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Gender Inclusion in Climate Change Adaptation

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Abstract

There is increasing evidence that climate change has an impact on natural disasters, such as flooding, and on agricultural production, both of which have implications for gender issues. In this paper we briefly review issues related to gender and poverty and examine the relationships between gender and various indices, including the human development index (HDI), the gender inequality index (GII), the multiple poverty index (MPI), and the masculinity score (MAS). Although the HDI, GII, and MPI are strongly related, they are not related to the MAS index.

We then look at systems of land ownership and inheritance and have found that, although the constitutions in many countries guarantee gender equality, many laws violate that principle, especially laws dealing with land ownership. In other cases, customary laws have priority over the formal legal system, resulting in gender-biased legal systems.

Finally, we discuss an example of job recovery after a disaster and interview three female agricultural workers in Japan. In the recovery process after a natural disaster, women are often expected to take care of family members; this can prevent them from returning to their jobs and place them at greater risk of either losing their jobs or being demoted. The results of the interviews demonstrate the recent empowerment of women in agricultural production and that these women have strong adaptive abilities.

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1. INTRODUCTION

Among the many areas concerning sustainability, relatively little attention has been paid to gender issues, especially in Asia. The issue of gender is still undeveloped in the field of climate change policy. Gender concepts are deeply rooted in a society's culture, and people are often unaware of gender-related issues. As a result, societies transfer "gendered" aspects of their culture from generation to generation.

According to Patt, Daze, and Suarez (2009, p83), "the term 'gender' refers to the socially constructed identities, roles and expectations associated with males and females. Over time, beliefs about gender have resulted in different valuations of men and women." Gender issues have many characteristics. The most important point in terms of climate change is that there are gender-based differences in poverty; women's poverty is deeply related to gender-biased social systems that are common in many regions, especially in rural areas (Food and Agriculture Organization [FAO] 2010).

In many societies, men and women are expected to play specific roles. Women are often expected to take care of household duties, whereas men are expected to manage family assets, protect their family members from outside events, earn money for everyday needs, and make society's decisions. Although some would argue this is because of the different physical characteristics of men and women, both patriarchal and matriarchal systems exist, indicating that gender roles are not a result of physical human features but rather of expectations. According to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (Adger et al. 2007, p730)

There are structural differences between men and women through, for example, gender-specific roles in society, work and domestic life. These differences affect the vulnerability and capacity of women and men to adapt to climate change. In the developing world in particular, women are disproportionately involved in natural resource-dependent activities, such as agriculture, compared to salaried occupations.

And they also state(Adger et al. 2007, p730):

Most fundamentally, the vulnerability of women in agricultural economies is affected by their relative insecurity of access and rights over resources and sources of wealth such as agricultural land. It is well established that women are disadvantaged in terms of property rights and security of tenure, though the mechanisms and exact form of the insecurity are contested. ... It has also become clear that a shift in policy focus away from reactive disaster management to more proactive capacity building can reduce gender inequality.

Along with those previous suggestions, we focus on the impacts of climate on agriculture and water-related disaster recovery, with special reference to vulnerable groups, especially women. We highlight several parts of this issue for the purpose of inclusion and mainstreaming gender issues in climate change adaptation policies. At first, we briefly review gender and the related concepts of human development, gender inequality, poverty, and attitudes. We then review existing literature concerning gender issues in the context of climate change adaptation. According to the points raised in that literature, we then look at systems of land ownership and inheritance, which are often gender biased. Finally, we discuss some of the cases concerning gender issues, including gender-biased failure of international aid agency projects after the 2004 tsunami in south Asia and an example of employment recovery after a disaster, and show some of the challenges involved in the inclusion of gender perspectives in the decision-making system of farm management by interviewing three female agricultural workers in Japan.

1.1 Exploring gender and related concepts

Gender-related concepts are defined as follows by the FAO (2010, p1):

Gender roles: those behaviours, tasks and responsibilities that a society considers appropriate for men, women, boys and girls.

Gender relations: the ways in which a society defines rights, responsibilities and the identities of men and women in relation to one another.

Gender discrimination: any exclusion or restriction made on the basis of gender roles and relations that prevents a person from enjoying full human rights.

According to these definitions, gender issues are deeply rooted in a society's culture, world views, attitudes, institutional arrangements, and legal and social systems. In most societies, the primary gender issue is that females are treated as inferior to males. Women are regarded as socially and economically vulnerable, especially in rural areas where gender-specific roles are still often strictly maintained. As discussed later, women—especially widowed and divorced women—have limited land ownership rights in many countries because women's rights are often connected with marital status.

