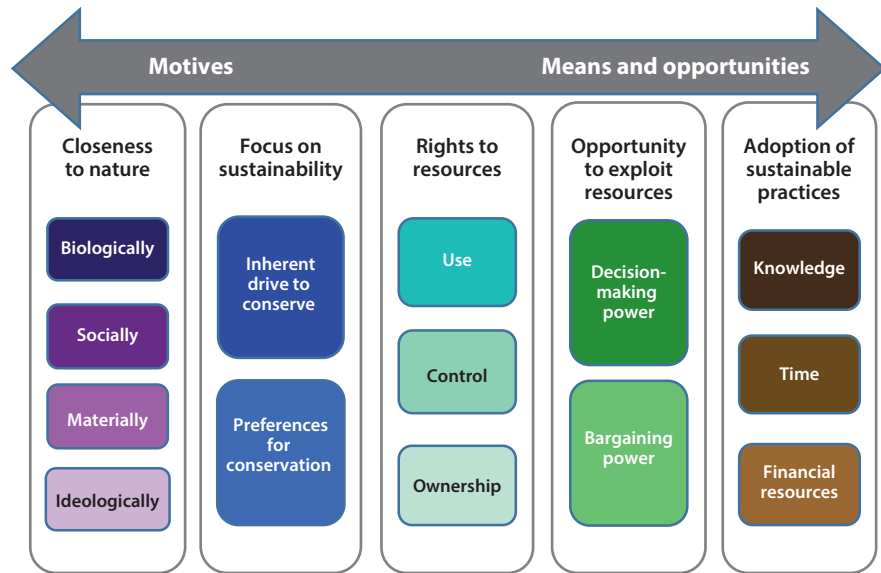


Figure 1

Conceptual framework linking motives and means and opportunity.

allow such actions to be taken. The means refers to the ability to exploit or conserve, which often depends on availability of other resources, including cooperation.

- Adoption of sustainable practices: Even if men and women are motivated to conserve resources, they may not be able to adopt sustainable practices because of lack of knowledge, labor, or financial resources. Thus, it is important to consider the extent to which constraints to adoption are gendered.

To explore each of the categories presented in **Figure 1**, this article reviews both quantitative and qualitative empirical evidence from research undertaken in the developing world that supports, refutes, critically examines, and expands upon gender issues in that particular category.

REVIEW OF THE EVIDENCE


To ensure a comprehensive review, we began by reviewing literature from the WED movement, ecofeminist theory, and other related disciplines to ground and motivate our review. We then reviewed empirical literature on gender and sustainability and gender and the environment. We looked for other reviews and original research on key issues that arose, including gender roles, and followed up on papers cited by these studies. We conducted keyword searches using Google Scholar and other databases, as well as searches of organizations' publications, and sent emails to researchers working on the topics of gender, sustainability, and the environment. The review draws primarily from literature on sustainable farming practices, water, forests, and biodiversity.

This review focuses on gendered roles, responsibilities, and understandings of sustainability and conservation. However, it also goes beyond looking at women and men as separate categories to identify what evidence exists on how relationships between women and men may affect sustainability.

We found a wide range of studies that relate to this subject, in academic sources, peer-reviewed journals, gray literature, and organizational materials, with a range of methodologies and quality

of evidence. Most of the material published by advocacy organizations tends to dwell on the view that women are victims of environmental degradation, a point also noted by Jackson in her critique of WED (Jackson uses the acronym WDE; see Reference 15), but empirical research, particularly peer-reviewed material, unpacks the nuances of men's and women's attempts to manage resources sustainably. We also note that any review of literature that attempts to highlight differences between men and women will be biased because those studies that report differences are more likely to be submitted and therefore published. Such publication bias is common to all scientific disciplines but has been found to exaggerate the prevalence of studies that show differences in cognitive styles of men and women (29).

Of the 166 sources cited in this paper, 83 are empirical studies that focus on one country (or, in a few cases, two countries within the same region), selected from the wide variety of literature on the topics of gender, sustainability, NRM, and intrahousehold relations. We also include 23 sources that are comparative analyses, reviews of other studies, or studies that cover countries in multiple regions. (See the **Supplemental Table** that details the various empirical studies included in our review; follow the **Supplemental Material link** from the Annual Reviews home page at <http://www.annualreviews.org>.)

 Supplemental Material

Closeness to Nature

Biologically. Gender is closely linked to biological sex. Some scholars view women as more interconnected with nature because a greater amount of their time and of their physical body is involved in reproduction, which these researchers view as a natural function (30, cited in 12). Furthermore, women's physical and bodily processes often limit social movement and involvement and thus reinforce perceptions of women being closer to nature. Social definitions of women's reproductive roles and taboos, e.g., on menstruation, have often restricted them to the homestead or community (see, for example, 31, 32). Even if these norms are relaxed, women are still prevented from going certain places (for a review, see 33).

Just as women are subject to feminine stereotypes, similarly men are the subject of reductionist views of masculinity that dictate what they can and should do (34, 35). Perceptions of men's physical strength contribute to the division of labor and reinforces views of men operating outside the household and performing tasks that are more physically demanding, whereas women operate inside the household or undertake tasks that are seen as less physical (see, for example, Reference 36 on Nepal).

The ability to move and undertake activities freely can have a direct impact on NRM, especially where harvesting (appropriation) or protection (provision) of resources requires mobility, as in fishing, forestry, irrigation, or even many farming practices. Studies also find that women's involvement in forest management may be constrained by their inability to travel (37) and that men, because they can move more freely than women, are often better informed about plant species located far from home, whereas women are more informed about species in local environments (38–40). Some studies find that women's participation in conservation groups increases their mobility by giving them reasons to leave the household (e.g., 41), though this change may also require a shifting of duties at home.

