

UN Women

Expert Group Meeting

‘Achieving gender equality and the empowerment of all women and girls in the context of climate change, environmental and disaster risk reduction policies and programmes’

11 – 14 October 2021

Sustainable food systems and gender equality in the context of climate change and biodiversity conservation

Expert paper prepared by:

Marta G. Rivera Ferre*

Spanish National Research Council at INGENIO (CSIC-Universitat Politècnica de València)

*The views expressed in this paper are those of the authors and do not necessarily represent those of the International Union for Conservation of Nature or the United Nations.

Sustainable food systems and gender equality in the context of climate change and biodiversity conservation

Marta G. Rivera Ferre.

Spanish National Research Council at INGENIO (CSIC-Universitat Politècnica de València)

Relation of food systems with biodiversity and climate change.

Food systems encompass all the activities and actors in the production, transport, manufacturing, retailing, consumption, and waste of food, and their impacts on nutrition, health and well-being, and the environment (Mbow et al. 2019). Food systems allow to manage natural resources to feed people and they play a central role in sustaining human life everywhere, not only to feed the population and fulfil the human right to food, but also as a form of livelihood to billions of people worldwide. Thus, depending on how we manage food systems, many different associated impacts can occur both in the ecosystems and the people.

A food systems approach allows analysing the social and ecological components of the system, and what it is more important, the interactions among them, which have often been neglected in previous decades. This system's perspective has now made evident the strong impacts that food systems have both on the people and the environment. FAO has highlighted the direct or indirect relation of food systems with all the SDGs, while the impact of food systems on the planetary boundaries is also striking and has been quantified (Campbell et al. 2017). Existing knowledge shows that food systems are not sustainable, being the main human system leading to people and ecosystems towards situations of extreme vulnerability, putting at risk the very sustenance of life. In this context, there is consensus that a major transformation of food systems is needed in order to ensure a decent life for all in the planet (Willett et al. 2019, UNFSS, 2021).

Regarding the relation of food systems with biodiversity and climate change, we need to understand first that, in both cases, there is a double-side relationship. On one hand, food systems impact biodiversity and contribute to climate change; and on the other hand, food systems rely on biodiversity (and well-functioning of ecosystems) and are extremely vulnerable to the impacts of climate change. Thus food systems, climate change and biodiversity are all extremely interlinked, as the IPCC Special Report on Climate Change and Land (SRCCL) clearly showed (Figure 1; Mbow et al. 2019). Regarding biodiversity, food system play a role through the inappropriate and intensive management practices associated to industrial agriculture, such as overexploitation of natural resources (soil, water), excessive use of external inputs, or the instauration of just a few crop varieties and animal species (FAO, 2019). Globally, food systems rely on 200 out of 6000 cultivable species, 66% comes from only nine species and 50% of four (rice, potatoes, corn, wheat). Same trend is observed in animal production, based only on 40 species globally of which only a few provide most of the meat, milk and eggs we consume (FAO, 2019), and for meat, only 3 species provide more than 90% of it (poultry, pig and beef). Yet, the food system is extremely vulnerable to biodiversity loss, affecting to the very capacity to produce food. When diversity decreases, also the resilience and adaptive capacity of the system is reduced. Biodiversity losses also reduce the ecosystem services provided by biodiversity, including regulation or internal productive cycles, as it is observed in the case of the reduction in pollinators' population (IPBES, 2019). Globally, 35% of vegetable crops depend on pollination (Klein et al. 2007). The real consequences of biodiversity loss on food systems is still unclear and the proposal is to reduce it to zero (Willett et al. 2019).

Regarding climate change, we know that the production and consumption of food contributes between 21-37% of all greenhouse gas emissions (Mbow et al. 2019). But food systems are also

extremely vulnerable to climate change, and this implies that our food security is in danger. All food security dimensions (availability, access, use and stability) are impacted by climate change. Changing trends in temperature and precipitation, as well as extreme events, have reduced global yields by 5%. Droughts and flooding in particular regions, affecting major commodity crops can lead to sharp increases in the price of those crops, or to transport interruptions. Changes in atmospheric CO₂ also lead to changes in the protein and micronutrient compositions of crops, reducing their quality. Water stress and associated lower water quality also reduce food use as it does the increasing persistence of micotoxins associated to warming (Mbow et al. 2019).

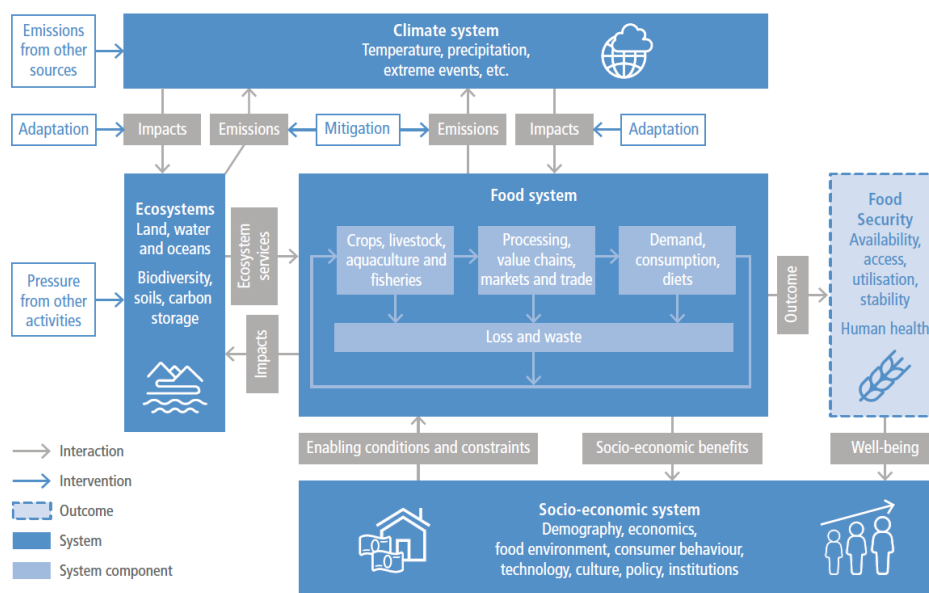


Figure 1. Conceptual framework of the food system and its relations with climate, ecosystem and socio-economic systems (Source: Mbow et al. 2019).

