

Women in the plant world: the significance of women and gender bias for botany and for biodiversity conservation.

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Flora is the Roman goddess of flowers, gardens, and spring. She is the embodiment of all nature, and her name has come to represent all plant life. In ancient Rome, rituals and celebrations were performed in her honour. But later the Church associated these with paganism and sexual promiscuity and it did what it could to eradicate her celebration. However, in the 18th century, Flora's image was revitalised at the same time that botany was established as an Enlightenment science. An explosion of interest in plants took place among the general population as well as among the scientifically and commercially inclined, due to colonial plant-hunting expeditions that were introducing an extraordinary number of exotic plants to the continent. Middle and upper class Europeans began seriously to explore and exploit the bounty in their own backyards. And, in 18th Century Europe, due to the associations in myth and literature between women, flowers and gardens, and due to the long tradition of women's medicinal herbalism and homegardening, botanical work was considered to be very much in line with feminine attributes. Young middle and upper class women were actively encouraged to pursue the study and cultivation of plants.

According to Ann Shteir, a Canadian historian, between 1760 and 1820, the ideas of a certain Swedish scientist, Carolus von Linneaus, gained great popularity in Europe and his system of plant classification became widely accepted. In fact, Linneaus became known as the 'father of Botany'. What Linneaus did was to classify plants according to sex and then according to the number of pistils or stamens. Linneaus's system was simple and readily understood by lay persons who had a passion for plants.

His system was based on parallels between plant and human sexuality and on concepts of masculine and feminine that were prevalent in his day. He used anthropomorphic terms to characterise the sexuality of the plant world – such as ‘brides and bridegrooms’, ‘eunuchs’ and ‘clandestine marriages’. According to Shreik, “He assigned a higher ranking to the class, a unit based on stamens (the male part), and a subsidiary ranking to the order, based on the pistil (the female part). He also represented the male part in plant reproduction as active and the female part as passive... he naturalised sex and gender ideologies of his day.”

The gender and anthropomorphic bias evident in Linneaus’s work went relatively unchallenged for nearly 70 years since it coincided well with Victorian conceptions of how nature and societies should be organised. But, by the 1820’s, some botanists began to turn to plant physiology as a new area of inquiry. Continental scientists in Paris and Geneva were developing ‘natural system’ approaches to plant classification based upon a series of characteristics rather than simply plant reproduction. Linnean botany was increasingly seen as the “lower rung of the ladder of botanical knowledge, associated with children, beginners, and women”. At the same time that Victorian England was romanticising nature, botany was becoming professionalised – symbolised by the inaugural speech of John Lindley as the first Professor of Botany at London University. In his inaugural address, Lindley strongly distanced himself from Linnean botany and allied himself with the continental thinkers – he insisted that botany should concern itself with plant structure rather than identification. But this is not all he did – he insisted as well

that “it has been very much the fashion of late years, in this country, to undervalue the importance of this science, and to consider it an amusement for ladies rather than an occupation for the serious thoughts of man”. The link between women and botany was to be severed – Flora was once again to be expelled for profaning the sacrosanct, but this time the sacrosanct was declared to be the ‘male’ science of botany. So, Shteir relates, “During 1830-60, botany was increasingly shaped as a science for men, and the ‘botanist’ became a standardised male individual..[women’s] botany was in the breakfast room.”

I intend to show in my talk that the fate of the Goddess Flora (a euphemism for women and plants) is still linked to gender bias in the scientific pursuit of knowledge about plants. A daughter of the mother science “Botany” is “Ethnobotany” – a science that, according to Balick and Cox, is “the study of the interactions of plants and people, including the influence of plants on human culture” (1996:i). This science has undergone a great resurgence thanks to the recent world-wide concern with biodiversity conservation. Small armies of ethnobotanists are not only being employed by pharmaceutical companies to explore and exploit the medicinal knowledge of indigenous peoples and the chemical properties of plants; also gene banks and conservation groups are employing ethnobotanists and ethnobotanical methods to increase their knowledge of indigenous people’s plant use, management and conservation practices. My talk is about ethnobotanical science and the way it is practised and about biodiversity conservation and the way it is conceptualised and performed. It is about how gender bias that has its roots in the ‘masculinisation’ of the science of botany affects