Materially. The tasks, duties, and roles that men and women perform on a daily basis differ depending upon the environment they live in. Scholars note that the material practices that women engage in, in particular domestic and subsistence activities such as collecting water and wood, bring them closer to nature than men are and give them learned, practical knowledge of ecosystems (17, 42, 43, as cited in 22; see also 4). However, concepts of what is considered male and female are by no means universal (44). The division of labor can also be influenced by other factors, such as age,

human capital, position in the family, caste, ethnic group, technology, and farming system (45–47), and can shift over time as a consequence of changes in land ownership, agricultural practices, soil fertility, technology, market access (48), and project interventions. For example, in Honduras, women’s participation in mixed-sex agricultural research groups was associated with their greater decision making in agriculture as well as a shift in responsibilities within the household (49).

Although in many societies most domestic work falls within a woman’s domain, this has never encompassed all her tasks. Women undertake various other careers, work outside the domestic sphere, and break from traditional gender norms around the world. Likewise, men break from traditional masculine roles as providers and caretakers, take on parental duties and domestic tasks, and involve themselves in childrearing (34). Elmhirst’s (50) work in Indonesia finds that responsibilities and patterns of resource control are both fluid and negotiable, and although there are generally certain tasks associated with men and women, these tasks change based on the occasion. Especially in nontraditional situations, such as female-headed households or when one adult emigrates, the work that each gender undertakes and thus the ways men and women interact with the environment are likely to change. For example, male migration in Mali has increased women’s involvement in livestock herding and charcoal production, which is associated with forest depletion (51; see 52 for a review of recent studies on male out-migration and the mixed findings of impacts on women). Although in many cases the gender division of labor may be quite persistent, particularly in societies with more rigid gender norms, e.g., with women hiring male labor when family men migrate, the important point is to examine what gendered roles are in any place and time rather than to make blanket generalizations.

The ways individuals interact with their environments are malleable (53). Individuals may strategically mobilize multiple and overlapping identities in regard to resource access claims and environmental change (54). For example, work by Resurreccion (48) in the Philippines finds that women are less likely than men to identify themselves as indigenous in order to claim land via a state-led program that grants land to individuals who can provide proof of indigeneity. The dual identities of indigenous and natural conservers of resources (viewed as a package by the government) were identities that women sought to discard but that men invoked to access land. Other work done by Radel (55) in Mexico found that women were collectively redefining themselves as farmers in order to legitimize their participation in a series of conservation projects that occurred throughout the region in the 1990s and early 2000s to access resources that they would not have been able to access otherwise.

Socially. Gender is viewed as one of the primary social constructs that mediate relations between individuals and can thus heavily determine individuals’ access to resources and their engagement with nature. Culturally specific views of gender reinforce the idea that certain physical or social spaces are explicitly for men or women. Women are often seen as confined to the domestic sphere and portrayed as nurturers and caretakers (of families and, by extension, of the environment), with men portrayed as both more likely to be involved in public spheres of life and less likely to care for nature (56, discussed in 4). The categories of nature, culture, female, and male are by no means universal; they are imbued with value and influenced by local histories and interpretations, and thus what is understood as female in one context may not be understood as such in another (44). These gendered identities are particularly important in regard to the environment, as they constitute one relation through which access to and distribution of natural resources are differentiated in societies (22).

Although ecofeminists viewed gender as a primary factor through which relationships with the environment are constructed, much empirical literature has shown that other factors beyond gender condition this involvement. Poverty is a key factor that determines the incidence of adverse

environmental effects, with poorer families being more heavily affected (17). In some societies, poverty is also linked to caste, another factor that constrains or enables access to resources (17). Age is also important in determining access to and control of resources, decision-making power, and the division of labor (57, as cited in 11). Nightingale's (22) work in Nepal, for example, demonstrates how gender intersects with caste, age, and marriage to determine who harvests leaf litter.

Ideologically. Finally, many ecofeminists postulated that women have an essential connection to nature that gives them an innate understanding of ecosystems and environmental protection (58). However, empirical results show this is not universal. For example, research in Myanmar (59) finds that women and men living near protected areas have different attitudes toward the protected areas, with women less likely to have a positive attitude and perceptions of the benefits of conservation, although this may be due to lack of education and knowledge on the topic because programs have targeted men.

Focus on Sustainability

As Nightingale (54) points out, a love and respect for nature does not automatically result in sustainable treatment of nature. How people conceptualize the boundary between themselves and nature affects how they understand and treat the environment.

Inherent drive to conserve. Women are often viewed as the more selfless sex (60, 61), and thus their behaviors in relation to the environment are often assumed to be a product of their care and concern for both future generations and the environment (11, 15). However, these actions are not necessarily altruistic. Although caring for the environment has been interpreted as a way of ensuring natural resources for future generations, it may be a way of ensuring old age support in communities where women do not control resources. Agarwal (17) argues that in India, women are motivated to protect the environment owing to material realities and not to some close connection to nature. For example, if women fail to use resources sustainably in their own communities, their own work burdens may increase (27).

Conflicting short-term and long-term interests further complicate the picture. In situations of dire poverty and scarcity, women may actually be less prone than men to conserve because they are in charge of the immediate survival of the family. In much of India, for example, it is women's duty to provide the fuel to cook the evening meal, and thus they may do something unsustainable in order to guarantee short-term subsistence (40). Work in China by Yang & Xi (62) finds that in historical times of hardship, women have collected greater amounts of firewood and ferns to supplement their income, even though it degraded the natural resource base.