In sum, there is a global agreement that we need to transform our food system to build sustainable food systems. SAPEA (2019) stated that a sustainable food system¹ “provides and promotes safe, nutritious and healthy food of low environmental impact for all current and future citizens in a manner that itself also protects and restores the natural environment and its ecosystem services, is robust and resilient, economically dynamic, just and fair, and socially acceptable and inclusive. It does so without compromising the availability of nutritious and healthy food for people living outside the boundaries of the system (community, country, region), nor impairing their natural environment”. Despite such a transformation may look like an impossible task, we must not forget that this would not be the first fast and deep transformation of food systems. In the last decades, both the Green Revolution and the globalization of food lead to major transformations in only a few decades. Thus, the transformation is possible. Luckily, a lot of the knowledge required to re-build our “broken food system”, mostly indigenous and local and traditional knowledge (ILTK), still exist. A vast body of this knowledge is on women’s hands, bodies and brains, which gives them a central role in the re-building process. Yet, to fully unfold this potential, it is necessary to address the major impacts that both climate change and food systems have on women and address the structural discriminations suffered in patriarchal societies, all of them factors disabling a real transformation.

¹ The definition provided in the document was for the EU, and I have broadened here to any region of the world.

Women, food systems, biodiversity and climate change

The linkages among food systems, biodiversity and climate change have strong interactions with gender and thus, to address food insecurity, biodiversity depletion and climate change adaptation and mitigation, we need to understand these relations. Women play a central role in food systems worldwide, both in their role as peasants and guardians of seeds and knowledge, and in their role as carers (Rivera-Ferre and Álvarez 2017). Despite there is no consensus in quantifying how much food is produced by women globally (Doss et al. 2018), and current indicators consider only what is measurable and visible, that is, agriculture that is focused to the market² leaving aside what happens within the household and subsistence agriculture, we can state that *women feed the world*. In their role as peasant producers of food, (women often grow most of the crops and small animals for domestic consumption) but also because they are the ones who hold the knowledge for storing, conserving, processing and preparing food; gathering non-timber forest products, medicinal plants and other natural resources and fuelwood; managing domestic water supply; and providing most of the labour for post-harvest activities. All these roles have been assigned to them through the sexual division of labour of patriarchal societies. Particularly relevant is women's knowledge about seeds, so that in some places they are called *the guardians of seeds*, with this role directly linked to (agro)biodiversity conservation. However, the expansion of industrial and market-focused agriculture producing large-scale monocultures has displaced women work making it invisible, since most of this work is linked to reproductive activities within the household, that is, the so-called domestic sphere, and reserved to the food security in the household and the community. Despite their central role, women are often the ones who suffer most the crises associated to the food system. Data show that during the COVID pandemics the number of hungry people increased, but women and girls were disproportionate impacted partly due to gender inequality and discrimination (SOFI 2021).

Women and other subordinated groups play a key role in biodiversity conservation as they need to ensure the long-term availability of resources they use for them and their families' subsistence, as well as other associated cultural and spiritual values (Álvarez and Lovera 2016). The preamble of the CBD "*recognises the vital role of women in the conservation and sustainable use of biological diversity and affirming the need for the full participation of women at all levels of policy-making and implementation for biological diversity conservation*". Indigenous peoples and local communities worldwide have demonstrated that their conservation practices are at least as effective or even more effective than top-down biodiversity conservation approaches, and here men and women hold different types of knowledge, all needed. Indigenous Peoples and Local Community Conserved Areas and Territories and other forms of rights-based, socially just community conservation also contribute significantly to climate change mitigation and resilience (Álvarez and Lovera 2017).

Climate change is also gendered so men, women and other genders experience impacts differently and have different adaptation capacities because their contextual vulnerability is different. Where men are expected to be brave and engage in life-saving actions, this can increase their likelihood of mortality; in other contexts social norms exclude women from learning to swim, climbing trees, or expect them to stay in the house even during floods (Nelleman et al. 2011; Rivera-Ferre 2021). Migration of young men to cities, partly related to climate change, has led to the feminisation of agriculture in many parts of the world, and while both men and women experience increases in productive roles, most often it is only women experiencing increased reproductive roles (Vincent et al. 2014) with the highest workload coming from care and domestic activities "associated" to them. Women's lack of access to resources and assets, e.g., land, financial, transport, hinder their

² Those statistics show that globally, women comprise over 37 percent of the world's rural agricultural workforce, a ratio that rises to 48 percent for low-income countries (estimates based on International Labour Organization models for 2020, cited in FAO 2021).

adaptive capacity (Tsikata 2016). In severe cases where extreme events or conflicts lead to humanitarian crisis, gender inequality is aggravated, increasing vulnerability and gender-based violence (GBV).

In sum, gender is a key axis of social inequality that intersects with other systems of power and marginalization to cause unequal experiences of food crisis, climate change vulnerability and adaptive capacity. Analysing gender is central to build sustainable food systems in the context of climate change and biodiversity losses. We could broadly speak of a gender justice dimension to climate and food as a normative concept that highlights the unequal distribution of power in the food systems and of climate change experience (including impacts, adaptation and mitigation actions) and seeks to develop solutions to maximise fairness in distribution of critical resources (modified from Reckien et al. 2018). Beyond distribution, gender justice in climate and food requires the recognition of the knowledge and activities of those groups made invisible by the industrial food system, and the participation in environmental and agricultural decisions, particularly by those in limited positions of power due to their ethnicity, socioeconomic status/class (peasantry), race, indigeneity, disability, sexual orientation, age, or place of residence.