scientific knowledge of the plant world and how this in turn affects our ability to shape that world in the ways that we desire. But my talk is not only about science – it is about achieving the third goal of the Convention on Biological Diversity: the “Fair and equitable sharing of benefits arising from its use” and therefore I will talk as well about gender equity and about how women’s status is affected by their relationship with plants. It is also about giving Flora her due, and bringing her back into her rightful place. This is a very big subject I will try to cover in very little time. I hope to demonstrate that gender studies is about achieving what sciences are ultimately about – improving human welfare and ensuring environmental integrity. Both human welfare and environmental integrity are everywhere an outcome in part of gender relations. But I also hope to demonstrate that gender studies is also about good science – that is, producing knowledge that is as unbiased, objective and comprehensive as possible. I will demonstrate these two things by looking at the case of gender and plants.

What is gender precisely?

‘Gender’ is a term coined in the 1960’s to refer to the relations between men and women that affect in a substantial way how each are expected to behave. These relations are thought by most to be ‘natural’ or pre-determined – that is, derived from biology or religion. However, for at least a hundred years, anthropologists have been researching differences between the sexes within societies and households. Since the 1970’s, gender relations and women in particular have been intensively studied. Taken as a whole, this research demonstrates that gender

relations are socially, historically, and spatially specific. They vary according to age, kinship status, religion, ethnicity, caste, and class situation within society. Differences between men and women are related to the fact that women bear children and men do not. Because of this biological difference, men and women experience life differently. Women in most societies are mainly responsible for childcare, cooking, and domestic tasks, but there are also variations in this pattern and, as women in the Netherlands are insisting, there is no biological reason why men can't also be responsible for these tasks. Women's involvement in just about every other realm of human activity such as agriculture, household financial management or the wage labour force, varies considerably over time and space. Thus, it has aptly been said that gender relations are 'homogenous in their heterogeneity'.

The first division of labour that arose in human society is the gender division of labour – that is, the division of roles and responsibilities according to sex. Rights, duties, freedoms, and obligations of every kind are, in most customary and formal legal systems across the world, also related to sex. Men and women have different and unequal rights to land, inheritance, credit, education, physical mobility, and political and religious participation. The combination of these differences means that women's and men's daily tasks, opportunities, benefits, and life experiences are nearly always different within the same society, village, and family.

Gender research has clearly demonstrated the presence of "gender bias" in social and natural sciences. This means that scientists take prevailing gender norms in a society to be 'natural' and often incorporate these norms into their theories

as unquestioned assumptions. It also means that scientists assume male predominance and take men's behaviour and knowledge to be 'standard' (e.g., men are the 'farmers', 'foresters', 'leaders', 'shamans', etc.) whereas women are given little importance or their behaviour is seen to be 'deviant' in comparison with men. Gender bias affects theories, the questions formulated, the methods used, and the research outcomes. The repercussions go far beyond simply creating biased scientific knowledge: they extend into related practices, policies, and interventions that are intended to change the interactions between people, and between people and their environments. They can distort the outcomes in ways that are unanticipated and not always desirable.

Women and the world of plants: what do we know?

This is a question that I have been trying to answer for the past several years in the context of a research programme that I developed that is establishing the world's largest knowledge base on local management of plant resources. This is a difficult question to answer because the information is very disperse and hard to locate. This information is contained mainly in ethnographic research done on indigenous societies, and has been carried out mainly by anthropologists and ethnobotanists who were not specifically setting out to research women's relations with plants but who, in any case, did collect data disaggregated by sex. I have collected around 3000 citations and more than 1200 documents and am in the process of reviewing these to understand women's relations with plants world-wide.

Today and in the future, the way that we view women in relation to plant biodiversity will greatly influence our

ability to halt the erosion of plant biodiversity across the globe, particularly of those plants that humans have found to be useful. From this literature review it has become apparent that, against most thinking on the topic, women collectively hold the majority (possibly the vast majority) of knowledge about the world's plants. The simple explanation for this is that, throughout history, women's daily work has required more of this knowledge. However, today, when it is perhaps more important than ever, women's knowledge and management of plant biodiversity are under-estimated and under-valued. The majority of the literature that directly deals with people's management and knowledge of plant biodiversity can still be termed 'gender blind' – that is, unaware of the fact that women and men have different physical domains of work, knowledge, practices, interests and needs with respect to plants and their environments.