Women have also been viewed as those primarily affected by environmental change in the developing world (63), giving them further incentive to use resources sustainably. A recent empirical analysis of 141 countries from 1981 to 2002 found that natural disasters lower the life expectancy of women more than that of men (64). However, men are also affected by environmental degradation, though in different ways. Joeques et al. (45) find that environmental changes in Malaysia, Kenya, and Mexico affect both men and women. Increased commercial logging in Malaysia lengthened the time men and women had to spend on tasks, though in the long term, employment opportunities increased and became more diverse for men as they migrated for work, increasing women's work burden. In Kenya, environmental change resulted in a more equitable sharing of labor by men and women for traditionally female tasks such as gathering water, though this was viewed as temporary assistance and not a long-term change.

Preferences for conservation. Beyond just feeling that they must or should undertake sustainable practices, ecofeminists have suggested that women wanted to conserve more than men did. Leach (4) quotes a UN Development Programme official who said, “the willingness of women to participate in natural resource management is greater than that of men” (p. 72). This was a common belief during the WED era, when women were targeted as primary or sole recipients of NRM interventions.

Several studies show that when women are involved in NRM, they undertake actions that benefit the environment. The Chipko Movement in India and the Green Belt Movement in Kenya provide famous examples of women-led efforts for conservation (17, 65). However, many critiques argue that the Chipko movement was not, in fact, evidence of a feminine bond with nature but instead a fight for natural resources in a context of gendered natural resource dependence and migration (11).

Thus, even when women are involved in actions that are beneficial to the environment, the motivation behind it may not be simple. In addition, in most cases women do not manage resources alone, so studies need to look at women and men working together. Sultana & Thompson’s (66) work on floodplain and fisheries management in Bangladesh finds that when both men and women are involved in management groups, compliance with rules is higher and conflict is lower. Agarwal’s (67–69) studies in Nepal and India find that, controlling for other factors, the inclusion of women in forest management executive committees contributes to improved forest governance and resource sustainability.

Some studies compare the results of women-only groups with men-only groups and mixed-sex groups. Westermann et al. (70) compare how 46 different gender-differentiated social groups in 20 countries in Latin America, Africa, and Asia differ in their activities and outcomes for NRM. They find that in groups where women are present, collaboration, solidarity, and conflict resolution all increase; the capacity for self-sustaining collective action was also higher in groups where women were present and significantly higher in women-only groups. Women’s groups also report a significantly higher proportion of regenerative outcomes¹ than men’s groups, whereas there was no significant difference between the groups in regard to reactive outcomes.

Women’s interest in issues related to NRM is not universal. Jewitt (47) and Resurreccion (48) find that some women in forest settings do not care to participate in forest- or land-related issues (71). Although this could be related to their attitudes toward conservation, it is likely also influenced by other, perhaps more tangible, factors. Zwarteveen & Neupane’s (36) study of a Nepalese irrigation scheme found that women in the study area had no interest in participating in the formal management committee. By not being involved they were able to take more water than they were entitled to and contribute less labor to maintenance without risking punishment.

Other studies show that women would actually behave less sustainably than men if given the same opportunities. Research using role-playing games in Jambi, Indonesia, by Villamor and colleagues (72) finds that the greater involvement of women in landscape-level decision making is likely to result in increased forest degradation and increased emissions from deforestation. Women in the sample were more likely to accept hypothetical offers of conversion of forests to oil palm and monoculture rubber plantations. Conversely, male players from the upland area of the sample showed strong conservation beliefs, which are likely attributable to a long history

¹To assess the capacity of groups to engage in progressively more sophisticated learning processes around NRM, the study categorized the different learning approaches to NRM taken by the groups into three categories: reactive (focused on eco-efficiency by reducing cost and environmental harm), regenerative (adoption of regenerative technologies and some principles of sustainability), and redesign (innovating to develop new systems of management rather than adopting new technologies to fit the old system).

of interaction with conservation and research organizations (72, 73). In this particular situation, understanding historical context matters: The research site was a matrilineal area where women controlled lowland paddy land and men developed agroforestry plots in upland areas (74), making the men targets of agroforestry and conservation extension messages.

German & Taye (75) find that women and men in mixed-sex groups in Tanzania have different priorities as a result of their gendered responsibilities for water and trees. Women value drinking water and, because they have few rights to land and trees, nurseries. Men prioritize irrigation water and trees to mark farm boundaries. Others find that men and women have different preferences for trees and plants: Although women may prefer trees with more domestic use value (e.g., potential for fuelwood, bark that can be used for medicinal purposes, or branches that provide shade for children grazing animals), men may prefer trees that have cash value (17, 76–78, as cited in 40). Women may also be more interested in conserving natural resources if these efforts yield benefits in their spheres of influence. In the Philippines, attempts to have women monitor lake water to determine if soil conservation technologies (SCTs) were reducing silting were unsuccessful until project staff realized that women were more interested in health issues than in soil loss. When the project began to raise awareness about how water quality affected the health of families and the program then expanded to include monitoring for *Escherichia coli*, women's participation increased significantly (79). Thus, men and women may prioritize different aspects of sustainability.

A growing body of research examines gender differences in risk and time preferences (which would favor sustainability), using economic experiments. In Karnataka, India, Bauer & Chytilová (80) find that women made more patient and risk-averse choices, especially if they had children. However, other studies have not found such gender differences (81, 82). The evidence from developing countries is still limited, and experimental methods have not been widely adapted to test explicitly for gendered preferences in NRM.