Gendered impacts of climate change on food security

The impacts of climate change on the food system are evident, and these have clear gendered implications. Differentiated impacts, vulnerability, risk perception, behaviours and coping strategies for climate change related to food security derive from cultural (gendered) norms, unequal access to, and control over, key productive resources and assets, unequal participation in decision-making processes at household, community, national and international levels, as well as unbalanced and unrecognized responsibilities between men and women in terms of unpaid care and domestic work. Thus, women and poor people are more affected by climate change because their contextual vulnerability is higher and they often have a higher reliance on subsistence agriculture which will be severely impacted by climate change (Aipira et al. 2017) and at the same time is often invisible for policies.

Gender affects all four pillars of food security in the context of climate change (Mbow et al. 2019). Regarding *food availability*, the effects of a changing climate are deeply felt in the water, agriculture and livestock sectors, where women's involvement is substantial (Sachs et al. 2020) in a context where they tend to have less access to productive resources, including land. Water scarcity can particularly affect women because they would need to spend more time and energy to collect water and are more exposed to GBV (Sommer et al. 2015; Aipira et al. 2017). Climate change has differentiated gendered impacts on livestock-holders livelihoods, health and nutrition (McKune et al. 2015; Ongoro and Ogara 2012) and children's health and growth in pastoralist societies may be reduced due to reduced milk consumption (Fratkin et al. 2004). In terms of *food access*, women intra-household inequity limits their ability to purchase food; in the context of decrease in yields, prices are likely to rise, with women least able to afford adequate nutrition (Kristjanson et al. 2017). Limitations also include lack of women's mobility and lack of decision-making within the household. In terms of *food utilisation*, men and women have different nutritional needs (e.g., during pregnancy or breast-feeding), which is also linked to age. Water scarcity may force women to use unsafe water in the household, increasing risk of water-borne diseases (Parikh 2009). Urban floods and droughts may result in water contamination increasing the incidence of diarrhoeal illness in poor children (Bartlett 2008). In terms of *stability*, women and children are more likely to be disproportionately affected by price spikes (Arndt et al. 2016; Hossain and Green 2011; Darnton-Hill and Cogill 2010; Kumar and Quisumbing 2013).

Gendered impacts of climate change and food policies- Avoiding Maladaptation

Given women's central role in feeding their families, decreasing women's capacity to adapt to the impacts of climate change also decreases that of the household and the community. If a gender analysis is not introduced, well-intentioned policies can reinforce gender stereotypes and increase women or other oppressed social groups discriminations leading to maladaptation. For example, in masculinised agricultural settings of Australia and Canada, climate adaptation can increase women's work on- and off-farm, but without increasing recognition for women's undervalued contributions (Hurlbet et al. 2019). Conservation agriculture or sustainable land management, recognised as sustainable adaptation options with synergies with mitigation, may increase the mean working hours of women (Halbrendt et al. 2014; Wekesah et al. 2019). Adaptation interventions focused on cash-crops as a way to increase economic return have reduced women participation in household decision-making in those places where the crops associated to women are those for domestic consumption. In forest conservation and restoration, too restricted rules of REDD+ that do not include traditional uses from local communities can hamper women and girls traditional activities in National Parks and get them even punished (Benjaminsen and Kaarhus 2018). Furthermore, women work in reforestation projects may end up subsidising carbon projects because the incorporation of women into social programs create unwaged and unpaid activities via *"women's work that at the same time increase women burden of work"* (Gay-Antaki 2016). Post-farm strategies that rely on increasing market orientation of smallholder production may intensify men's control over benefits from production in East Africa (Tavener et al. 2019).

To address differences in adaptive capacity, the differential access to the social and environmental resources and assets required for adaptation need to be addressed, in other words, gender inequality in rights-based resource access, including land, education, health, and other basic rights need to be considered. Further drivers of gender inequality result from social exclusion from decision-making processes (in formal and informal institutions) and labour markets (Hurlbet et al. 2019). The "non-economic" status of women's activities implies that they are not included in wider discussions of priorities or interventions for climate change, even despite they are managing the farms. Their perspectives are not included; their needs are not met; and thus, interventions, information (including weather and climate forecasts), technologies, and tools promoted are potentially not relevant, and even can broaden discrimination (Alston 2009; Edvardsson Björnberg and Hansson 2013; Huynh and Resurreccion 2014, cited in Mbow et al. 2019).

The project SEQUAL (<https://mon.uvic.cat/sequal/>), in its preliminary results of the analysis of climate change policies in some European countries, reveals a lack of gender perspectives in climate policy, symptomatic of a more general absence of people in climate policy documents (Eggebo et al. submitted). Climate change is constructed as a market, technology and/or security issue. Thus, the problem of climate change and suggested responses to it are constructed in such a way that gender is irrelevant. By implicitly limiting the concept of adaptation to a "rational" policy process, people are presented as 'recipients of adaptation', in state of active agents in shaping their destinies.

Women empowerment in agri-food systems, biodiversity conservation and climate change

To overcome food systems limits and barriers to climate change adaptation and mitigation suffered by women and other genders, it is necessary to address the structural discrimination within food systems, biodiversity management and climate change governance. Rights-based approaches have already been highlighted as the most inclusive and efficient way to address them. Rights-based approaches can empower local communities to manage common natural resources for climate change and sustainability. Implementing rights-based approaches requires facilitating

women participation and empowering. Indeed, empowering women in regard to decision-making, resources, and bargaining power can bring synergies among household food security, adaptation and mitigation options (Alston 2014). Women’s empowerment includes a variety of options, from economic to social and institutional arrangements, and may include targeting men in integrated agriculture programs to change gender norms, which have shown to have positive outcomes in malnutrition (Bezner-Kerr et al. 2016).

