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Food Crises and Gender Inequality

Bina Agarwal

Abstract

This paper examines the current food crises, the projected effect of climate change, the vulnerabilities created by regional concentrations of food production, imports and exports, and the significant role of women as food producers, consumers and family food managers. Bridging productivity differentials between male and female farmers, by helping women overcome production constraints, would significantly increase agricultural output. This becomes an imperative, given the feminization of agriculture. Institutionally, a group approach to farming would help women and other small holders enhance their access to land and inputs, benefit from economies of scale, and increase their bargaining power economically and socially.

JEL Classification: J16, J43, Q13, Q15, Q18

Keywords: food crises, food security, gender inequality, women farmers, agricultural productivity, gendered constraints, and group farming

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Contents

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Food Crises and Gender Inequality[1]

Bina Agarwal

Summary

This paper examines the nature of the current food crises, the projected effect of climate change on food availability in developing countries, the vulnerabilities created by regional concentrations of food production, imports and exports, and the significant role of women as food producers, consumers and home food managers. A substantial body of work demonstrates that bridging the productivity differentials between male and female farmers, by helping women farmers overcome the production constraints they face, could significantly increase agricultural growth and output. This also becomes an imperative, given that the proportion of women in the total agricultural work force has been growing across the developing world, thus tending toward a feminization of agriculture.

Institutionally, the paper makes a case for a group approach to farming, arguing that this would be more effective than individual family farming in helping women and other small holders enhance their access to land, overcome many of their production constraints, take advantage of economies of scale, and increase their economic and social bargaining power. Successful examples of group farming in several transition economies and in India demonstrate the feasibility of this approach. Some additional measures that could help women and their families improve their access to food are outlined as well. Overall, a concerted focus on women as farmers, food consumers and family food managers would enhance food security at all levels: within the family, the country, and globally.

1. Introduction

Of the several crises looming before us globally, perhaps the most significant, of the longest duration, and the most endemic, is the crises of food security and chronic world hunger. These are issues of longstanding concern and the alleviation of hunger is one of the most important millennium development goals. But this crisis has an added urgency with developments in recent years, such as the rise in global food prices; the shift in global cropping patterns from foodcrops to biofuels in major food exporting countries; long-standing governmental neglect of agriculture, especially in terms of infrastructural investment, in many developing countries; and the looming threat of climate change and its expected adverse effect on food production.

These developments are both cause for serious concern and an opportunity for change, since there is now a renewed global interest in agriculture to reduce constraints to economic growth and improve food security. There is also a growing recognition of the need to tap the potential of small farmers, a vast number of whom are women.

1 This is an updated and revised version of a paper written as a background document for the United Nations Committee for Development Policy, New York, for the subtheme 'Global Crises: Why Gender Matters', 2010. I also draw upon Agarwal (2011). I thank Frances Stewart, Ana Cortez, Hiroshi Kawamura, Raghav Gaiha, Ramesh Chand, Joachim von Braun, Sara Ahmed and Sudipto Mundle for their helpful comments on the earlier draft, and Ram Ashish Yadav and Swati Virmani for their research assistance. I am also most grateful to Teri Raney and Andre Croppenstedt at the Food and Agricultural Organization, Rome, for sharing their background material on women farmers and agricultural productivity.

Food security, however, is a complex issue. It requires both adequate food availability and economic and physical access to what is available. The quality of food (e.g. adequate micronutrients) is also important. In each of these respects, women's role is pivotal. Women are major food producers and so are significant contributors to food availability. Their access to food has an important bearing on their own food security and that of their families. And food quality is of particular importance for women, given their special needs during pregnancy and lactation.