The FAO (2010, p1–3) also defines gender equality, equity, and balance:

Gender equality: women and men enjoy equal rights, opportunities and entitlements in civil and political life.

Gender equity: fairness and impartiality in the treatment of women and men in terms of rights, benefits, obligations and opportunities.

Gender balance: the equal and active participation of women and men in all areas of decision-making, and in access to and control over resources and services.

These terms are sometimes used interchangeably, but they have appeared in various different usages, including laws and constitutions that call for gender equity and/or equality. The concepts are useful for improving our understanding of gender discrimination, inequality, and unbalanced social systems as well as for encouraging the empowerment of women in society. Although many societies still have gender-bias tendencies in their social systems, many are trying to overcome them.

1.2 Human Development Index, gender equity, and Hofstede's Culture Index

To overview the general status of gender issues around the world, we now examine several indices that indicate gender status. Each year the United Nations Development Programme (UNDP) releases the human development index (HDI), which “captures the losses in human development due to inequality in health, education and income,” and other related indices, such as the gender inequality index (GII), which “reveals gender disparities in reproductive health, empowerment and labor market participation” (UNDP 2010). In 2010, the multidimensional poverty index (MPI) was introduced as an index that “identifies overlapping deprivations suffered by households in health, education and living standards” (UNDP 2010, chapter 5, p86).

HDI and GII scores are strongly associated—the higher the HDI score, the lower the GII (Figure 1). The highest HDI scores are found in Scandinavian countries, such as Sweden, and the lowest ones are in African countries, such as Zimbabwe.

Gender inequality is often said to generate a “loss” of achievement of human development. For example, UNDP (2010, p93) stated that “the Netherlands has very low maternal mortality, has among the world's lowest adolescent fertility rate and is

close to parity in educational attainment, political participation and employment,” and therefore has a low GII. Qatar, however, has the least gender equality among the developed countries. As can be seen in Figure 2, even though both countries have similar HDIs, the difference in GII leads to lower levels of human development.

GI is also closely associated with the MPI. In societies with high GII scores, females often receive less education, and child mortality rates are higher, usually because of biased treatment of women. As the GII reaches about 0.6, an increase in MPI can be seen (Figure 3). In societies with high GIIs (>0.6), people have less chance to prove their abilities, which is usually more true for women. More resources are allocated to men than women because of this biased allocation as a result of institutional and cultural factors.

Organizational culture scholar Geert Hofstede created the masculinity index (MAS), which is based on psychological variables and is considered to indicate the “mindset” of a society (e.g., Hofstede 2001).¹ A high score indicates a more masculine attitudes of a society. In general, although Asian developing countries (marked in orange in Figure 4) had a wide range of HDI scores, their MAS scores were in the middle range. Japan which has a high HDI, also has a very male-dominant attitudes, as the high MAS score indicates.

As we discuss later, Japan is making many efforts to overcome gender issues but it is evident that Japanese society still has strong gender-biased attitudes. This shows two things. One is that gender issues are not resolved automatically according to development in economy. And the other, more important, point is that even though people have a strong gender-biased attitudes, institutional settings can be improved, although society would observe some distortion. In Japan, some academics in labor economics or sociology of labor argue that this is one of the causes of the low birth rate that is one of the most serious social issues and policy agenda items in recent Japanese society. This male-dominant way of thinking prevents women from working outside their home, or expects that women working outside home are still solely responsible for all of their household duties. In this situation, according to some discussions that appeared in “the child and childbearing support plan” of the Ministry of Health, Labor, and Welfare (2010), women are hesitant to have children.

From a climate change adaptation point of view, those distortions are potentially dangerous. After climate-related natural hazards such as floods happen, women are expected to play double roles—one is as a worker in society, and the other is as a mother or supporter of her own home or community. Those two roles are usually very hard to play simultaneously, and often women are forced to give one up. We will see a case later.

2. CLIMATE CHANGE ADAPTATION AND ITS EFFECTS ON GENDER ISSUES

According to Patt, Daze, and Suarez (2009), there are different gender attitudes towards risk responses (men are more likely to take risks than women) and in decision-making processes (women are more likely to seek and listen to advice, and learn from others with more experience). Those female tendencies make it easier for consulting agencies to offer help; women are more likely to take advice and carry out things that aid agencies suggest.