When women have access to decision making and bargaining power, they can contribute to both adaptation and mitigation while ensuring household food security (Ajani et al. 2013). Evidence shows that when rural women have the same access as men to productive resources, services and economic opportunities, there is a significant increase in agricultural output, with immediate and long-term social and economic gains, which contribute to the reduction of poor and hungry people (FAO, 2021). In Western Kenya, widows, in their new role as main livelihood providers, ensured food and water security through investments in rainwater harvesting systems and agroforestry, working together in formalised groups of collective action (Gabrielsson and Ramasar 2013). In Nepal, women’s empowerment improved maternal and children nutrition, mitigating the negative effect of low production diversity (Malapit et al. 2015). Integrated nutrition and agricultural programs have increased women decision-making power and control over home gardens in Burkina Faso (van den Bold et al. 2015) with positive impacts on food security.

Empowering women to decide on the size of their families through the provision of reproductive health services and education is also proposed as a demand-side measure for climate mitigation and adaptation (Dodson et al. 2020; Page and Larsen 2010; Stephenson et al. 2010; The Lancet 2009; figure 2). Global support for family planning could reduce population by 15% by 2050 and 45% by 2100 compared with the current trend (O’Sullivan 2018).

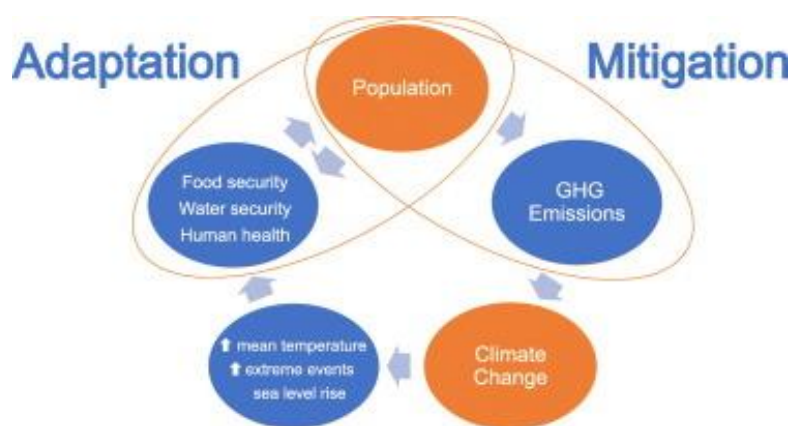


Figure 2. Relationship between climate change adaptation, mitigation, food security and right-based approaches with a focus on women empowerment (Source: Dodson et al., 2020)

In sum, empowered and valued women in their societies increases their capacity to improve food security under climate change, make substantial contributions to their own wellbeing, to that of their families and communities, and, ultimately, to sustainable development (Langer et al. 2015). This requires also making visible women work and value it, not based on their contribution to commercialised agriculture, which is often dominated by men, but on their contribution to well-being and food security in household and community (Otieno Onyalo 2019). This implies to value women’s knowledge and activities as essential to sustaining life, away from the conventional markets, changing our perceptions about subsistence agriculture, which Rivera-Ferre and Álvarez (2017) reframed as *agriculture for life*.

Women knowledge to restore food systems, biodiversity conservation and climate change adaptation and mitigation

In the current emergency context in which there is agreement that food systems need to be transformed and urgent actions are required to enhance biodiversity conservation and climate change adaptation and mitigation, women knowledge and experiences are central. Indeed, their exclusion by industrialised and market-focused food systems has allowed them to conserve a big part of the knowledge required to rebuilt our food systems with that triple function of achieving the human right to food, conserve biodiversity and adapt and mitigate climate change.

In the last few years the recognition of the importance of women and their specific roles and knowledge is increasing. In the United Nations Fourth World Conference on Women in Beijing in 1995, the intellectual contribution of indigenous women was explicitly recognised. In 2001, the Women's World Summit Foundation annual campaign was developed under the slogan “*protect your traditional knowledge*”. In Pacific Island, for example, women can use traditional knowledge to preserve and store food and seeds ahead of approaching storms, floods or drought, which can carry their families through the recovery months. They hold critical knowledge on where or how to find clean water, which crops to grow in a flood or a drought season and how to survive through climate extremes (Aipira et al. 2017). In rural areas in Mexico, exposed to both floods and droughts, women’s unpaid roles are key for household nutrition management, providing off-farm products, nursery, knowledge about edible weeds, displaying an informal resources' exchange system that helps to cope with the seasonal shortages arising as a result of climate change (Dey et al. 2018) out of the conventional market. Evidence also indicates that women’s decision-making power on household spending patterns is associated with healthier diets and better child nutrition outcomes (Heckert et al. 2019).

Agroecology as an strategy for empowering women, building sustainable food systems, enhancing biodiversity and adapting and mitigating climate change

Agroecology, is gaining recognition for its transformative potential to build sustainable food systems. It is probably the most exciting action with the highest capacity to promote global food security, biodiversity conservation, climate change adaptation and mitigation, and gender justice. In the IPCC Special Report on Climate Change and Land (SRCCL) agroecology was highlighted for its strong adaptation and mitigation potential while promoting food security, but its gender potential was not assessed. Agroecology is defined as the ecological design and management of farms and food systems (Gliessman 1990, 2007), through forms of collective action (Sevilla-Guzmán and Woodgate, 1997), which explicitly considers economic, social, environmental and ecological aspects, based on traditional peasants’ knowledge to promote endogenous development, but open to innovations that help sustainability (Sevilla-Guzmán and Woodgate 2013) and characterized by a transdisciplinary, participatory and action-oriented approach (Méndez et al. 2013). At farm level, agroecological practices, based on local crop varieties, local breeds and ILTK, include crop rotation, crops associations, intercropping, legume diversification, mulching, organic soil amendments (compost, manure, crop residue), animal-crops integration, and water saving and harvesting practices, among others, promoting both ecological and cultural diversity. These practices have been linked to increased food and nutrition security through sustainable soil management practices and increased agrobiodiversity, but also to dietary diversity (Bezner et al. 2019). Yet, the potential of agroecology in promoting women empowerment and gender equality when it is accompanied by a set of strategies with an explicit gender focus and training has been less discussed. Thus, I will not discuss here the potential of agroecology to promote food security, biodiversity conservation and climate change mitigation and adaptation, which has been extensively discussed in the literature, but rather will focus on how, and under

which conditions, can agroecology contribute to promote gender justice and overcome some of the structural barriers described above.