The above examples demonstrate that men and women can show a wide range of interests and motivations relating to sustainability and that these are conditioned by their individual situations and lived realities. Factors such as immediate necessities, labor constraints, information sources, social roles, livelihood options, and external interventions affect the choices men and women make, and thus it is hard to say whether men or women are more naturally inclined to care for the environment. Furthermore, although many of the papers referenced above generalize about gender differences, it is important to remember that gender alone is just one of many factors that can condition an individual's choices; age, social status, and caste, among others, can create differences among women that make them far from homogeneous.

Rights to Resources

Even if an individual is motivated to undertake sustainable actions, if she or he lacks the resources to do so, the opportunity is lost. The ability to use natural resources is often highly gendered, with men and women enjoying differential levels of rights to different kinds of resources, which are embedded in customary and statutory legal institutions. Resources can be private, common, or public goods and can be accessed individually or via family, user groups, or the state (83). Rather than pure ownership, rights are better understood as overlapping bundles of rights (84). The intrahousehold literature provides a glimpse into what factors affect an individual's ability to use, control, and own assets. Other resources, such as forests and water, are often accessed communally and may be controlled and managed by user groups. For poor, rural households, the village commons are critical sources of food, fuel, and fodder. For women, communal resources provide a source of subsistence less dependent upon relationships with family men (17).

Use. Use rights include the right to access the resource (for example, to walk across a field), withdraw from a resource (pick wild plants), or exploit a resource for economic benefit (fish commercially) (85). Use rights shape the appropriation of natural resources.

In some areas, women have well-established rights to collect forest products despite these products being located on state property or on private property owned by men. Using International Forestry Resources and Institutions (IFRI) data from 290 forest user groups in Kenya, Uganda, Bolivia, and Mexico, Sun et al. (86) find that female-dominated groups tend to have more property rights to trees and bushes than do male-dominated or gender-balanced groups—perhaps because women collect nontimber forest products or firewood for domestic use, whereas men are more interested in timber harvesting, which is more commercially oriented and less sustainable. Rocheleau and Edmunds discuss how, in many parts of Africa, women can collect fruit, deadwood, and leaves from men’s trees to use for their own purposes (87–90; as cited in 91). Across cultures, farming women seem to predominate in the collection of wild foods (92), though there are some exceptions (93). In many countries, this collection takes places in what Rocheleau & Edmunds (91) term “in-between” spaces, on the periphery of fields, roads, and other areas. However, such use rights are often conditional: The specific rights to individual plant species indicate who may use what parts of the plant, for what purposes, and at what times, such as the detailed rules that contribute to the sustainability of biodiversity in the forests of Uganda (94).

In many societies, women are responsible for domestic water and are accorded priority over irrigation and other water uses, but this does not necessarily translate into women having a voice in higher-level decision making (control rights) over water (95, 96). Technology also plays an important role in shaping who does and does not use various resources. Bray (97) points out that technology studies have long been gender blind and that in contemporary society, at least in the Western world, “technology is firmly coded male” (p. 38). It is thus necessary to take a deeper look at what technologies might be needed to engage in specific NRM practices and what gendered associations those technologies have.

Women may have access to land (use rights) through their husbands, fathers, or other relatives (37), which allows some appropriation, but such rights often explicitly preclude women from making long-term investments on the land because that is seen as asserting a claim of ownership (98). Thus, adoption of sustainable practices requires attention to control rights.

Control. Control or decision-making rights include rights to management (plant a crop), exclusion (prevent others from accessing the forest), or alienation (rent out, sell, or give away the rights).² These rights affect the ability as well as incentives to limit extraction and to replenish the resource (provision).

On private land, it is important to consider whether women have rights to plant trees or undertake long-term investments such as terracing. Individuals may lose the incentive to manage resources sustainably if they cannot control the produce from those resources or do not have long-term rights to the resources. The early intrahousehold literature (e.g., 99–101) documented that in the Gambia and Cameroon, women did not want to contribute labor to irrigated rice production on their husbands’ irrigated rice plots because the proceeds were controlled by men. However, control is not necessarily separate: An area can be shared by men and women and can shift depending on the time of year. Research by Leach (102) in Sierra Leone finds that men are responsible for a space during the periods of groundnut cultivation, whereas the same space is the women’s responsibility during fallow times.

²In this review, we separate alienation from the bundle of rights under “control” and use it to define ownership.

In common pool resources, control rights may rest with the government or with user groups. In the latter case, the extent of men's and women's effective voice in the user groups, as well as the overall effectiveness of the groups, will determine their control rights. These groups are often male dominated, in part because of the association between men and public space (for a review of factors limiting women's participation, see 69, 103). Work in Uzbekistan also finds that because women are not viewed as land managers—even though they perform most of the work due to high male out-migration in the area—their participation in water users' associations to manage irrigation technologies is limited (104). In Madhya Pradesh, India, when committee leaders report that women belong to forest protection committees, participate in committee meetings, and patrol the forest, then control of illicit grazing and of tree felling increases by 24% and 28%, respectively, and the regeneration of allotted forest also increases by 28% (105). The proportion of women on committees and their class background also matters. Based on data from 135 community forestry groups in Nepal and Gujarat, India, Agarwal (69) finds that having more women on executive committees is associated with stricter rules, except when there are more landless women who have no alternatives to the forest for firewood and fodder needs. The study shows how women who are party to decision making are more likely to follow and enforce the rules. However, a higher proportion of women in the user groups does not necessarily translate into stronger control rights: In their review of 209 forest user groups, Sun et al. (86) find that, compared with male-dominated groups, gender-balanced groups participate more in forestry decision making and are more likely to have exclusion rights, but female-dominated groups have weaker sanctioning and exclusion, perhaps because these are strong-arm tactics more associated with men. The evidence on gender in user groups is growing but still fragmentary, and there is considerable endogeneity: The places where women play an active role in user groups are not necessarily comparable to other sites.