¹ See also <http://www.geert-hofstede.com/>

We primarily focus on two aspects of climate change adaptation—disaster recovery and agricultural production—along with the Intergovernmental Panel on Climate Change (IPCC) fourth assessment report (Adger, W. N. et al. 2007) and other mapping efforts. Many studies and reports have been published about climate change and its impacts, but the topic of gender issues and climate change adaptation has received relatively little attention. There are many papers on related topics, such as disaster recovery, agricultural practices, and water and energy issues. Some papers have emphasized the importance of gender consideration as part of the larger climate change issue. In this section, we briefly review some of the literature in this area. UNDP (2008) created a website for gender issues that has a section devoted to climate change. It is an informative guide to academic and nonacademic papers and reports, activities, and organizations related to climate change and gender issues.

Aguilar, Araujo, and Quesada-Aguilar (2007) discussed gender and climate change impact in general in the context of developing countries. According to them, “Women are the main producers of the world’s staple crops, providing up to 90% of the rural poor’s food intake and producing 60–80% of the food in most developing countries.” The impact of climate change in agricultural production has the potential to cause severe food shortages across the world, but the rural poor will be the most affected. They also pointed out, “Climate change does not affect women and men in the same way and it has, and will have, a gender-differentiated impact. Therefore all aspects related to climate change (i.e., mitigation, adaptation, policy development, decision making) must include a gender perspective.” In addition they stated that “women are not just helpless victims of climate change—women are powerful agents of change and their leadership is critical.” (Aguilar, Araujo, and Quesada-Aguilar, 2007, p3) This point is crucially important in the context of the case studies of Japanese female farmers discussed later. The Canadian International Development Agency (2010) deals with similar points.

The relationships among gender, human rights, and poverty in the context of climate change adaptation have been widely studied (e.g., Denton 2004; Demetriades and Esplen 2008; Polack 2008; Terry 2009; Hertel et al. 2010). In these papers, women are often described as victims of gender-biased social systems. Demetriades and Esplen discussed the “gender–poverty–climate change nexus,” which includes physical and mental health, ascribed and legal inferiority, discrimination in the labor market, poverty of time, lack of political clout, insecurities, conflict related to climate change, and cultural constraints. They also stated that women have already begun to learn how to adapt to some of these challenging conditions. Terry (2009) wrote there could be “no climate justice without gender justice.” She discussed how poor men and women have to cope with climate risk adaptation without much help. She also pointed out that culturally and financially restricted poor women and men will be affected by the climate risk unevenly and that women will be even more restricted in response to the risk.

Whereas Demetriades and Esplen (2008) and Terry (2009) discussed gender issues in the context of one society, Denton (2004) and Polack (2008) discussed gender issues in the context of international negotiations. Denton noted that north–south cleavage, a market-driven ethos, and the strong focus on the physical aspects of climate change are some of the reasons why gender and human rights issues have been a relative latecomer in the climate change field. Polack (2008) discussed the issue of human rights, including gender, in the context of international negotiation and participation processes. She claimed that the international negotiation process itself is gender biased and that marginalized groups are underresearched.

Hertel et al. (2010) examined the gender–poverty nexus from the point of view of economics. They used disaggregated household data and the Global Trade Analysis Project general equilibrium model to show the impact of climate change across the world in 2030. The most important point in their analysis is that people in poor

countries, such as those in Africa, are the most vulnerable to climate change impacts. They wrote:

While climate change has a fairly consistent impact on the real cost of living at the poverty line, the impact on household earnings is quite varied. In regions where the bulk of the poor are self-employed in agriculture and adverse productivity impacts are relatively modest, higher global agricultural prices can boost factor returns in the sector, thereby reducing overall poverty. On the other hand, when poverty is dominated by wage earners and urban poverty, the opposite applies. (Hertel et al. ,2010,p583)

The implication of this argument is that, if farmers lose their land, they have to find jobs in other sectors. Often this means they will become wage earners and become even more vulnerable to climate change impacts.