Despite still only a few studies have analysed the role of agroecology and related strategies in empowering women, there is quite consensus on its potential. This potential is achieved through women groups and networks, proper training, participatory approaches, the valorisation of ILTK, and a food systems and complex approach. But most of all, because in many contexts agroecology is promoted and put in practice through bottom-up processes led by women. So it is women's groups from below, through collective action, the ones promoting agroecology, or what is called a feminist agroecology. It is through this process of building new political subjects (Siliprandi 2010) and social capital among women that agroecology can then display all its options to promote gender justice together with food security, biodiversity conservation and climate change adaptation and mitigation. As Sylvester and Little (2020) found, "*women derive multiple benefits from agroecology. These benefits include: sharing knowledge, creating community, income generation, independence (financial and having their own identity that goes beyond that of a man's), cultural identity, health (human and land), biodiversity conservation, self-confidence, and leadership opportunities within agroecological networks*". Agroecological women networks tend to focus on women's interests, which include income diversification and family nutrition, friendship and group solidarity, improving also their position as leaders in networks promoting rural women's agency, agroecology and food sovereignty (Oliver, 2016). In Brazil, women participation in urban agriculture through agroecological networks has contributed to the formation of a popular feminist collective identity among participants, fostering the awareness of oppressive social structures, such as gender inequality and GBV, (de Carvalho and Bógus 2020). If implemented through participatory approaches that promote gender equity, agroecological practices in Malawi have shown to increase health and well-being (Bezner et al. 2019). Agroecological participatory education with a gender perspective is central to achieve those outcomes.

Another important characteristic of gender-focused agroecology refers to its potential to confront sexual division of labour. Calderón et al. (2018) found that agroecological farms in Guatemala had more balanced gender roles. Gender-oriented agroecology training empowered women and men to disrupt the traditional sexual division of labour in rural communities in Brazil (Schwendler and Thompson 2017), supported new 'emergent' masculinities in Malawi in which men were more involved in cooking and child care (Bezner-Kerr et al. 2016), and improved child's dietary diversity through increasing agricultural production diversity, men's involvement in household chores, and women's mental health in Tanzania (Santoso et al., 2019). This type of agroecological training addressed to the youth has contributed to changing framings to be more inclusive of different populations, generations and genders, and to foster an appreciation of the interconnectedness of humans and nature (Goris et al. 2019).

It is important then to clarify that it is not agroecological practices per se what are capable of enhancing women role in promoting changes toward building sustainable food systems, biodiversity conservation and climate change adaptation and mitigation, that is, in promoting gender justice. It is an agroecology that is built from below through collective action and women's groups. Thus, agroecology, from a feminist perspective, is constructed as a radical proposal that involves more than a set of techniques (Trevilla Espinal et al. 2021). Indeed, collective actions is central in building sustainable food systems based on agroecological principles even if actors do not even name their actions as agroecological. In New Zealand, indigenous women groups promoting local food systems to address global food issues through community gardens and farms, based on their own knowledge and cultural values (both key principles of agroecology) are counteracting food poverty through access to local food while bringing more attention to valorise the essential role that indigenous women play in addressing food security issues in the

communities (Stein et al., 2018). In Kenya and Uganda, Andersson and Gabrielsson (2012) found that emergence of local social institutions for collective action, in which particularly women farmers organize themselves, *“is one potential pathway to livelihood and sustainability improvements also in a setting of private land ownership. Trust building, awareness raising and actions to improve livelihood security through risk sharing and pooling of labour and other limited assets have given people more time and resources available for diversification, preventative activities, experimentation and resource conservation. It thereby strengthen farmers’ capacity to cope with and adapt to change, as well as contributes to the agency at the local level”*.

From a food systems perspective, agroecology also has the capacity to build alternative economic options different to those based on conventional markets, that in many contexts, can better suit women needs. Agroecology creates new markets around the social and solidarity economy, as well as different forms of exchange, such as that found in participatory guarantee systems and community supported agriculture (CSA). In USA, where farming is one of the most unequal professions today, only farms engaging in CSA experience a marked decline in the gender income gap (Fremstad and Paul 2020). In Australia, female producers, through sustainable agriculture, smaller plots of land and direct marketing are seeking alternatives to hegemonic agriculture due to its gendered financial and social constraints, as an alternative to the competitive productivist agricultural approach and a shift in the masculinist construction of farming (Newsome 2020). This is not to forget that the current economic system is built through the invisibilization and exploitation of the work occurred in the domestic sphere, that is, the reproductive work, and this includes many of the agricultural activities linked to food security, biodiversity conservation and climate change adaptation and mitigation. Finally, agroecological food systems promote dietary diversity and better diets, all needed to build sustainable food systems.

Still, barriers to the development and implementation of agroecology, exist. For instance, universities and extension services are still mostly focused on the green revolution and business as usual approaches to address food systems challenges, including climate smart agriculture or sustainable intensification. Those options can bring important changes to food systems towards sustainability, but their approach is conventional, top-down and gender-blind, which in the end limit their transformative potential and do not contribute to gender justice. Sylvester and Little (2020) also found multiple barriers to women’s participation in agroecological networks, all of them structural, including: access to leadership positions, government support, access to capital, technology, land access, high costs of agriculture, a lack of understanding of Indigenous culture, triple burdens, and machismo and microaggressions. Here it is where parallel efforts need to be implemented if we want to really display all the potential of agroecology in promoting gender justice while building sustainable food systems, biodiversity conservation and climate change mitigation and adaptation. Women alone cannot (and must not) do all the work.