I'd like to present to you some of the main preliminary conclusions arising from the review of this knowledge base. Women predominate in plant biodiversity management in their roles as housewives, plant gatherers, home gardeners, herbalists, seed custodians and plant breeders. I'll go through each of these areas briefly.

Woman the housewife

Women, in their roles as housewives performing domestic tasks, sustain an intimate and important relationship with plants. These tasks include, among many others, food preparation, preservation, storage and processing. In fact, the kitchen is quite possibly the most under-valued site of plant biodiversity conservation.

Culinary traditions are a highly important aspect of cultural identity. Foods are consumed not only for their nutritional content, but also for their emotional, ritualistic, spiritual, and medicinal values. Food is, in most cultures, also a fundamental constituent of exchange and hospitality, which are in turn basic organising principles of many traditional societies. While the idea of what constitutes an adequate meal or dish may be influenced by men, women are generally considered as the 'gatekeepers' of food flows in and out of the domestic sphere. Culinary traditions are perpetuated by the careful transmission of knowledge and skills, particularly from mother to daughter. Culinary preferences, as well as the post-harvest processes that are required in order to provide edible and culturally acceptable food, have a marked influence on knowledge, selection, use, and conservation of plant biodiversity. For example, in the Andes, the cradle of the world's potato diversity, Zimmerer's research showed that different species groups correspond to different culinary requirements: freeze-drying, soup-making, and boiling. In maize production, different food dishes also depend on different groups of cultivars (1991). In Tuscany in Italy, Pieroni shows that women use more than 50 wild plant species to make traditional soups. As young Italian women enter the labour force and spend less time in the kitchen, he fears that the knowledge that women hold about these wild plant resources will be completely lost (1999). In urbanised Quintana Roo, Mexico, Greenberg learned that immigrant Mayan women transplant a large number of plant varieties that are native to their homes in the Yucatan into their urban homegardens, mostly in order to maintain their Mayan culinary traditions. In this way, they maintain elements of their ethnic identity as well as conserve and diffuse plant genetic diversity (1996). As culinary traditions

are lost, the reasons that people maintain a large amount of plant biodiversity are also lost.

Which plants are selected, managed, produced, and conserved for food depends on a wide range of criteria related to culinary qualities and beliefs about health and nutrition. But domestic work entails more than cooking: it also entails processing, preserving, and storing plants. Which plants are selected for use is related to processing characteristics, storability, preservation methods, the technology available for these, and to local knowledge, labour, and fuel availability. Food processing and preparation are even more essential in most traditional societies because they make plants edible through detoxification, which requires in-depth knowledge of plant characteristics. The knowledge and skills required in the post-harvest food chain are complex and dynamic, and many studies show that indigenous women's knowledge in food processing and storage often correlates with scientific knowledge. For example, women ferment plants using indigenous techniques that reduce spoilage and increase nutritional value, and they employ precise techniques to store and preserve plants that reduce the incidence of pests and diseases. Historical research carried out on the American Indian women gatherers of the Northwest Pacific Coast of the United States showed also that most plant resources were seasoned and processed by methods which required special techniques as well as storage (Norton, 1985). When harvested and stored in quantity, native plant foods were dependable, all season staples. Plants could only be harvested in a limited season and, without processing and storage, they would have been unavailable during a large part of the year. Food storage and preservation skills

that depend upon ethnobotanical knowledge thus are vital to ensuring household food security and to ensuring that plants are useful to people and therefore subject to management and conservation.