Many authors have investigated gender and migration and agricultural production systems (e.g., Warner 2010; Carr 2008). These discussions are closely related with gender-differentiated impacts from climate change, and the authors try to closely examine the impacts of climate change on the structure of society. Warner (2010) discussed climate-change-induced migration in several regions in the world. She wrote, "Characteristics like gender, age, socio-economic status will all affect unfolding patterns of environmentally induced migration." (Warner, 2010, p410) Essentially she argues that those with money or other social support systems will be able to migrate earlier, while the poor and vulnerable will not initially be able to move. She further stated:

Gender and demographic structure[s] also play a role in environmentally induced migration patterns. Property rights, resource distribution and family roles affect men and women's migration patterns, particularly when the environment becomes a strong push factor. (Warner, 2010, p410)

Carr (2008) and Nielsen and Reenberg (2010) discussed culture and agricultural production systems (including gender differences in agricultural production) in Africa. They stated that a person's social position is determined more by institutions, ethnicity, and gender than by individual ability.

Each of these authors has tried to construct an association or perspective for mainstreaming gender issues in the climate change adaptation discussion. There are several discussions in related sectors of climate change adaptation, including disaster prevention and recovery. One example is Alston's (2009) examination of drought policy and ongoing agricultural reconstruction in Australia. As part of the larger study, Alston pointed out that drought policy remains significantly gender blind.

Researchers have also examined the mental stress and vulnerability of female survivors of disasters. Bonanno, Galea, Bucciarelli, and Vlahov (2007) conducted research on New York City residents after 11 September 2001. They found gender was the most powerful predictor of resilience (ability to recover) and that female gender was associated with a reduced likelihood of resilience.

Some researchers have focused on job recovery after a disaster. Zottarelli (2008) used two waves of survey to examine the determinants of employment recovery status in New Orleans after Hurricane Katrina from the point of view of the interaction between location and race. Although displacement, income, and home ownership were significant determinants of job recovery, women were almost twice as likely to fail to recover employment conditions than men because, as Zottarelli concluded, they were expected to take care of their family members and generally had to remain away from their jobs for longer than men. Although research on gender and disaster often focuses on developing countries, it is clear there are still many issues to study in developed countries as well.

In conclusion of this literature review, we can see how climate change impacts differently on women and men. Women are more likely to be affected by the impacts, as they are in a more vulnerable economic, institutional, and political situation, and this applies not only to the damage but also the recovery process. Society needs to improve its decision-making process to reflect the voices of a variety of groups, including women. This will improve society's resilience, as Brody, Demetriades, and Demetriades (2008) pointed out:

Yet women are more likely than men to be absent from decision-making, whether in the household or at community, national or international levels – either because their contribution is not valued or because they do not have the time, confidence or resources to contribute. ... With more participative processes, these strategies and interventions can truly identify and meet the needs of those they aim to assist. In this way, processes can be forged that respond to local realities while feeding into a broader vision of climate change deceleration. (Brody, Demetriades, and Demetriades , 2008, p2)

3. GENDER (IN)EQUALITY AND POVERTY: LAND OWNERSHIP AND INHERITANCE SYSTEMS

As previously discussed, gender inequality and poverty are closely associated. One aspect contributing to this is the system of land ownership and inheritance in each society. Land ownership has several potential facets: a place to live, a source of income (agricultural production, etc.), an asset that can be sold for cash, and a source of other production (e.g., forestry, commerce, manufacturing). Each of these aspects is closely associated with poverty. This is also closely related to climate change adaptation. As we have seen in the last section, Hertel (2010) pointed out that people who do not own their land for their own living ("self-employed in agriculture") are more vulnerable to climate change impacts.

A summary of land ownership and inheritance systems from the point of view of gender equity, especially in customary law, is presented in Table 1. Although most countries call for gender equity in their constitutions, in practice customary laws predominate and those laws are not usually gender equal. In all but two of the countries shown in Table 1, females have limited land ownership rights and face less-favorable land inheritance systems. Often, the rights that women have are dependent on marital status or place of residence, such as in the People's Republic of China. Surprisingly, in some countries, the constitution and individual laws are contradictory, and even though the constitution calls for gender equity, individual laws violate it, such as in Cambodia, Nepal, and Viet Nam.

In many societies in Asia, so-called customary laws were established during the colonial era, when Western systems of government were applied to colonial regions to collect land-based taxes. Governments were not interested in an individual's land rights—they were instead interested in units of agricultural production (see Mizuno and Shigetomi [1997] for a discussion of the history of Asian land tenure systems).