Ownership. Complete ownership of the resource implies the ability to alienate the resource—to rent out, sell, or give away the rights to the resource. Alienation rights are hypothesized to provide additional incentives for long-term investment in the resource (106, 107). In matrilineal areas of Ghana, women were more likely to plant cocoa trees on land on which they had secure, private property rights (108). These rights could be obtained through purchase, but in this particular situation, they were acquired when husbands gave wives land as gifts in return for their labor in establishing cocoa farms. When women were less secure about their land rights, they were less likely to adopt long-term practices such as tree planting, and they shortened crop rotations³ (109). Also in Ghana, Goldstein & Udry (9) find that individuals whose land rights were less secure were less likely to leave their land fallow to allow regeneration because they risked losing it if they were not actively farming it. Because women are rarely in positions of sufficient political power to be confident of their land rights, women fallow their plots less often and for shorter duration than their husbands and achieve much lower yields.

However, when we examine the evidence on cases of gender and long-term incentives for sustainability, especially for women, we find that tenure security rather than ownership (as perceived in Western societies) is paramount. Specifically, the critical factor is that no one else has the right to alienate women from their land or other natural resources.

In communal areas of Zimbabwe, Fortmann et al. (110) find that the potential that a woman might lose land and trees following widowhood or divorce was an important source of insecurity for women and that it limited tree planting on household land; women and men were equally likely

³This was done to boost short-term production, but it left less time for the land to lay fallow and regain its fertility.

to plant trees on community woodlots because rights over those trees derived from community membership and investment, not marital status, and hence there were fewer gender differences in tenure security (even though neither women nor men had full ownership rights).

Efforts to strengthen women's land rights, such as through land certification programs, have been associated with higher adoption of sustainable farming techniques. Many of these programs, though not considered formal titling programs, do convey alienation rights to certificate recipients. Unfortunately, most impact evaluations have only analyzed differential impacts for male- and female-headed households, not for men and women within those households. Deininger et al. (111) find that households' awareness of their land rights as defined by the 1998 Uganda Land Act, which strengthened tenure security and legal protection of customary owners and women, increased the propensity to undertake SCTs. Household characteristics that increased a farmer's propensity to invest include the level of education on SCTs, and, "somewhat surprisingly" (111, p. 610), a dummy indicating that the household is headed by a female. Ali et al.'s (112) study of a pilot land tenure regularization (LTR) program in Rwanda found that the impact of LTR on land-related investments by female-headed households was double that of men, with female-headed households exhibiting a roughly 19 percentage point increase in likelihood of measures to construct or maintain soil conservation structures. Similarly, Deininger et al. (113) find that community-based land registration in Ethiopia led to more households undertaking new land-related investments, specifically tree planting and using SCTs, but this also examined household-level responses and did not distinguish between male- and female-managed plots. A follow-up survey (114) six years after the land registration found, consistent with the earlier studies, that households with more registered land were more likely to plant trees and that trees were more likely to be planted on women-managed plots with more secure rights. Although results are still preliminary, they are consistent with earlier work showing that secure land rights increase incentives to invest in sustainable farming practices.

A range of payment for environmental service (PES) programs offer incentives for biodiversity conservation, protecting water supplies, or carbon sequestration, including REDD+ (the UN's program Reducing Emissions from Deforestation and forest Degradation). These payments are usually made only to recognized land owners (115). Thus, gender differences in ownership will further affect the ability of women to tap PES programs and hence the incentives for sustainable practices (116). There are also concerns that women have little influence over decision making in REDD+ programs, which commoditize natural resources, and women will lose access to resources in a "stampede to appropriate REDD's financial rewards" (117, p. 11).

Opportunity to Exploit Resources

Being able to exploit resources depends on a variety of factors, including whether or not one is able and chooses, in a certain context, to exploit said resources. Not exploiting resources does not signify the lack of desire to do so. As Jackson (15, p. 1948) notes, "because women have not been at the forefront of tree logging or mining or rainforest burning does not mean that they are naturally more caring about the environment"; it is more likely to express gender divisions of labor and distribution of opportunity.

Decision-making power. The extent to which women and men can act on their preferences and priorities depends on the extent of their decision-making power, which is influenced by multiple factors. Decisions about whether or not to undertake sustainable actions occur at multiple scales, ranging from the household level to the national level, and are influenced by both physical and social constraints.

At the household level, although there is a large literature showing that differential control of resources within the household affects intrahousehold decision-making power (8), there is less on how decision-making power affects adoption of sustainable practices. Udry's (118) study of intrahousehold differences in agricultural productivity in Burkina Faso found that manure tends to be applied with less intensity on female-managed plots compared with male-managed plots within the same household. Although there are newer studies that attempt to decompose agricultural productivity differences across male- and female-managed plots, they look at short-term productivity measures (yields) rather than sustainability.

At the community level, men are generally more likely both to have greater decision-making power and to be in situations in which they are engaged in higher-level dialogue regarding environmental change, whereas women often experience limited levels of involvement in local and national dialogues on the environment (72, 119, 120). Furthermore, simply including women in positions of power on management committees will not ensure that they speak up, represent other women's interests, or influence decision making (121). Agarwal (69) finds that in India and Nepal, a critical mass of 25–33% women was needed before they felt able to speak up. Unfortunately, this limits the contributions that men and women can make to the sustainable use of natural resources. In Bangladesh, Sultana & Thompson (66) find that compliance with rules limiting fishing in protected areas is higher when both men and women are actively involved in fishery management groups because women, who control catches, exert pressure to ensure compliance with fishing rules, whereas men patrol the fish sanctuaries at night when it is unsafe for women to do so. Hambly Odame (122) notes that in western Kenya, failure by an agroforestry extension project to understand the importance of men's role in the distribution of resources and benefits within women's groups led to a 67% rate of collapse over a 12-year period, often resulting in a loss of labor, capital, and moral support for group members.