Woman the gatherer

An important conference entitled "Man the Hunter," held in 1966, was attended by anthropologists from across the globe. Up to that date, models of human evolution were based upon the idea that men, and hunting, were the driving forces in human evolution. It was assumed until then that men used tools, hunted the food and provisioned women who remained at the 'home-base' taking care of the children. I might mention that the sciences of human evolution are among the most gender biased of all, and that their theories are still very attached to those of that pre-imminent Victorian thinker, Charles Darwin, but no matter how fascinating that subject, I won't go into it here (see Fedigan, 1986 for a thorough review). Since then it has become widely recognised that, in most foraging societies (those dependent mainly on hunting, fishing, and gathering), both historically and today, the bulk of foodstuffs is provided by gathering which is carried out primarily by women. New models of human evolution have been developed that are based not on "man the hunter" but rather on "woman the gatherer". According to one statistical analysis of 135 different societies around the world with various subsistence bases (e.g., agriculture, animal production, hunting, fishing, and gathering), women provide 79 percent of total vegetal food collected. Estimates from other databases are close to this score (Barry and Schlegel, 1982).

The plants or plant parts gathered by men and women often reflect the division of labour in other spheres. Women gather plants that they are 'responsible' for, such as those needed to make sauces and relishes or those that serve as inputs for their own production such as basket and cloth making. Men and women have different needs and responsibilities for gathered plants, and different knowledge and preferences with respect to them. Flickinger researched gender differences in local knowledge and use of forest plants in Uttar Pradesh, India. In general, women have greater knowledge of the usefulness of plants than men and perceive their usefulness differently. Men's priority uses of plants are for agriculture (fodder and mulch) and women's uses are more related to the household - medicines, tonics, cleansers, fibre, food and tools. Further, much research shows that men often collect plants from 'men's spaces' and women collect from 'women's spaces'. It may be that only men are allowed to enter 'sacred groves' or highland forests, whereas 'women's spaces' are 'disturbed' environments such as field margins, irrigation canals, roadsides, and fallows. But in many societies, contemporary women, like their historic counterparts, also venture far from home to gather plants in relatively 'wild' places such as forests and savannah, and it can be that men are not permitted to gather in 'women's wild spaces'.

The idea that plants growing in natural environments are 'wild' is also often mistaken: many are not strictly either 'gathered' or 'wild' but are selectively managed and harvested. An example of how 'wild plants' are managed by women in their natural environments is provided by Native American basket producers in California. Basket making historically was based on the collection of white root where

250-750 plants were needed to make a single basket (Stevens, 1999). While harvesting, women left the plants and removed the weeds, thereby cultivating the bed and enhancing the habitat for the production of new plants (Dick-Bissonnette, 1997). Women also cultivated the roots with digging sticks, encouraging the growth of long straight rhizomes. Upon harvesting, women left sufficient rhizomes in place to keep the patch viable for future use. This system was sustainable for hundreds of years. Women's ethnobotanical knowledge of 'wild plant management' was essential for the survival of these tribes for at least several centuries. Nowadays, since the available gathering sites have disappeared, modern basket weavers are growing their own materials in home gardens (Stevens, 1999).

Across the globe today, gathering provides a substantial contribution to rural livelihoods, particularly in areas where there is abundant genetic diversity and where populations are resource-poor and food supplies are short seasonally or during crises. However, foraging resources are declining rapidly. Population growth, market expansion, and environmental degradation are increasing the time and labour invested in foraging activities, particularly by women. The reduction of foraged foods in the diet is leading to poorer nutrition and is reducing emergency food supplies, thus increasing reliance on food purchases and decreasing knowledge and use of local plant biodiversity.

Woman the gardener

Homegardens are the oldest and most widely used cultivation systems on the planet. They tend to have greater species

diversity than cultivated fields. Tropical gardens are the most complex agroforestry systems known. For example, in West Java, where some of the world's richest homegardens are located, 240 plant species were found in gardens in just two sub-districts (Soemarwoto, et.al., 1976). Most definitions of homegardens refer to their location near the home, their function as a secondary source of food and income for households, the predominance of family labour, and their multi-functionality as aesthetic, social and recreational spaces, as well as for provisioning of medicines, herbs and spices, fodder, building materials, and fuel. While the gender division of labour in homegardening varies across regions and cultures, the close link between gardens and the domestic sphere everywhere ensures that women tend gardens. It is clearly women who manage homegardens across the developed world as well as in tropical Africa and Latin America, and they make strong contributions to homegardening in Asia, so that, globally, women hold the majority of knowledge, skills and responsibilities in homegardening. Like much of women's work, homegardening is relatively 'invisible' and is often disparaged as 'minor' or 'supplemental' to agricultural production. The fact that the majority of garden produce does not enter into the market, that many of the plants cultivated are traditional varieties known mainly to local people, and that the land areas involved are generally small and near the home, all contribute to the continuing invisibility and devaluation of homegardens, which in turn contributes to the invisibility and devaluation of women's contributions to plant biodiversity conservation.

