You Grow Girl: Women as Protectors of Global Plant Biodiversity

Jessie Dolliver

As conservation biologists declare that we are in the midst of a mass extinction, national and international efforts to preserve genetic diversity have accelerated. Biodiversity is crucial for ongoing food security, sustainable agricultural development, and the prevention of food poverty. Research has been conducted to discover the key players in conservation, with the results consistently showing that women bear the load of biodiversity management worldwide. This is not the result of a deeper intrinsic connection to nature, but rather the result of culturally and socially determined roles of care. Gendered knowledge of the environment has been recorded all over the world, and should be recognized if we are to realistically face the catastrophe of mass extinction.

The loss of biodiversity has accelerated dramatically in the 20th and 21st centuries (Abdelali-Martini *et al.*, 2008), with some conservation biologists going as far as to hypothesize that we are in the midst of the sixth mass extinction in the history of the planet earth (Kolbert, 2014). This loss has been noticeable particularly in recent decades. Subsequently, national and international efforts have been made towards the preservation of genetic diversity. Biodiversity is important for sustaining ecosystem functioning, and is crucial for ongoing food security, sustainable agricultural development, and the prevention of food poverty worldwide (Abdelali-Martini *et al.*, 2008; Karl, 2009). Should one main crop die out, there must be other food sources to turn to in nature – the Irish potato famine was primarily due to the lack of diversity in the potato population. Biodiversity is essentially the totality of genetic resources in the world- and is the very foundation of all

life on earth (Karl, 2009). In order to design and implement programmes for biodiversity conservation at a local level, much research has been conducted to determine the key existing players in conservation efforts. This mass body of research has shown consistently that it is women who, through culturally and socially determined roles, bear the load of biodiversity management worldwide, particularly plant biodiversity (Zobolo and Mkabela, 2006). This phenomenon of gendered knowledge of the environment has been recorded globally: amongst potato farmers in Ntcheu and Dedza, Malawi (Mudege *et al.*, 2015); in the tiger reserves of Periyar, India (Pillai and Suchintha, 2006); amongst Swedish forest owners (Umaerus, Högvall Nordin and Lidestav, 2017); in Brazilian agriculture (Mello and Schmink, 2016; Waltz, 2016); with the Adi women of Arunachal Pradesh in the Eastern Himalayas (Singh, Rallen and Padung, 2013); amongst the specialist cucurbit cultivators of the Ivory Coast (Zoro Bi *et al.*, 2005); anywhere in the world where men and women live and farm.

Why is it that women have this role of conservationists? It certainly is not due to increased access to, or possession of land - nor is it the result of women having any social authority or power in decision-making processes (Tsegaye, 1997). Rather is the traditional roles that women have been conditioned to adopt which force women to become environmental protectors (Tsegaye, 1997; Ramprasad, 1999; Howard, 2003; Abdelali-Martini *et al.*, 2008). Women's traditional roles of collecting water, gathering firewood, managing agriculture, foraging, and treating illness with botanically-derived medicines exposes them to natural resource depletion and the erosion of biodiversity, and compels them to act against it (Voeks, 2007; Karl, 2009; Fungo *et al.*, 2016). It is important to bear in mind, when discussing the role of women and their environmental protection, that no one gender is intrinsically a better steward of the environment (Doss *et al.*, 2017). Through their role in society as carers however, women have cultivated a deep and valuable knowledge of the value of diversity of plants – the different species which may be used for nutrition, health, or income. Traditional and landrace varieties of cash crops, herbs, and spices, are grown in their home gardens, and the exchange and saving of seeds is practised (Karl, 2009).