Bargaining power. Bargaining power determines the distribution of gains from cooperation, whether that is at the household level (between spouses, for example) or at the community level (between households). Much of the literature on gendered bargaining power focuses on intrahousehold bargaining. Although that may be relevant for sustainability (influencing use of agricultural land, for example), sustainable use of many natural resources such as forests or water depends on bargaining within communities, with government, and with outsiders over the level and distribution of resource extraction or investment. These negotiation processes are also highly gendered.

Women's limited formal education and lack of confidence speaking in public may limit their participation in NRM user groups, especially in formal meetings (103). But these limits can be overcome. A randomized evaluation of water infrastructure maintenance in rural Kenya found that speeches made by NGO facilitators about the importance of women's participation in the user committees increased women's participation, along with encouraging women to attend the community meetings at which committee members were selected and holding the meetings at a convenient time for women (123).

The intrahousehold literature highlights the importance of property rights in conveying bargaining power. In Kerala, India, a panel study by Agarwal & Panda (124) finds that although a woman with better employment than her husband was more likely to be subjected to marital violence, those women owning land or a house faced lower risks of marital violence than propertyless women. Similarly, secure property rights also strengthen bargaining power within communities, with government, and with outsiders. In examining the gender implications of large-scale land deals, which often involve conversion from smallholder production to large-scale monoculture, Behrman et al. (125) highlight the importance of women's (lack of) state-recognized property rights in whether they have a seat at the table in negotiations.

Adoption of Sustainable Practices

Ultimately, the sustainability of natural resources hinges on the adoption of various practices to restrain extraction and ensure regeneration. Examining the links between gender and sustainability therefore requires considering gender differences in constraints and/or enabling factors for adoption, including knowledge, time, and financial resources.

Most studies of adoption constraints deal with farm-level practices, but these also apply to collective resource management. In comparisons of user groups in Kenya, Uganda, Bolivia, and Mexico, Mwangi et al. (126) find that higher proportions of females in user groups reduced the likelihood of adoption of new technologies and resource monitoring practices that are associated with improved sustainability, which they attribute to gender biases in technology access, labor constraints, and limitation to women's sanctioning authority. Mixed female and male groups offer an avenue for exploiting the strengths of women and men.

Knowledge. Knowledge of sustainable practices is a prerequisite for adoption. That knowledge can be customary, experiential, scientific, or a blend of these.

Ecofeminists viewed women as primarily responsible for food and water collection, thus providing experiential knowledge about those resources. Some studies have supported this theory, showing that women are often more knowledgeable than men about the attributes of trees and are better able to identify trees, shrubs, and grasses near fields and pastures (127, 128, as cited in 41) or wild food plants (94). But it is important also to consider men's environmental knowledge, as well as differences among women (22, 47). Differences in knowledge may be due to gender, but they may also be based on different experiences, rights, responsibilities (129), and resource ownership (47), which may or may not be influenced by a person's gender.

Wangari and colleagues (130), for example, find that both men and women in Kenya knew many of the same places to collect and classes of ecosystems, but their priorities varied, and they often used different species and different products from the same species. Interestingly, there was a larger knowledge gap between generations of men on these topics than there was for women, likely because of increased out-migration of younger males during times of famine and drought when the necessity of collecting wild foods grew.

Knowledge about biodiversity constitutes an important aspect of NRM. Ecofeminists have stressed the role of women as primary "selectors and custodians of seed," thus making them more knowledgeable about seed varieties than men are (131, p. 211). However, as described above, the division of labor conditions what tasks men and women engage in. In many cultures, there are also men's crops and women's crops (94, 132, 133), but such distinctions, like the gender division of labor, are not static (134). In Jharkand, India, Jewitt (135) finds that many of the women moved to the village upon marriage and thus were not as familiar with the local species and varieties as the men in the village who had grown up in the area and had spent much of their childhood in the forests. Research on medicinal plants by Huong (76) among the patrilineal Dzaio of Northern Vietnam reveals that knowledge about different plant species and uses for the plants is conditioned by age, gender, and space. Although herbal medicine plays a large role in the community and thus both men and women are familiar with it, women tend to have better knowledge of and ability to recognize plants, partly because they have grown up in the village and are more likely to have accompanied their parents (particularly mothers and mothers-in-law) to the forest to collect.

As important as local knowledge is, some sustainable practices require information from outside. Important sources of that information include extension systems, formal groups, social networks, and information and communications technologies (ICTs). Studies of agricultural innovation systems have found that effective access to each of these sources is also gendered.

Many studies find that women are more disadvantaged than men in access to extension services. A World Bank and IFPRI study (136) of Ethiopia, India, and Ghana finds that women's access was consistently less than men's, though it varied by crop type and region. Most other studies (for a review, see 137) find lower access to extension services for women than for men, owing to a variety of factors.⁴ For example, who is identified as the farmer in a household (Reference 134 shows that there are various ways to define farmers) may influence who receives extension advice. Although women often participate alongside men in farming activities, they often own less land (139), so targeting the landowner as the sole individual to receive extension services excludes women from learning farming techniques. Even where women are landowners, programs may target men, as seen in the agroforestry programs in Jambi province discussed above (72). By contrast, when promotion of agroforestry for soil fertility replenishment in Kenya was explicitly designed to reach women as well as men, including efforts to ensure that illiteracy was not a barrier, there were no significant gender differences in adoption by gender or poverty status in the pilot villages. Because people had to search for information over greater distances in the nonpilot villages, men, who have greater mobility and social space, were more likely to learn about the new approaches (140).