The importance of homegardens for plant conservation has been under-estimated. For example, when Alexiades investigated medicinal plant use among forest dwellers in the Venezuelan Amazon, he found that most medicinal

plants are collected from fallow land and homegardens rather than from forests, which most researchers assume supply the largest proportion of medicinals. Gardens “..represent a ‘genetic backstop’, preserving species and varieties which are not economical in field production and are planted small-scale..” (Ninez, 1987). In swidden cultivation systems, useful varieties that would be lost due to clearing and burning are transplanted to homegardens where they may thrive (Okigbo, 1985). One of the most important reasons to conserve plants *in situ* rather than in gene banks is to permit their continued evolution, and it is in homegardens where much of this evolution takes place. Many authors have noted that farmers first experiment with new crop varieties in homegardens to determine their productivity before they are planted in fields. The migration of the potato from South America to other parts of the globe occurred through homegardens, and the diffusion of maize began when Incan women settled newly conquered territories and brought maize seed with them to plant in their new homes (Ninez, *Ibid.*). Among the Maya in highland Guatemala, “Women educate children through the chores of the garden. They teach how to use farm tools, what plants need to thrive, and how to manage crops, especially through weeding and harvesting” (Keys, 1999:89).

Homegardens are a vital resource particularly for poor women since they permit them to provide additional food and income for their families. Many studies show that a woman’s garden provides basic nutrition in periods of food scarcity and food supplies year-round. Homegarden food production is not necessarily supplemental and the amount of labour used may be large in certain parts of the year.

Over much of sub-Saharan Africa and Latin America, women are the predominant managers of urban homegardens that provide a substantial source of the total livelihood for low-income households through sales of produce and supplemental food supplies. Ninez showed that this holds even in developed countries such as the United States, where a community garden can produce US\$5000 of output with US\$500 in input. During the Great Depression and World War II, over 40% of all fresh produce in the US came from homegardens and they were even more important in Europe. In former Soviet countries today, homegardens provide a very substantial proportion of total household food supply and studies show that these are managed predominantly by women.

Woman the herbalist

The World Health Organisation estimates that 80% of the world's population use plant medicines for their primary health care needs (Farnsworth et al., 1985). Between 25 and 40% of all modern pharmaceuticals are derived from plants. Research on folk medicine and medicinal plants is booming, but this has tended to focus on the knowledge of folk medicinal specialists: shamans, midwives and herbalists (McClain, 1989). Shamans and 'medicine men' usually have great power and status and the majority of these specialists are male. However, female priestesses are prevalent particularly in Africa and Asia. Herbalists, on the other hand, are specialists in treating illnesses through the use of plants and are frequently women; midwives are also herbal specialists and are usually women, although men can also be midwives. Women's ethnobotanical knowledge and

medicinal roles are often unexplored by ethnobotanists who tend to make a beeline for the 'shaman' or 'medicine man'.

The focus of ethnobotanists on healers and medical specialists as 'key' informants also means that they have often ignored lay persons. Awareness is growing that the 'common' knowledge of lay women is actually that which predominates in traditional health care systems. Most illnesses are not life threatening and expert medical advice is only sought when home remedies do not work. (McClain, 1989:21; Good, 1987). The medical role and knowledge of women is essential to the health of households members and, in several societies, lay women have a greater role in the knowledge and use of medicinal plant resources than their male partners, as is demonstrated by many studies. Several researchers interpret the healing activities of women as an extension of child-care duties and their responsibility for family health and caring for the ill. Knowledge of herbal remedies is often passed along the female line as daughters take care of ill siblings. Lay women experiment with medicinal plants, and those that do not serve are quickly discarded. Ensuring local women's continued access to and control over these plants is crucial both for rural health care and for genetic conservation.