Let us take an example of how women's gendered agricultural roles impact biodiversity. In India, as in many other Asian countries, it is the role of the women to clean and select seeds to plant for the next growing season (Ramprasad, 1999). This is a continuous activity, beginning the moment a crop flowers. In the fields the women judge and decide which healthy plants to choose seeds from for next year. In Southern India, women also

conduct a set of rituals and sacred rites prior to seed storage, on behalf of the family. During the ritual, the seeds are protected from pests using certain leaves with insecticidal properties, such as Lakkli leaves (*Vitex negundo)* or Neem leaves. Seeds may be preserved by mixing with the seeds of field bean (*Dolichus lablab)* and mustard. Ceremonial germination tests, *Negilu Poofe,* are conducted whereby varieties are planted and worshipped, and inspected after 7 days. If the shoots are too small, or too few, they are considered unsuitable, and the woman of the household will exchange or borrow seeds to replace them - an example of selective breeding in real time (Ramprasad, 1999).

The acknowledgement in the literature of women as conservers of biodiversity is relatively new. Previously, in the seventies and eighties, development "experts" considered women collecting firewood for cooking to be one of the main causes of deforestation and the ecological crisis at hand – more so than commercial logging or mass construction (Rocheleau, 1995; Karl, 2009). The ecological crisis was also attributed to women, who foolishly had "too many children," and were thus responsible for overpopulation and environmental disaster (*Ibid*). Worryingly, this rhetoric has been echoed in recent publications, where the activities of women in African and Asian regions must be "carefully observed or studied," lest they lose control and destroy the planet entirely (Edet, Oladelef and Popo-ola, 2013).

Multiple studies have been conducted to review the extent and the robustness of the knowledge of women in agricultural societies (Tsegaye, 1997; Cabrera, Martelo and Garcıa, 2001; Abdelali-Martini *et al.*, 2008; Karl, 2009). One study conducted by Cabrera, Martelo, and Garcia (2001) in Mexico compared women's knowledge about maize varieties to scientific analyses in the lab to determine the accuracy of the women's collective wisdom. The women's empirical knowledge was shown to be equivalent to the laboratory results. The corn varieties preferred by women were the most resistant to local weather, were the most nutritious, and had the highest tortilla yields due to their high water absorbance. The women studied also accounted for 77% of the workforce during harvest, and 80% in the process of seed selection. Furthermore, they forage and keep small intercropped and diverse plots to cultivate plants for medicine and animal fodder, using a saying "qué lindo es tener de todo" ("how wonderful it is to have a little bit of everything"). Another major study of West Asia and the "Fertile Crescent" (Jordan, the Palestinian Authority, and Syria) corroborated these findings (Abdelali-Martini *et al.*, 2008). This area is the centre of origin of many major food and pasture crops such as wheat, barley, lentil, pea, olives

and figs, along with medicinal crops domesticated over the last 10,000 years. Despite the political conflict of the area, which prevents farmers from accessing land, women have conserved much of the local natural wealth.

In Tayssir, in the Palestinian Authority, women produce foodstuffs from both cultivated and wild species of fruits and vegetables, and are involved in seed selection and cleaning of landrace (relatively unaltered, heritage) cultivars (Abdelali-Martini *et al.*, 2008). Women maintain these landraces because they fit traditional local dishes. This is also a driver for biodiversity conservation in Ethiopia (Tsegaye, 1997). Ethiopian women describe the landraces as having a better taste and being more adaptable in preparing variable dishes. Women farmers, who are solely responsible for cooking in Ethiopia, also claim that landraces are more nutritional. It is likely the case that all these characteristics are attributable to landraces, as diverse as they are. Landraces and wild species are the products of long term dynamic interaction with the environment and are thus adapted to a variety of conditions - as opposed to uniformly growing to the largest possible form (as many crops have been selected to do now). Ethiopian women farmers safeguard food security at the household level by storing seeds for planting in underground pits, traditional silos (locally called 'gotera' and 'gota'), or small air-tight containers (Tsega, 1994). Women also introduce new biodiversity to their locality through social networks, introducing materials and knowledge from neighbours, friends, relatives, the wild, and from markets. They also mix seeds from different sources – the Sidama women in southern Ethiopia intentionally mix seeds of *Brassica* species to induce hybridization and subsequent genetic recombination (Tsegaye, 1997). This creates very complex diversity which may produce a vigorous recombinant crop. These women farmers then share lessons learned from these "unofficial" experiments at informal gatherings such as the coffee ceremony, religious festivals, trips to and from the market, and when fetching water or fire wood (*Ibid*).