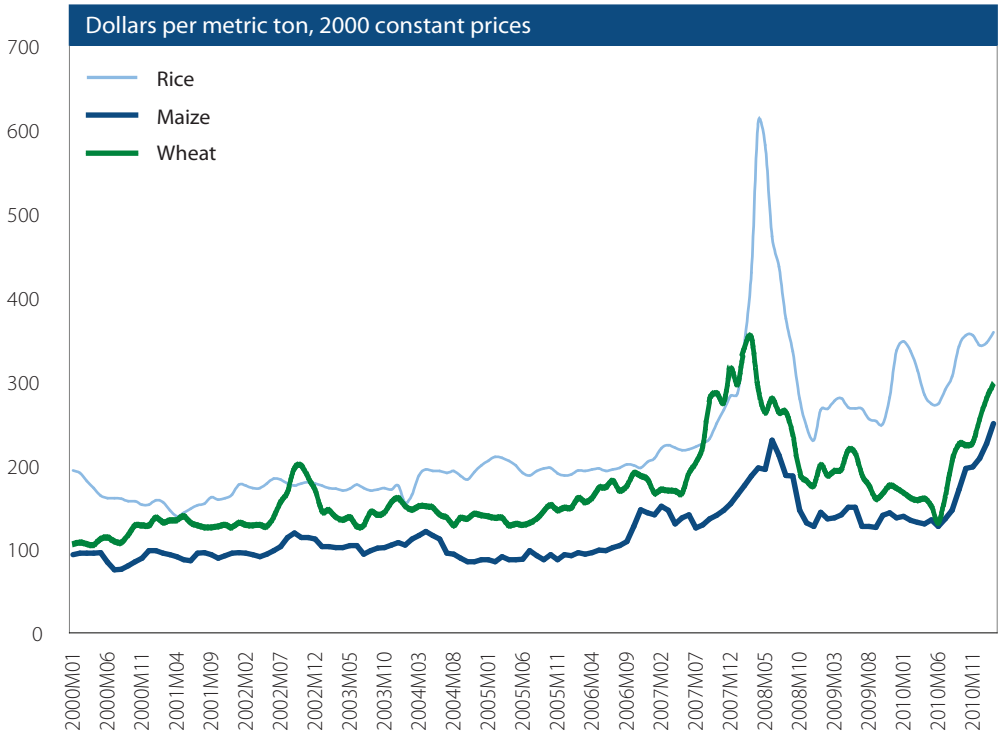
This paper will spell out: (i) the nature of the current food crisis and what we may expect with climate change; (ii) the importance of women as food producers, the endemic production constraints faced by women farmers, and the significant potential for increasing agricultural production globally, by helping women overcome these constraints; (iii) Women as consumers and home food managers, and gender unequal access to food; and (iv) how the constraints and inequalities women face as producers, consumers, and family food managers could be overcome. In this context, the paper will especially outline the benefits of a group approach to farming, and illustrate its effectiveness with ground examples of success.

2. The nature of the food crises

2.1. The current crisis: underlying features

In 2007/08 we saw a dramatic rise in food prices. The food price index rose by nearly 40 per cent relative to 9 per cent in 2006 (von Braun 2008). Wheat price almost quadrupled and maize prices almost tripled between 2000 and 2008 (figure 1). As would have been expected, the adverse effects of price rise fell on foodgrain importing countries and on the net buyers of foodgrains within countries (Quisumbing, *et al.* 2008, see also von Braun 2008-09). The worst affected were the poor, especially women and children in

Figure 1: Food price rise for major crops, 2000 to 2010



Source: Joachim von Braun (2008), updated by him.

poor households. By World Bank estimates, the price rise added 105 million to the poor, mostly in South Asia and sub-Saharan Africa (Ivanic and Will 2008). Although the 2007/08 spike in prices was especially dramatic, the overall upward trend in food prices continues and is cause of major concern globally, as is the prospect of price volatility.

An important underlying factor in the price rise, and one which also impinges on long-term prospects of food security, is the regional concentration of foodgrain production and exports. In 2008, Asian farmers produced 90 per cent of the world's rice and around 40 per cent of its wheat and total cereals (table 1). But most Asian countries consume what they produce, and the exports come from only a few. For instance, although over 80 per cent of rice exports came from Asia in 2008, the exporters were essentially Thailand, Vietnam, India and Pakistan, in addition to the USA which contributed 11 per cent of rice exports. Similarly 85 per cent of wheat exports came from only four regions: North America, Russia, Europe and Australia; and 81 per cent of maize exports came from North America and Latin America (especially Argentina and Brazil). Taking all cereal exports together, 65 per cent came from North America and Europe (figure 2).