Men and women not only have different knowledge of medicinal plants: their knowledge is also structured in a different way, which is related not only to the division of labour, but as well to social power. Ethnobotanical research has often introduced a double bias: on the one hand it, has relied on a limited sample of predominantly male informants and, on the other, it has structurally neglected female healers and the realm of domestic curing and herbalism.

Woman the plant breeder and seed custodian

There would be no agriculture without seed and not nearly as much seed variability without seed custodians and plant breeders. Increasingly, these are large multinational corporations and international institutions that manage gene banks, and increasingly the world's agriculture is dependent upon them and on the purchase of seed. Traditionally, plant breeders and seed custodians are small farmers, and often if not predominantly women. Women in sub-Saharan Africa as well as in indigenous societies in Latin America and the Pacific are usually directly responsible for crop production. As crop producers, they consider all of those selection factors that are critical to farmers who produce in marginal environments and manage many varieties for many purposes. For example, in Rwanda, women produce more than 600 varieties of beans (Sperling and Berkowitz, 1994), while in Peru, in one small village, Aguaruna women plant more than 60 varieties of manioc (Boster, 1984). While both men and women are involved in crop selection and have highly specific knowledge and use a variety of criteria, these differ substantially between them, and women's criteria and knowledge are more often overlooked by formal plant breeders and conservationists. Women often have a broader set of varietal selection criteria in comparison with men since they use plant materials in more diverse ways: for example, rice not only provides food, but also straw for thatching, mat-making and fodder, husks for fuel, and leaves for relishes. Women's responsibilities for post-harvest processing and family food supplies means that women try to ensure that varieties are in line with culinary traditions, are palatable and nutritious, and meet processing and storage requirements. Several studies show that, even when

women do not produce crops, men take their wife's preferences and criteria into account when selecting varieties, but researchers mostly neglect this since they are not directly related to yield and pest and disease resistance.

Very frequently, women are responsible for tasks related to seed management including seed selection, storage, preservation and exchange. Informal seed exchange systems are often female domains, and include mechanisms such as the bride price, gift giving, and kinship obligations, as well as market and barter transactions. Women's predominance in seed management activities is often explained by the close relation that this has with post-harvest and domestic work. Others suggest a more cosmological explanation that may be found to hold across many traditional societies. In the Peruvian Andes, Zimmerer relates that women almost exclusively manage potato and maize seed. Men are forbidden to handle seed or enter seed storage areas (1991). The explanation for women's control of seed is to be found in Andean cosmology. In Quechua, plants that are useful to humans are all worshipped under the name of mother: Mama sara (maize), Mama acxo (potato), Mama oca (Mama cocoa). Andean thinking contains a dual concept of reality based on masculine and feminine principles. "Seed" also refers to semen, providing a metaphor between the "seed" that the male deposits in the womb and that which is sown in the field, collected, and later deposited in the home (Tapia and de la Torre, 1993). Throughout human history and across most societies, women and fertility, and seed and fertility, are equated.

After providing this review of women's roles in plant biodiversity management and conservation, I'd like to turn

my attention once again to the questions posed at the beginning of my talk in relation to biodiversity conservation, human welfare, and scientific bias.

Women and rights to plant genetic resources

You are all aware of the debates and discussions going on about intellectual property rights to plants and the conservation of plant biodiversity. Most now acknowledge that indigenous farmers and forest dwellers should have rights to the genetic material they have developed and be compensated for its use. However, what these international systems of rights and discussions have largely failed to acknowledge is that there are pre-existing (indigenous) systems of rights to these resources that socially regulate access to and control over their knowledge, exploitation, exchange, and use. These indigenous systems serve to manage and conserve plant biodiversity. Native peoples have their own concepts of intellectual property at individual or group level based on residence, kinship, gender, or ethnicity. Leading experts in this field acknowledge that little is known about these 'indigenous' rights regimes and that research in this area should be a priority.