Women's knowledge surrounding biodiversity is often overlooked or ignored, as it is considered "duty" and not valued as productive work in measures like the GDP or GNP (Waltz, 2016). It is seen as ontologically inferior to modern science (Escobar, 1998). In this sense, modern reductionistic science, and the development industry, can be realised as patriarchal projects, which may exclude ecology and knowledge systems other than those of the West (Pillai and Suchintha, 2006). Globalization and neoliberalism have confounded and contributed to this issue in recent decades – the functional principles of neoliberalism (efficiency, competition and orientation toward profit) being diametrically opposed to the care and

sustainability necessary for biodiversity conservation (Hawthorne, 2001; Wichterich, 2009). The spread of extractive capitalistic agriculture, under neoliberal governmental policies, and facilitated by globalization, has reinforced existing trends of genetic erosion, and has replaced women-led plant breeding and seed keeping (Karl, 2009). There are few protections against this genetic erosion and gendered erasure of knowledge. The international treaty of the Convention on Biological Diversity (CBD) recognizes:

> *[T]he vital role that women play in the conservation and sustainable use of biological diversity and affirms the need for the full participation of women at all levels of policy-making and implementation for biodiversity conservation.*

In reality, however, there are few conservation strategies under this convention that take into account women's central role in agrobiodiversity, and women's existing "unofficial" management regimes are overlooked entirely (Momsen, 2007; Müller, 2010). The gender-blindness intrinsic to such strategies inevitably results in gender bias, and leads to policies which, at best, do nothing to improve the situation, and at worst are likely to harm women (Padmanabhan, 2011).

Seed governance regimes must acknowledge the intellectual resources that women have in the form of practised and realised traditional ecological knowledge (TEK). Gender-blind regimes for any type of conservation project at international or national levels are fundamentally flawed in conception, and will suffer from this oversight (Galiè *et al.*, 2017). Currently, many governmental conservation and sustainable development initiatives do not effectively involve women in gender-equitable strategies (Deda and Rubian, 2004; Singh, Rallen and Padung, 2013). Some may even exacerbate pre-existing inequalities and negative power structures, by excluding women from access to, and control over, land and ecosystems (Rocheleau and Edmunds, 1997; Costa, Casanova and Lee, 2017). Other women's programs designed by developmental agencies have focused on educating, training, and improving the status of women in relation to men, without accepting the value of women's knowledge (Karl, 2009). In "developing" countries this lack of valuation is rooted in ontological hierarchy and may be symptomatic of persistent colonial attitudes. Recognition and reinforcement of indigenous women's knowledge by supporting the practise and transfer of it is crucial for adequate biodiversity conservation (Howard, 2003; Zobolo and Mkabela, 2006; Padmanabhan, 2011; Singh, Rallen and Padung, 2013).

We are now living in an age wherein the human population has reached a size that is extremely difficult to provide for. Agriculture currently uses approximately 36% of globally available ice-free land, and there is little room for sustainable expansion, despite growing food demands (Goldstein *et al.*, 2016). Therefore, the functional agricultural land and systems which we do control must be managed wisely and sustainably. Sustainable agriculture is defined as agriculture which includes environmental conservation in order to provide for future generations (Padmanabhan, 2011). Gender-based conflicts, biodiversity, environmental pollution, depletion of natural resources, and declining yields are all barriers to sustainable development. Thus it is critical to analyse the contribution of women farmers to sustainable development.