Table 1: Land Ownership and Inheritance in Customary Law in Male- and Female-Dominated Societies

Country	Customary norms, religious beliefs, and social practices that influence gender-differentiated land rights	Traditional authorities and customary institutions	Inheritance/succession de facto practices	Discrepancies/gaps between statutory and customary laws
Male-dominated				
Bangladesh	Married men traditionally have ultimate authority on household resources	Traditional headmen	Follows customary law	Large
Cambodia	Most women leave decisions related to property to their husbands; a man may sell land without his wife's consent.	Village chief, community chief, or group leader; the elders are the administrative authority within the community or village	Children are theoretically equal, but in practice the oldest child might inherit more	Gaps in regard to the inferior status of women within the family
People's Republic of China	Women's land ownership rights vary with marital status; there may be some disadvantage in marrying outside of the local village.	Not applicable	Daughters lose rights to inheritance once married	Disadvantages depending on marital status
India	Varies by region, but widespread seclusion of women and marital status make female inheritance harder.	Customary village councils	Patriarchal dominated, even male inheritance (a male child of the family) absent, limited female inheritance	Large
Indonesia	Husbands and wives usually consult with one another before making major decisions on what to do with their property.	Varies by community	Traditional Javanese inheritance customs grants all children an equal share of a deceased parent's property	No discrimination, but there are some limitations
Japan	Traditionally the eldest living male has the right to the family's assets, but changing.	Customary village councils	Follows modern law, but the eldest boy is seen as succession to a family, and inherits all assets of the family.	Favored but no longer used
Malaysia	Varies by ethnic group, but men are normally the head of the household; in all ethnic groups, a wife is expected to obey her husband and his family.	Village headman	Varies by ethnic group; some communities restrict women's land ownership rights	Religious laws dominant in the private sphere
Nepal	Male ancestral lien emphasized; women have very limited rights to land. Women are always under men's patronage (before marriage, her father; once married, her husband).	Varies by ethnic group	Most land passes from father to son	Gaps even in the constitution and the country code
Pakistan	Women are always under the protection of family men (father, son, and brothers).	Many institutions; women have no or limited roles	Women do not usually inherit land; if they do, it is in trust of a son	Gaps even in the constitution and in customary practices
Philippines	Varies by region; discrimination is strong in the south (Muslim) part but weaker in the north.		Bilateral inheritance systems whereby both male and female descendants may inherit	Larger gaps in predominantly Muslim areas
Republic of Korea	Until recently, women had very limited land ownership rights.	Eldest male is the village head	A patriarchal family registration system was in place until January 2008.	Was large, but has recently changed

Country	Customary norms, religious beliefs, and social practices that influence gender-differentiated land rights	Traditional authorities and customary institutions	Inheritance/succession de facto practices	Discrepancies/gaps between statutory and customary laws
Sri Lanka	Varies by ethnic and religious group; some have very deep-rooted male-dominated systems.	Village leaders	Depends on the marriage contract of the women.	Some ethnic groups still follow their own systems and some of the systems violate a wife's rights from the Western legal point of view; some national laws violate the constitution.
Uzbekistan	Men dominate; household property is usually in the man's name.		Patriarchal	Large
Viet Nam	The man is the head of the household and has the right to make decisions regarding all family assets, including land.		Son-preference is traditional in inheritance	Gaps between the constitution and in practice; customary practices limit full enjoyment of women's personal rights
Female-dominated				
Thailand	Women dominate land ownership; this system was weakened after the introduction of the Civil Code	<i>Phu-yai-ban</i> , or village chief	Women traditionally inherit land	Women traditionally inherit land
Lao People's Democratic Republic	Varies by ethnic group, but in the majority of groups women have higher status than men.	Village headman	Varies by ethnic group	Women dominant

Source: <http://www.fao.org/gender/landrights/topic/>

4. ADAPTATION STRATEGIES IN THE CASES OF DISASTER RECOVERY AND THE AGRICULTURAL SECTOR

Some researchers have examined natural disasters, such as the 2004 tsunami in the Indian Ocean and Hurricane Katrina. Fulu (2007) reported on the recovery process in the Maldives from the tsunami in 2004, the relations with aid agencies from developed countries and international nongovernment organizations (NGOs), and the experts' general ignorance of gender sensitivity. She pointed out that the aid agencies' "gender-blind responses" to the tsunami created problems (e.g., temporary houses, workforce placement, and jobs), because they resulted in the exclusion of women and disregarded their significant impact on gender relations. She cited an example of a workforce project that was supposed to be gender balanced but that excluded women, even though this was the only chance for islanders to earn money. Finch, Emrich, and Cutter (2010) examined the social response to Hurricane Katrina and its aftermath and found that the disparities derived from race, class, gender, and age differences have resulted in an uneven impact of the catastrophe on various communities in New Orleans and their ability to recover.