Recommendations to empower women, build sustainable food systems, enhance biodiversity conservation and climate change adaptation and mitigation

Rights-based approached to food security and gender equality (right to food, right to a safe and clean environment, right to education, sexual and reproductive rights, etc.)

Access to resources (land, water, seeds), assets (training, services, transport, finance, markets) and institutions (local to global, formal and informal).

Participation and leadership in decision-making (from the household to the policy-making)

Measures towards recognition and redistribution of domestic work, including experiential training addressed to men, to avoid triple burden of work to women.

Elimination of GBV for human nutrition and food security in the context of climate change.

Facilitating spaces where women can meet to share knowledge, emotions, etc. and build collective action processes.

Valuing and recognising the central role of women's indigenous, local and traditional knowledge in the construction of sustainable food systems, biodiversity conservation, climate change M&A.

Support agroecology as an alternative that builds upon people's knowledge to build sustainable food systems, and not simply as a set of practices.

Structural changes in universities and extension services towards agroecology.

Acknowledgements

I would like to acknowledge the learning and exchanges around climate change, food security and gender to all authors of the IPCC gender boxes of the AR5, SRCCL and AR6 working group 2 and the Civil Society Mechanism of the Committee of Food Security.

REFERENCES

Aipira, C., A. Kidd, Morioka, K. 2017: Climate change adaptation in pacific countries: Fostering resilience through gender equality. In: *Climate Change Adaptation in Pacific Countries*. Climate Change Management [Leal Filho W. (ed.)]. Springer International Publishing, Cham, Switzerland, pp. 225–239.

Alhassan, S.I., Kuwornu, J.K.M., Osei-Asare, Y.B. 2019. Gender dimension of vulnerability to climate change and variability: Empirical evidence of smallholder farming households in Ghana. *International Journal of Climate Change Strategies and Management* 11(2): 195-214.

Alston, M., 2009: Drought policy in Australia: Gender mainstreaming or gender blindness? *Gender, Place and Culture* 16: 139–154.

Alston, M., 2014: Gender mainstreaming and climate change. *Womens. Stud. Int. Forum* 47: 287–294.

Alvarez, I., Lovera, S. 2016. New Times for Women and Gender Issues in Biodiversity Conservation and Climate Justice. *Development* 59, 263–265.

Andersson, E., Gabriellson, S. 2012. Because of poverty, we had to come together': collective action for improved food security in rural Kenya and Uganda. *Int. J. Agric. Sust.*, 10 (3).

Arndt, C., M.A. Hussain, V. Salvucci, Østerdal, L.P. 2016: Effects of food price shocks on child malnutrition: The Mozambican experience 2008/2009. *Econ. Hum. Biol.*, 22, 1–13.

Babtiste, ... (CCB Gender, SRCCL)

Bartlett, S. 2008. The Implications of Climate Change for Children in Lower-Income Countries. *Children, Youth and Environments*, 18(1), 71–98

Benjaminsen, G., & Kaarhus, R. 2018. Commodification of forest carbon: REDD+ and socially embedded forest practices in Zanzibar. *Geoforum*, 93, 48–56.

Bezner Kerr, R., E. Chilanga, H.Nyantakyi-Frimpong, I. Luginaah, E. Lupafya. 2016. Integrated agriculture programs to address malnutrition in northern Malawi. *BMC Public Health*.

- Bezner Kerr R., Kangmennaang J., Dakishoni L., Nyantakyi-Frimpong H., Lupafya E., Shumba L., Msachi R., Boateng G.O., Snapp S.S., Chitaya A., Maona E., Gondwe T., Nkhonjera P., Luginaah I. 2019. Participatory agroecological research on climate change adaptation improves smallholder farmer household food security and dietary diversity in Malawi. *Agric., Ecos. and Env.*
- Briggs L., Krasny M., Stedman R.C. 2019. Exploring youth development through an environmental education program for rural indigenous women. *J. Env. Education*
- Calderón C.I., Jerónimo C., Praun A., Reyna J., Santos Castillo I.D., León R., Hogan R., Prado Córdova J.P. 2018. Agroecology-based farming provides grounds for more resilient livelihoods among smallholders in Western Guatemala. *Agroecology and Sustainable Food Systems*
- Campbell, B. M., Beare, D. J., Bennett, E. M., Hall-Spencer, J. M., Ingram, J. S. I., Jaramillo, F., Ortiz, R., Ramankutty, N., Sayer, J. A., & Shindell, D. 2017. Agriculture production as a major driver of the Earth system exceeding planetary boundaries. *Ecology and Society*, 22(4).
- Cheryl Doss, Ruth Meinzen-Dick, Agnes Quisumbing, Sophie Theis- 2018. Women in agriculture: Four myths. *Global Food Security*, 16: 69-74.
- Darnton-Hill, I., and B. Cogill, 2010: Maternal and young child nutrition adversely affected by external shocks such as increasing global food prices. *J. Nutr.*, 140, 162S–169S,
- de Carvalho L.M., Bógus C.M. 2020. Gender and social justice in urban agriculture: The network of agroecological and peripheral female urban farmers from São Paulo. *Social Sciences*
- Deaconu A., Mercille G., Batal M. 2019. The Agroecological Farmer's Pathways from Agriculture to Nutrition: A Practice-Based Case from Ecuador's Highlands. *Ecology of Food and Nutrition*.
- Dey, A., Singh, G., Gupta, A.K. 2018. Women and Climate Stress: Role Reversal from Beneficiaries to Expert Participants. *World Development* 103: 336–359.
- Dodson, J.D., Dérer, P., Cafaro, P., Götmark, F. 2020. Population growth and climate change: Addressing the overlooked threat multiplier. *Science of The Total Environment* 748: 141346.
- Doss, C., Meinzen-Dick, R., Quisumbing, A., Theis, S. 2018. Women in agriculture: Four myths. *Global Food Security* 16: 69-74.
- Edvardsson Björnberg, K., S.O. Hansson. 2013: Gendering local climate adaptation. *Local Environment* 18, 217–232.
- Eggebo, H., Lundberg, A.K., Teigen, M. (submitted). Gaps and Silences: Gender perspectives in Norwegian Climate Policy. *Social Politics*.
- FAO. 2011. *The State of Food and Agriculture 2010-2011 - Women in Agriculture: Closing the Gender Gap for Development*. Rome.
- FAO. 2019. *The State of the World's Biodiversity for Food and Agriculture*. In *The State of the World's Biodiversity for Food and Agriculture*. <https://doi.org/10.4060/ca3129en>
- FAO. 2021. *Achieving gender equality and women's empowerment in agriculture and food systems - A handbook for gender focal points*. Rome. 45pp.
- Fratkin, E., E.A. Roth, Nathan, M.A. 2004: Pastoral sedentarization and its effects on children's diet, health, and growth among Rendile of northern Kenya. *Hum. Ecol.*, 32, 531–559
- Fremstad A., Paul M. 2020. Opening the Farm Gate to Women? The Gender Gap in U.S. Agriculture. *Journal of Economic Issues*.
- Gay-Antaki, M. 2016. "Now We Have Equality": A feminist political ecology analysis of carbon markets in Oaxaca, Mexico. *J. Latin American Geography* 15(3), 49–66
- Gliessman, S. R. 1990. Agroecology: Researching the ecological basis for sustainable agriculture. In *Agroecology*, edited by S. R. Gliessman, 3–10. Springer New York: *Ecological Studies* 78.