During the Green Revolution, technological solutions and fixes were introduced and dispersed globally in order to solve world hunger once and for all, by increasing production and yield of a select few staple crops (Wichterich, 2009). This increase in yield came at a price however, as energy intensive technologies and farming techniques innovated in the Green Revolution necessitated large inputs of water and fertilizer, resulted in soil erosion, and ultimately compromised many traditional institutions and traditions designed to maintain biodiversity (Shand, 1997). The technologies of the Green Revolution set off a very dangerous feedback cycle. Conventional breeding to develop F1 hybrids of several plants such as maize and semi-dwarf, disease-resistant varieties of wheat and rice were implemented and spread (Godfray *et al.*, 2010). These varieties succeeded and were profitable, as they could be provided with more irrigation and fertilizer, as mentioned above, but without the risk of major crop losses due to disease or breakage (lodging). This however, resulted in great uniformity in crops, and little diversity. Not only was this dangerous for crop stability (as one bad disease could wipe out the entire food source), it also opened up many developing countries to exploitative business relationships. Uniformity in crops equates to uniformity and consistency of a product, which is a necessity for large scale industry. Multinational corporations benefited from these new market suppliers which had sprung up in developing countries, and offered initially attractive contracts to many farmers who became subsequently locked into exploitative deals and monocrop farms (Cotula et. al 2009). This commoditization of agriculture worldwide has resulted in the reduction of many wild species (as a result of habitat destruction and competition), and of many domesticated landraces (Padmanabhan, 2011).

Once species which have been formed over thousands of years through varying environmental pressures and the unending process of natural selection have been destroyed, they cannot be restored. Each time the genetic pool of agriculturally viable species is reduced, the basis for further breeding activities and experimentation is undermined. Human populations are left more vulnerable to hunger and disease. It is therefore of great importance to formulate strategies for conserving genetic resources which include the input and advice of the women in any given area (Swaminathan, 1998; Swanson and Goeschl, 1999). Considering that traditional knowledge in many countries is organised along gendered lines, it is likely that a gender-sensitive methodology is required to build conservation efforts on existing specialised knowledge systems.

The changing climate of the twenty-first century must also be taken into account here, as inequalities in society are likely to be exacerbated under a changing climate, and gender imbalances are prevalent in agrobiodiversity management (Bhattarai, Beilin and Ford, 2015). Nepal demonstrates well the interface of gender and climate adaptation. The Himalayan region in Nepal is currently being heavily affected by climate change, as temperatures rise and snow melt is speeded up (Stocker et al., 2013). Glacial and snow melt is one of the main water sources in the Himalayas, but if it melts too quickly many communities will be left without a reliable water source in the decades to come. Gender inequality is also historically entrenched in Nepal (Bennett, 2008), and as a result there are many socio-economic and agrobiodiversity management systems rapidly responding to climate change across the countryside. In these responses, socio-economic inequalities are revealed, as women are increasingly taking on more responsibility for agrobiodiversity management, by abandoning certain crops; adopting high-yielding and cash crops instead (Bhattarai, Beilin and Ford, 2015). In this case, climate change has accelerated genetic erosion. Despite normally being denied control over land, women bear the responsibility of responding to local challenges arising when adapting to climate variability. This includes agrobiodiversity management. Across the entire study of climate and gender roles in agrobiodiversity, some gender relations were changed, and in some cases existing gender relations were reinforced (*Ibid*). As women must interact with natural resources regularly to fulfil domestic roles, the effect of climate on these resources is often noticed by women first (Alvarez and Lovera, 2016). If the resources they utilize on a daily basis are depleted, the burden on women will of course increase - for example, rising heat demands a longer distance to walk to find water (Yadav and Lal, 2018), thereby reducing access to education putting women in danger while on the journey.

At a national level however, there appears to be very little appreciation of gender-differentiated adaptation practices. A neoliberal approach is continually adopted for adaptation, with a productivist paradigm highlighting technology and commercial production (Bhattarai, Beilin and Ford, 2015). This will not solve the issue of disappearing biodiversity, nor will it fundamentally change gender-based power structures in rural Nepal. The knowledge of women, hard-won through their experiments and historical experience with plants, must be integrated into adaptation strategies in order to protect biodiversity in the future. Rosalind Franklin, the woman who contributed to the discovery of the structure of DNA once said: "You look at science as some sort of demoralising invention of man, something apart from real life, and which must be cautiously guarded and kept separate from everyday existence. But science and everyday life cannot and should not be separated." (Maddox, 2002). This is true also for the scientific community and women farmers around the globe – both have specific and valuable knowledge systems which must be shared and implemented if we are to ensure food security and biodiversity going in to the future.

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