In this section, we discuss two case studies. The first is a brief description of a published example of recovering from the effects of a natural disaster from the point of

view of gender. The second is derived from interview surveys with three female Japanese farmers.

4.1 Disaster recovery

As mentioned in section 2, there have been many studies of disaster prevention, recovery, and related gender issues, including Zottarelli's (2008) study of recovering occupational status after Hurricane Katrina in New Orleans that showed that women were less likely to regain employment and more likely to obtain worse employment after a disaster. Oshima (2006) reported a similar example in Niigata Prefecture, Japan, after the floods of 2004 in which a female manager of a private company was demoted after missing a few weeks of work. Several men at the same company also experienced the same flood, but they returned to work sooner. In fact, it took the woman more than twice as long as her male counterparts to return to work, and she was demoted because of this delay. The woman is from a rural area in the prefecture where families usually are larger than average and community ties are strong. Women are expected take care of their family members and their community, whereas men are free to return to work much sooner. Local residents said some men went to work as usual the day after the flooding, but women were expected to limit their role to mothers and wives and to maintain the family's house and care for aging parents.

4.2 Effects on agricultural activities and institutionalization of women's participation in decision-making processes

According to the IPCC Fourth Assessment Report (Adger, W. N. et al. 2007), the agriculture sector is one of the sectors most affected by climate change. Although there is still a division of labor by gender in agriculture and, as we have seen in previous papers, women are more likely to be seen as victims, rather than being responsible for the climate change adaptation and related activities in a society. But to include women in adaptation strategies, we need to change this view. We start with a brief review of the history of the farm management agreement, which has been a successful part of Japanese agriculture policy for about 50 years (Ministry of Agriculture, Forestry and Fisheries 2010). Then, we show the results of interviews.

4.2.1 The farm management agreement

According to the Ministry of Agriculture, Forestry and Fisheries (2010), the farm management agreement is explained as follows:

In family farming, a family business agreement documents matters such as business plans reached through discussions between families and the roles and working conditions of each farm household. It is important to clarify the roles and working conditions of each member involved in family farming in order to achieve efficient and stable management. Family business agreements define the roles of family members who will work in farming such as women and farm successors. It also enables families to become eligible for farmer annuities and other subsidies, as well as making it possible to take advantage of collective application rights under the farmer certification system. (Ministry of Agriculture, Forestry and Fisheries. 2010, p90)

Under this agreement, partners or managers of a family farm can not only have a right to join decision making in business planning but also have a right to receive several merits.

The origin of this agreement goes back to the 1960s, and the current form of the agreement was established quite recently, in 1995, based on an advice document of

one of the department chiefs of the Ministry of Agriculture, Forestry and Fisheries. The advice document stated that female farmers can be true partners of a farming business. The first agreement system was about seeking better working conditions among family members, especially between father and son and between husband and wife. In 1995, this system was reviewed and its name was changed to the farm management agreement, and it became more a business contract among family members. This new system encourages family members, including women, to discuss and manage their farm business to be more efficient and provide better working conditions. It also includes a farmers' pension system (Iwamoto 1999; Abe 2009).

This agreement system and networking is key for reflecting the voice of women in adaptation strategies which Brody, Demetriades, and Demetriades (2008) proposed.

4.2.2 Climate change adaptation in Japanese agriculture

According to a report by the Ministry of Education, Culture, Sports, Science and Technology, Japan Meteorological Agency, and Ministry of the Environment (2009), the impact of climate change on Japanese agriculture (food supply section) can be summarized as follows: (i) the quality of rice and fruits has already been observed to be declining, (ii) rice yields are projected to decline in future, and (iii) orchards are projected to relocate. Also, a report about wise adaptation by the Ministry of the Environment (2008) proposed several strategies that should be adopted to adjust to those changes based on vulnerability assessment of a particular society against climate change. Examples of options for agricultural fields in the report are to (i) develop and introduce varieties of rice or other crops that tolerate higher temperatures, (ii) relocate fields, and (iii) change or adjust cultivation methods. As we will show in our record of interviews, our interviewees are independently and voluntarily think about those adaptation strategies.

4.2.3 Interviews with three female farmers

Interviewees were selected from the Agricultural Women's Net, which is an independent organization established more than 20 years ago by women working in the agriculture sector. Members are active in networking, exchanging information, and holding annual meetings. The organization has become influential not only for women in agriculture but also in the rural reconstruction movement. Although membership is national, we chose three farmers from the region near Kanto (Chiba, Kanagawa, and Nagano). The authors conducted the interviews at the women's homes in October and November 2010 using a semi-structured questionnaire. Each interview took 2–3 hours.