- Gliessman, S. R. 2007. *Agroecology: The ecology of sustainable food systems*, 2nd ed. Boca Raton: CRC Press.
- Goris, M., van den Berg, L., Lopes, I. da S., Behagel, J., Verschoor, G., Turnhout, E. 2019. Resignification practices of youth in zona da mata, Brazil in the transition toward agroecology. *Sustainability*, 11(1).
- Halbrendt J., Kimura A.H., Gray S.A., Radovich T., Reed B., Tamang B.B. 2014. Implications of conservation agriculture for men's and women's workloads among marginalized farmers in the central middle hills of Nepal. *Mountain Research and Development*.
- Heckert, J., Olney, D.K., Ruel, M.T. 2019. Is women's empowerment a pathway to improving child nutrition outcomes in a nutrition-sensitive agriculture program?: Evidence from a randomized controlled trial in Burkina Faso. *Social Science & Medicine* 233: 93-102.
- Hossain, N., Green, D. 2011: Living on a Spike: How is the 2011 food price crisis affecting poor people? *Oxfam Policy Pract. Agric. Food L.*, 11, 9–56.
- Hurlbert, M. Baptiste, B., Fletcher, A., Rivera Ferre, M.G., Mahadevia, D., Vincent, K. 2019. Gender in inclusive approaches to climate change, land and sustainable development. Cross-Chapter box 11. In: *IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. WMO, UNEP. pp 717-719.
- Huynh, P.T.A., Resurreccion, B.P. 2014: Women's differentiated vulnerability and adaptations to climate-related agricultural water scarcity in rural Central Vietnam. *Climate and Development* 6, 226–237.
- IFPRI. 2019. Is women's empowerment a pathway to improving child nutrition outcomes in a nutrition-sensitive agriculture program?
- IPBES. 2019. Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. <https://ipbes.net/global-assessment>
- Klein, A.M., Vaissière, B.E., Cane, J.H., Steffan-Dewenter, I., Cunningham, S.A., Kremen, C., Tscharntke, T. 2007. Importance of pollinators in changing landscapes for world crops. *Proc. Royal Society B: Biological Sciences*, 274(1608), 303–313.
- Kristjanson, P., Bryan, E., Bernier, Q., Twyman, J., Meinzen-Dick, R., Kieran, C., ... Doss, C. 2017. Addressing gender in agricultural research for development in the face of a changing climate: where are we and where should we be going? *Int. J. Agric. Sust.*, 15(5), 482-500
- Kumar, N., Quisumbing, A.R. 2013: Gendered impacts of the 2007–2008 food price crisis: Evidence using panel data from rural Ethiopia. *Food Policy*, 38, 11–22
- Lancet, The. 2009. Sexual and reproductive health and climate change. *The Lancet* 374(9694): 949.
- Mason, R., J.R. Parkins, Kaler, A. 2017: Gendered mobilities and food security: Exploring possibilities for human movement within hunger prone rural Tanzania. *Agric. Human Values*, 34, 423–434
- Mbow, C., Rosenzweig, C., Barioni, L.G., Benton, T.G., Herrero, M., Krishnapillai, M., Liwenga, E., Pradhan, P., Rivera-Ferre, M.G., Sapkota, T., Tubiello, F.N., Xu, Y. (in alphabetical order). 2019. Chapter 5. Food security. In: *An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. WMO, UNEP
- McKune, S.L., Silva, J.A. 2013: Pastoralists under pressure: Double exposure to economic and environmental change in Niger. *J. Dev. Stud.*, 49, 1711–1727.
- Méndez, V.E., Bacon, C.M., Cohen, R. 2013. Agroecology as a transdisciplinary, participatory, and action-oriented approach. *Agroecology and Sustainable Food Systems* 37 (1):3–18.
- Nellemann, C., Verma, R., Hislop, L. (eds). 2011. *Women at the frontline of climate change: Gender risks and hopes. A Rapid Response Assessment*. United Nations Environment Programme, GRID-Arendal.