Several studies show that, among indigenous populations, rights to gather plants are strictly regulated and are passed from mother to daughter. For example, gathered acorns were the most important dietary staple among California Indians, and "Oak trees and seed plots were owned by women and inherited matrilineally..." (Dick-Bissonnette, 1997:235). Married daughters gathered seeds from their mothers' seed localities but not from their mother-in-laws'

localities. Rights were established through continuous use and by marking out gathering locations. These rights were taken very seriously - if another woman tried to take resources ahead of a claimant, a fight would ensue that sometimes led to a family feud. Across the globe, among the Igbos in Nigeria, an indigenous vegetable, *Telfairia occidentalis* (fluted pumpkin), is grown in women's homegardens, and is considered to be a 'women's crop'. Women cannot cut *Telfairia* plants belonging to others - to do so desecrates the other's field and, to atone, the earth goddess must be appeased. This means that, to have access to *Telfaria*, each adult female must plant her own field (Akoroda, 1990). Dr. Price's work on women's traditional gathering rights in Thailand stands as perhaps the most in-depth research to date on this topic (Price, 1997).

If indigenous rights (and women's rights) to plants are not recognised, they can be readily usurped. Debates about rights to plant biodiversity and their outcomes cannot be considered as gender neutral since, while women constitute the majority of those gardeners, gatherers, herbalists, and plant breeders who have developed agrobiodiversity and identified useful plants, due to gender bias they are likely to be the last to have their rights recognised and therefore to benefit from related development or compensation schemes. Assuming that the rights or compensation given to 'indigenous groups' or 'farmers' will reach women is incorrect. Mechanisms of compensation that earnestly seek to benefit the provider of these resources and stimulate their continued conservation must carefully consider means by which the rights of women in particular can be respected.

Gender bias in ethnobotany and related sciences

A significant methodological shortcoming of ethnobotanical research is that it often takes the plant knowledge of a few people to be representative of the knowledge of entire cultures. Most ethnobotanists (even women), tend to be blind to gender differences, even though the knowledge and use of plant biodiversity is everywhere gender-differentiated. There are three associated errors. The first is related to the failure to research women's knowledge and use of plants, which becomes an error of *omission*. Ethnobotanists simply assume that males (particularly senior males) are adequate representatives of the collective ethnobotanical knowledge of their communities or that these males have superior ethnobotanical knowledge. The knowledge that women specifically hold is simply bypassed. Where women have more knowledge of plants than men do, not interviewing them means that these species and varieties will be omitted and therefore biological diversity will be under-estimated. The second error is one of *unreliability*. It is related to using sources that are not well informed, leading to the improper identification of plants, their management, characteristics, uses, or names. Numerous studies have shown that women are often more able to correctly identify these parameters in comparison with men, particularly with regard to plants that fall more directly into their domains. For example, most ethnobotanical publications on women's health issues have been written by foreign men who have interviewed native men who in turn report on behalf of native women. The third type of error is also very significant: an error of *interpretation* leading to a misunderstanding of people-plant relationships, since a critical component of these

relationships is not revealed. I will give examples of this a little later on. It is often difficult to determine whether the first two errors have been committed. Research is presented in such a way that it is impossible to know whether women have been included since references are to gender-neutral descriptors such as 'farmers', 'dwellers', 'experts', tribal names, etc.. In the majority of cases where it is made explicit that women were included in the research, the data are nevertheless not presented in a sex-disaggregated fashion, which limits our ability to interpret such data with respect to gender differences.

Zimmerer carried out what is probably the most comprehensive research to date on Andean native cultivars and production systems, which was at the same time gender-sensitive. The vast majority of previous work on Andean agriculture is gender-blind. Zimmerer studied the significance of gender differences in ethnobotanical knowledge with regard to potato cultivars and reasons for these differences. He showed that male farmers are less accurate than women are when naming species, apply fewer names, and incorrectly name uncommon taxa. Men know less about culinary properties that are key to conceptually distinguishing cultivars. Increasingly men are outmigrating to take on wage labour, and the gap between men's and women's knowledge has increased.

Gender, biodiversity loss and conservation

If women are predominant managers of plant biodiversity, then research should consider the ways in which they specifically may be affected by genetic erosion, such as the diffusion of modern varieties and increasing commoditisation

of plant resources, decreasing access to common land, and changing consumption patterns. Gender relations are also changing and, with them, women's incentives and management practices are changing, which in turn affects biodiversity management.