Two of the three interviewees signed the farm management agreement with their husband and other family members; one is not managing her farm land by herself, so she doesn't need to have an agreement.

Interview 1: Kashiwa, Chiba

The S family lives in Kashiwa City, Chiba Prefecture, about 1 hour from central Tokyo. Because of its proximity to the city, many residents commute to the Tokyo metropolitan area daily. The number of farmers in this area has decreased dramatically in the past several decades as a result of urbanization.

We interviewed Mrs. S, who is in her early 50s. She was a primary school teacher until her parents-in-law mostly retired from agricultural production. Her in-laws still grow some vegetables in small fields and sell them at a nearby shop. Mr. S worked at the Kashiwa City Office for several years after graduating from the University of Tsukuba, and later began to farm.

Mr. and Mrs. S and their eldest son make up the main labor force of the family farm. They grow several types of Asian pears, rice, and vegetables, and sales of Asian pears

make up more than 90% of their total revenue. They do not sell the pears at the market but ship them directly to their own customers.

When asked about the impacts of climate change as they relate to their farm, Mrs. S mentioned the irregular picking season of late-harvest pears, leaves falling later on the pear trees, early blooming, and unusual disease and insect damage. Because they grow several varieties of Asian pears, which usually bloom from May to July, they can continually sell them from early August to late November. The types of climate change impacts she mentioned can have positive and negative effects on this production. The late-harvest pears have been of higher quality in recent years, which could be seen as a positive impact. The blooming season was excellent this year, so the late-harvest pears grew faster and the family had to work hard to pick both the early harvest and late-harvest varieties at about the same time, which imposed an additional labor burden on them.

Mr. and Mrs. S work together to grow and sell the pears. They seem to be fairly equal partners but they do have some sharing burdens. When asked about her responsibilities in terms of community actions or participating in traditional summer festivals and events, she said, “My father-in-law and mother-in-law are responsible for those activities. When we are harvesting pears, we do not have enough time to join those activities.” She continued, “This is a suburban area of Tokyo. Many people commute to Tokyo and they also do not have enough time to join traditional or conventional community activities. People do not expect women to play conventional roles any more.”

Interview 2: Hachioji, Tokyo

Mrs. Y lives in Hachioji but her farm fields are all in Kanagawa Prefecture—it takes about 10–15 minutes by car to get to her fields from her home. She is about 30 and has two children—one is 4 and another is just 11 months. Her husband works in the central Tokyo area at a publishing house. She lives near her parents, so they often take care of her children when she works in the farm fields. Her parents were not farmers, nor was her husband. She currently has more than 10 farm plots.

Several times a year she holds festivals (harvesting or planting) for non-farmers so that they can enjoy farming. She also accepts female trainees who want to become farmers and sell vegetables. She works with two other people, both of whom are disabled, but she is the farm manager.

Mrs. Y told us that this summer was exceptionally hot, so hot that she was unable to work during some daytime hours. She missed the planting season for several vegetables she had planned to plant because the soil’s surface temperature was too high.

Because she lives in one of the commuter towns near central Tokyo and commutes to her farm land, she does not have conventional, traditional rural community ties. People do not expect her to play traditional women’s roles, but she did tell us she went through a period in which she had difficult relationships with older male farmers near her farm plots.

Interview 3: Suzaka, Nagano

We interviewed Mrs. K who lives in Suzaka City, Nagano Prefecture. She is in her 60s and has many official duties in her hometown and in a women farmers’ network. She is one of the founding members and now the vice-president of a national female farmers’ network. She was born in Kanagawa Prefecture near Tokyo and came to this rural town after marrying her husband. Prior to that she worked as a Kanagawa prefectural government official. She learned farming from her father-in-law and other farmers in town. She also took seminars hosted by agricultural associations.

Her husband works at a private company in one of the nearby cities, so after her father-in-law retired, she began to manage the K family farm. She has been recognized as a good skilled farmer, growing cherries, grapes, and other fruits. Similar to the S family, she also does not sell her fruit at the market but sells directly to her own customers.