Social networks are a critical pathway for information. For example, preexisting social groups can serve as a convenient platform for starting a collective action/NRM group, and social networks can facilitate the spread of information about NRM practices. New work finds that there are gender differences in social networks, social groups, and social capital. Work by Magnan et al. (141) in India finds that men and women within the same household have very different networks of agricultural contacts. Women's networks are as large as men's, and in the case of poor households they are larger; however, women's contacts are likely to be with poorer households that are less likely to adopt new agricultural technologies.

Men and women may also join different kinds of groups. Godquin & Quisumbing (142) find that in the Philippines men and women are equally likely to join groups, but men are more likely to join production-focused groups and women to join religious and civic groups. In Uganda, Jagger & Pender (143) find that male- and female-headed households are equally likely to be involved in agriculture- and environmentally focused organizations, but female-headed households are more likely to be involved in other types of community-based organizations and NGOs. Other studies (for a review, see 137) point to differences in the types of groups that men and women join, and still others explore demographic characteristics such as gender of household head and marriage status that influence group participation. Ensuring that information on sustainable practices reaches women may require disseminating it through groups that they join, not relying on producer groups by default, if these reach only men.

Social capital can also have positive outcomes for NRM through facilitating relations of trust, establishing reciprocity, setting common rules, and forming different kinds of connectedness (i.e., bonding, bridging, and linking) (144). Several studies find that when people have strong connections to one another and when their advice is sought and incorporated during the planning of conservation activities, then they will be more likely to sustain protection in the future (145–148, as cited in 149). Work by Njuki and colleagues (150) finds that gendered social capital is a critical factor in improving the adoption and use of technologies that are beneficial for livelihood outcomes.

Finally, assets such as TVs, radios, and mobile phones can also serve as important tools for accessing information about agriculture and the environment in rural settings, but gender

⁴The exception is a study by Davis and colleagues (138) in Kenya, Uganda, and Tanzania, which finds that in Kenya and Tanzania extension services are equally available to men and women, but in Uganda women are less likely to participate.

differences often exist with regard to ownership of ICTs (151). Mobile phones are important not only as a potential source of information about technologies but also as a means to facilitate collective action and monitoring of resource use in irrigation systems, forests, or fisheries. Thus, ensuring access to mobile phones is important for women's effective participation in NRM.

Labor. Many sustainable practices require additional labor inputs. Therefore, control over labor—own, family, or hired—is necessary for adoption. Quisumbing & Kumar (114) find that although male- and female-headed households are equally likely to adopt SCTs in Ethiopia, because SCTs are labor intensive, adoption tends to be higher in larger households with more labor resources and lower in households with higher opportunity costs of labor (better-educated households, more livestock). However, because men often have the means to hire labor or have greater bargaining power within the household, they can often mobilize more labor resources. Udry's (118) study in Burkina Faso, for example, shows that women's labor within the same household was more intensively applied to men's plots than to their own.

Women's inability to harness labor resources contributes to their time burden, and male out-migration in some areas may exacerbate labor shortages for women. However, although it is common to assume that women in the developing world are more time constrained, owing to their double involvement in productive and reproductive work, recent results from the Women's Empowerment in Agriculture Index in 13 countries (152) show that both men and women report being highly time-constrained across most countries, though the levels of time poverty are higher for women.

Environmental degradation, in particular the depletion of water, wood, and soils, is assumed to affect women more heavily than men, lengthening a woman's workday as these resources become more scarce and she needs to travel farther to gather the same amount (17). Research by Kumar & Hotchkiss (153) in the hill areas of Nepal shows that as deforestation increases, so too does women's time burden; increased deforestation also reduces household income, food consumption, and nutrition. However, men's time can also be affected by environmental degradation (see, for example, the discussion of Reference 45 earlier in this article). Research in the Volta Region of Ghana reveals that during periods of drought women's workload increased more than men's, although men were also affected, often having to move to cities in search of work (154).

Targeting interventions to women alone may inadvertently increase women's labor burdens: Assuming that women will be the environmental managers means extending the burden of unpaid work they are expected to perform (15). Nightingale's (22) work on conservation practices around the harvesting of leaf litter in Nepal demonstrates that conservation activities may increase the time burdens of individuals, perhaps without their consent. In her study, restrictions on harvesting leaf litter, a task done solely by women in the community, increased time pressure in women's harvesting activities. The restrictions were made by men, who did not suffer the consequences of limiting harvesting; women, unsurprisingly, did not always feel it necessary to uphold the new rules (22). Research by Torri (155) finds a similar situation in Rajasthan, India, where protective forest measures set by men have increased the daily workload for women, and particularly daughters-in-law, who are younger and have lower status in their households. However, other studies have found that if an increased workload is accompanied by other benefits, such as improved household income, women may not mind the trade-off. A study assessing the effects of stabling⁵ in Senegal

⁵Stabling refers to a technological package whereby farmers give cows a stable, a food supplement, an animal health-care package, and improved manure production methods. It results in increased milk production, improves soil quality, and conserves soil moisture (via increased amounts of manure). It also has the potential to decrease land degradation because it serves as an alternative to grazing (156).

found that women whose husbands adopt stabling, despite a large increase in their daily workload, support the adoption of this practice because the increased income has improved their lives and the lives of their children. Most women in the study stated that if given the chance they would also adopt the technique themselves (156).