For example, decreasing access to land is one major reason for the erosion of genetic resources managed by women. When land becomes privatised, women may lose access to forests and fields where they gather wild plants; when men turn to cash cropping, women may lose access to gardens or fallow fields where they manage traditional varieties. A large number of case studies shows that, in sub-Saharan Africa, as cash crops and particularly export crops are introduced, men began to usurp some of women's usufruct land to cultivate the new crops. Women have often been compelled to relinquish land where they produced traditional varieties and to contribute their own labour to men's crop production (Wooten, 1997, Shroeder, 1997, Astone, 1996).

There have been attempts to develop conceptual frameworks to assess why farmers conserve plant biodiversity on farms, but these have neglected to consider gender and other intra-household relations. The neglect of the division of labour and the total demand for labour represents a serious omission. Stephen Brush et.al. (1992), probably the world's leading authorities on agrobiodiversity conservation, thought that male outmigration in the Andes might provide additional income that could be used to preserve traditional crops, but they also thought it could lead to genetic erosion since the farmers' knowledge would not be available to maintain these cultivars. They tested this hypothesis and found a negative correlation between on-

farm diversity and off-farm occupations, which they thought was due to the fact that farmers earned more by working off-farm than by maintaining their native cultivars. But Zimmerer found in one of the same communities that Brush studied, that cultivar loss was not due to the absence of the male farmer who has the principle expertise. Male outmigration doesn't decrease the expertise available since women hold most of this expertise in the first place. Rather, the 'feminisation of agriculture' is occurring due to temporary male outmigration. Women-headed farm households don't have enough labour available to maintain all of the diverse cultivars.

In another article, Brush (1995) laid out four factors that lead to farmers' conservation of traditional varieties: 1) land holding fragmentation means that farmers manage several fields and cultivate folk varieties in at least one or more of these fields; 2) marginal agronomic conditions mean that folk varieties perform better than improved varieties; 3) local varieties may sell better in local markets especially when farmers don't have access to distant markets; and 4) farmers have preferences for maintaining traditional varieties. How could a gender perspective improve this framework? With regard to the first point, different fields are often managed by different household members who have different responsibilities for providing plant resources, different access to technology, labour, credit, knowledge, and markets. The pressures on plant resources in one field may therefore be quite different from those on another field, and for different reasons. With respect to point 2, it has often been shown that the land to which women have access is more marginal in agronomic terms than that to which men have access and that women will often produce

varieties that men don't produce due to lower land quality. Women are the 'marginal farmers' *par excellence*. With respect to point 3, men and women often have access to different markets, where women mainly are able to access local markets where the demand for local varieties is often greater, and men have access to distant markets where the demand for modern varieties is greater. Finally, with regard to point 4, it is clear that women are principal guardians of culinary and medicinal values and that their varietal preferences are often more diverse than men's.

The Convention on Biological Diversity has as its third objective to ensure the "fair and equitable sharing of the benefits" from the use of biological diversity. This cannot be addressed at all without considering the importance of women and gender relations in biodiversity management at the local level, and the presence of gender inequalities and gender bias in local, regional, national, and international systems that develop norms and regulations around biodiversity conservation. There is nearly a total failure to acknowledge the importance of women or gender relations in the literature and in policy documents dealing with biodiversity conservation. It is therefore very likely that, at local and national levels where these things matter most, women's contributions and their welfare, needs and rights will also be overlooked. This means that the costs and benefits of biodiversity depletion and conservation will not be accurately understood or estimated. If women's values and uses in particular are overlooked, then the costs to women of genetic erosion and the benefits that they derive from conservation will also be poorly estimated. Drawing from historical experience, the costs and benefits to women are overlooked because their activities are often unpaid, linked to the domestic sphere, and 'invisible' to economists,

planners, and scientists. Gender-sensitive approaches to the estimation of the costs and benefits of biodiversity conservation and to the assessment of their distribution and their impacts on human welfare are not an ill-affordable luxury – they are instead *sine qua non*.

Until that time when science and research related to plant biodiversity conservation attributes enough importance both to women and to gender relations in local plant resource management, the theoretical frameworks that inform them, the methods employed, and the resulting empirical data will be insufficiently robust to permit answers to be found for the most basic questions posed. It is once again time to give Flora her due and to bring women back into their rightful place in the science of botany and into the attempt to conserve the world's biodiversity which, after all, is mainly Flora's heritage.

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