When we asked about the gender issue, such as unequal treatment of women, she replied, “If women have will, they can overcome it.” Even though she knew nothing about farming when she first came to Suzaka (the small city she now lives in), she told us that she was very surprised that other women did not think about the purpose of their farm operations. They merely did things because they were told to do so and showed little interest in the management of their own farms. She was also surprised that women were not aware of the pesticides they were using on their vegetables. She said, “They seem not to be independent farmers.”

She also talked about this summer’s extremely hot weather. Her grapes did not grow well, and some did not fully mature. She said that the temperature during the blossoming season was too high for honey bees to collect grape pollen, so many grapes were not pollinated. She told us that she was looking into grape varieties that are more suitable to hotter summers.

4.2.4 Gender and climate change and adaptation for our interviewees

Table 2 shows the summary of our three interviews. All three female farmers told us that, as the weather has become more unstable in recent years (especially in 2010), they have had to consider what to grow in the next season or year. It takes several years for fruit trees to grow and become ready for production, so fruit growers need to be especially careful when planning.

Table 2: Summary of Three Interviews of Female Farmers in Japan

Item	Kashiwa, Chiba	Hachioji, Tokyo	Suzaka, Nagano
Age	Early 50s (with husband, son, parents-in-law, and temporary workers) ^a	Early 30s (with two helpers)	Late 60s (with husband and temporary workers) ^a
Products	Asian pears (direct sales), vegetables, rice	Organic vegetables (direct sales)	Grapes, cherries (direct sales), vegetables (reduced chemical use)
Current impact of hot summer	Irregular harvesting, especially late-harvest pears; bigger pears, especially early ones; reduced harvest	Fewer working hours (only mornings and evenings); less germination (high soil temperature)	Irregular harvesting; poor development of grapes
Response (this year)	More labor required, rescheduled work plan		Change variety of grapes, rescheduled work plan
Response (long-term planned) ^b	Plan the introduction of new varieties of Asian pears	Search for new vegetables that are suitable for hot summers	Try new grape varieties

Notes: ^aThe farm management agreement; ^bAll of the farmers received local extension service to search for new varieties.

Source: Authors

All three of our subjects managed their farms in their own style, either as an equal partner with a husband or as a farm manager. Because of this, no one complained about gender-related issues. In addition, there is a decreasing number of male farmers in the Japanese agriculture sector, and new farmers are needed, whether male or

female. Also, the rural community in Japan is changing so that there are weaker family ties and community constraints. Mrs. K was something of an exception. She is a founding member of a women's network of farmers. She said that gender issues include the issues of awareness and independence of female farmers for farm management and everyday life, which was the reason for originally creating the women's network.

5. CONCLUSION

Gender issues have not been overcome, even in developed countries; it is not a problem that is solved automatically with economic growth. According to our analysis, women who are in relatively weaker positions still suffer gender-bias problems, as was shown in our example of the female manager of a private company being demoted because she took too long to return to work after a flood. But this issue of gender-differentiated impacts can be resolved by changing institutional settings in the labor field.

In socially "marginal" sectors, such as agriculture, whose labor decreased dramatically, and its sales are less than some of the largest automobile companies, however, where women often constitute the majority of the labor force, some women seem to have overcome or at least improved gender-related problems. In many sectors, women are seen to be "victims," but as we have seen in the case study of Japanese female farmers, with governmental institutional arrangements, such as the farm management agreement, they can manage their own situations independently when facing the impact of a changing climate. They have enough ability to cope with the changing climate, and will adapt accordingly. To enable them to do so, the Government of Japan has improved institutional arrangement towards gender equality, and encouraged female farmers to establish their own networks. Reflecting their voices to current policies is the key to improving a gender-biased society towards a less biased sustainable society. From our results we can propose an effective approach for climate change adaptation and gender issues as follows:

- (i) Identify the institutional deficit of gender-unequal laws and rules, such as land ownership and the inheritance system. Sometimes, they violate the constitution.
- (ii) Recognize gender-biased social norms in society. Even where there exists strong gender-biased norms, governments can establish less gender-biased social systems, as has been done in Japan, as often those systems are more economically and/or socially efficient. Be practical.
- (iii) Listen to people's voices and reflect those constructive ideas in the social systems so as to solve social contradictions, such as the dual responsibility of women in the workplace and in the home or community. We saw this case in the recovery process of water-related disaster.
- (iv) Points (i)–(iii) are also applicable for international aid agencies, as we have seen in the case of the Maldives after the 2004 tsunami. Gender-blind aid will worsen the situation of women, and that will be a huge loss to society.

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