A lack of time may also affect whether and how women participate in groups and activities that relate to NRM. If group meetings are scheduled at inconvenient times or lack childcare, women may be less likely than men to attend. For this reason, women may prefer short-term involvement, such as participating in a demonstration (40). Having the time necessary to undertake sustainable changes must also be considered hand in hand with the individual's preferences on how to use his or her time.

Financial resources. Sustainable resource practices often require financial investments or foregoing immediate income to allow the resources to regenerate. Gender differences in cash or credit constraints, ability to save, or remittances would therefore affect adoption of those practices.

In many developing country contexts, women have less information than men about financial products and services because of lower literacy rates and lower access to important factors like transportation (157). In addition, they may face biases from bank tellers or lending institutions or may lack the collateral (such as land) needed to take out a loan. However, men may not always have more access to credit. This is especially the case with microfinance, which in recent years has targeted primarily women and women's groups for receipt of loans, partly because of higher repayment rates among women (158, 159). In her work on gender and livelihood diversification in the rural Philippines, Hill (160) finds that women often were more likely to be loan recipients than men, who are assumed to gamble and drink away the money. Women in her sample often reported having borrowed on behalf of their husbands. Other studies find similar results in which women lose control of the loan once it enters the household (161). However, very little work has been done on microcredit and its connection to environmental outcomes and natural resources (see 162). One of the few studies on the topic (163) examined a project at a nature reserve in China meant to reduce conflict and local reliance on natural resources by providing small loans to start businesses. Although most of the borrowers were men, the creation of women-only groups later in the project's lifetime affected women by increasing both their work burden and their opportunities for work, travel, and socializing. However, the project has not met its goal of reducing either men's or women's reliance on natural resources and actually may be having the opposite effect.

Remittances are one source of financing that may favor women, especially in areas of high male out-migration (e.g., 164). But remittances, whether controlled by women or men, may not be used to invest in sustainable resource management. Recent evidence from a multicountry study on the effects of emigration and remittances on agriculture (165) suggests that migration and transfers are used to accelerate a transition out of agriculture, including investments in child schooling.

CONCLUSIONS

After reviewing the evidence on these issues, there is a simple answer to the question of whether gender matters for sustainability: Yes, it does. But this does not mean that women (or men) are inherently more resource-conserving; rather, it is that we need to take account of both women and men, their intangible and intrinsic motivations, and their material conditions and means.

Most programs to promote sustainability have been gender blind and thus ended up working primarily with men, who are more likely to occupy public spaces (including community organizations and government or external programs) and are often more readily recognized by outsiders as the foresters, irrigators, fishers, and even farmers. Ecofeminism can be seen as a valid response to

that tendency to overlook the importance of natural resources for women and the important roles women play in managing natural resources. But perpetuating an ecofeminist myth by considering only one side of the evidence on the extent of—and reasons for—gender differences in appropriation and provision of natural resources is also misleading. Treating women as a homogeneous category can be a useful strategy to draw attention to the role of women in NRM, but we need to move beyond this simplistic view to acknowledge the differences among women (and men) and to consider the factors besides gender that are relevant to NRM policy and programs.

Based on this review, we suggest that attitudes, desires, and preferences of men and women regarding the sustainability of the environment in general as well as for particular resources are important to consider, though preferences for sustainability are malleable, influenced by material conditions and awareness campaigns. Gender roles and dependence on resources for livelihoods are particularly salient in shaping both knowledge of resources and preferences for their conservation. Property rights to natural resources influence the motives and means that men and women have to exploit or conserve resources, but to understand these we need to look beyond ownership to examine the bundles of rights to use and control resources and the security of tenure that men and women enjoy. Decision-making and bargaining power within the household and community affect the extent to which men and women are able to exploit (or invest in) resources. But whatever the motivations and decision-making power that men or women have, unless they also have the knowledge, labor, and financial resources necessary to adopt practices that either limit extraction or enhance the resource base, sustainability will not be achieved. Thus, understanding the specific constraints to adoption, and how these may differ for men and women, is fundamental to ensuring sustainability.

In many situations where conservation activities are under way, incorporating a gender lens into the project may be synonymous with targeting women (22). Although ensuring that women are incorporated into the project is essential, doing so at the expense of paying attention to men and the relations between women and men is problematic, as the evidence in this review suggests that there are often complementary roles for men and women in crafting and enforcing rules governing both extraction and provision of natural resources. Furthermore, projects that pay attention only to women run the risk of reinforcing old gender stereotypes or even creating new ones. Finally, it is also important to examine how international institutions shape policy, programming, and research in regard to poverty alleviation, development, gender, and sustainability. Anthropological examinations of international development describe the complicated relationships among various actors, as well as differential interests, knowledge, and relations of power that shape development policy (166).

As a social construct, gender is both fluid and context specific. Climate change and migration make gender roles even more dynamic. Assumptions and extrapolation from other places or times can be misleading, so there is a need for updated and sex-disaggregated information on key parameters such as livelihood strategies, seasonal migration, property rights, and participation in resource user groups.

The increase in gender analysis of NRM—particularly forestry—over the past two decades is encouraging, but coverage is still spotty. A review by Mai et al. (71) finds that between 2000 and 2011 most gender research on forestry examined gendered participation in community forestry programs in South Asia and market access in Africa, with most studies conducted in India and Nepal. Gathering consistent data on both the condition of the resource and the users, such as through the IFRI network, would be an important and valuable step to extend to other resources beyond the forestry sector. This would also permit further examination of the relationships among gender, livelihoods, resource rights, bargaining power, and constraints to adoption of sustainable practices.

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