- Newsome L. 2020. Beyond 'get big or get out': Female farmers' responses to the cost-price squeeze of Australian agriculture. *Journal of Rural Studies*
- Oliver B. 2016. *The Earth Gives Us So Much": Agroecology and Rural Women's Leadership in Uruguay. Culture, Agriculture, Food and Environment*
- Omwoha, J.N. 2007. Gender Contribution and Constrains to Rural Agriculture and Household Food Security in Kenya: Case of Western Province. *AAAE Conference Proceedings: 369-372.*
- Ongoro, E., Ogara, W. 2012: Impact of climate change and gender roles in community adaptation: A case study of pastoralists in Samburu East District, Kenya. *Int. J. Biodivers. Conserv.*, 42, 78–89.
- O'Sullivan J.N. 2018. Synergy between Population Policy, Climate Adaptation and Mitigation. In: Hossain M., Hales R., Sarker T. (eds) *Pathways to a Sustainable Economy*. Springer, Cham.
- Otieno Onyalo, P. 2019. Women and agriculture in rural Kenya: role in agricultural production. *Int. J. Humanities, Art and Social Studies (IJHAS)*, 4 (4): 1-11.
- Page, A., Larsen, M. 2010. The empowerment of women and the population dynamics of climate change. *Journal of Public Health* 32 (4): 590–591.
- Parikh, J., 2009: Towards a gender-sensitive agenda for energy, environment and climate change. Division for the Advancement of Women, United Nations, Geneva, 7 pp.
- Rao, N., Mishra, A., Prakash, A. et al. 2019. A qualitative comparative analysis of women's agency and adaptive capacity in climate change hotspots in Asia and Africa. *Nature Climate Change*. 9, 964–971
- Reckien D, Lwasa S, Satterthwaite D, McEvoy D, Creutzig F, Montgomery M, Schensul D, Balk D, Khan, I. 2018. Equity, Environmental Justice, and Urban Climate Change. In: *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network* [C. Rosenzweig, W. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal, and S. Ali Ibrahim (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 173-224.
- Rivera-Ferre, M.G. 2021. Climate change is not equal to all. *Mètode Sciences Studies Journal*, 110.
- Rivera-Ferre, MG.; I. Álvarez. 2017. From a Market Approach to the Centrality of Life: An Urgent Change for Women. In: *Watch Right to Food and Nutrition: Fight World Food Crisis: 40-45.*
- Sachs, C.E., Jensen, L., Castellanos, P., Sexsmith, K. 2020. *Routledge Handbook of Gender and Agriculture*.
- SAPEA. 2020. A sustainable food system for the European Union. *Science Advice for Policy by European Academies. Evidence Review n°7*. SAPEA, Berlín, Germany. 224p
- Santoso, M.V., Bezner Kerr, R. Kassim, N., Martin, H., Mtinda, E., Mtei, K., Young, S. 2019. Production Diversity, Men's Help with Household Tasks, & Lower Women's Depression Mediate Impact of an Agriculture Intervention on Child's Dietary Diversity in Tanzania. *Current Dev. Nutr.*
- Schwendler S.F., Thompson L.A. 2017. An education in gender and agroecology in Brazil's Landless Rural Workers' Movement. *Gender and Education*.
- Sevilla Guzman, E., Woodgate, G. 1997. Sustainable rural development: From industrial agriculture to agroecology. In: *The international handbook of environmental sociology*. [Redclift M, Woodgate G, eds.] Cheltenham, UK: Edward Elgar, 93–94.
- Sevilla-Guzman, E., Woodgate G. 2013. Agroecology: Foundations in Agrarian Social Thought and Sociological Theory. *Agroecology and Food Systems* 37 (1):32–44.
- Siliprandi, E. 2010. Mujeres y agroecología. *Nuevos sujetos políticos en la agricultura familiar. Investigaciones Feministas* 1: 125-137.
- SOFI. 2021. *The State of Food Security and the Nutrition in the World: Transforming food systems for food security, improved nutrition and affordable healthy diets for all.*

Sommer, M., S. Ferron, S. Cavill, House, S. 2015: Violence, gender and WASH: Spurring action on a complex, under-documented and sensitive topic. *Environ. Urban.*, 27, 105–116.

Stein K., Miroso M., Carter L. 2018. Māori women leading local sustainable food systems. *AlterNative*.

Stephenson, J., Newman, K., Mayhew, S. 2010. Population dynamics and climate change: what are the links?, *Journal of Public Health* 32(2): 150–156.

Sylvester O., Little M. 2020. “I came all this way to receive training, am I really going to be taught by a woman?” Factors that support and hinder women’s participation in agroecology in Costa Rica. *Agroecology and Sustainable Food Systems*.

Tavener K, van Wijk M, Fraval S, Hammond J, Baltenweck I, Teufel N, Kihoro E, de Haan N, van Etten J, Steinke J, Baines D, Carpena P, Skirrow T, Rosenstock T, Lamanna C, Ng'endo M, Chesterman S, Namoi N., Manda, L. 2019. Intensifying Inequality? Gendered Trends in Commercializing and Diversifying Smallholder Farming Systems in East Africa. *Frontiers in Sustainable Food Systems* 3:10

Thompson, M. S., 2018: Critical perspectives on gender, food and political economy. *Handbook of the political economy of gender*, Edward Elgar Publishing, 470–485.

Trevilla Espinal, D.L., Soto Pinto, M.L. Morales, H., Estrada-Lugo, E.I.J. 2021. Feminist agroecology: analyzing power relationships in food systems, *Agroecology and Sustainable Food Systems* 45(7): 1029.

Tsikata D. 2016. Gender, Land Tenure and Agrarian Production Systems in Sub-Saharan Africa. *Agrarian South: J. Political Economy* is the official periodical publication of the Agrarian South Network (ASN) 5: 1-19.

UNFSS. 2021. <https://www.un.org/en/food-systems-summit>

Vincent, K.E., Tschakert, P., Barnett, J., Rivera-Ferre, M.G., Woodward, A. 2014. Cross-chapter box on gender and climate change. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]

Wekesah, F.M., Mutua, E.N., Izugbara, C.O. 2019. Gender and conservation agriculture in sub-Saharan Africa: a systematic review, *International Journal of Agricultural Sustainability* 17(1): 78-91

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J. A., De Vries, W., Majele Sibanda, L., ... Murray, C. J. L. 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170), 447–492