Not only does this regional concentration mean over-dependency on certain countries for fulfilling the needs of food deficit regions, but it also means that policies in the exporting countries can overly influence global foodgrain availability and prices: for instance, foodgrain availability can fall and prices rise, if

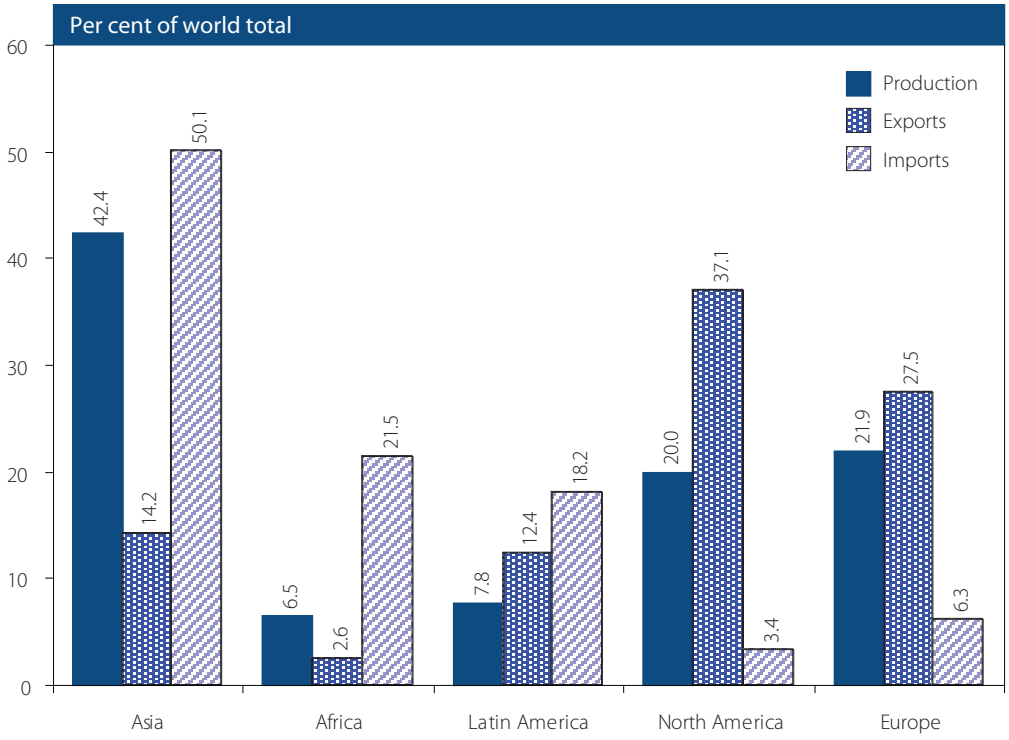
Table 1: Production, exports and imports of rice, wheat, maize and total cereals by world's regions, 2008

Percentages

	Production	*Exports*	*Imports*
Rice			
Asia	90.4	80.1	47.0
Africa	3.7	1.7	31.5
Latin America	3.9	6.6	10.9
North America	1.4	10.9	3.3
Europe	0.5	0.3	6.0
Wheat			
Asia	40.3	8.2	48.2
Africa	3.1	0.6	25.9
Latin America	3.2	5.9	15.8
North America	14.1	35.1	2.3
Europe	36.1	40.4	7.3
Australia	3.2	9.7	0.0
Maize			
Asia	28.4	3.3	50.9
Africa	6.9	4.9	15.5
Latin America	14.6	26.9	25.9
North America	38.8	54.4	2.9
Europe	11.2	10.4	4.8
Total cereals			
Asia	42.4	14.2	50.1
Africa	6.5	2.6	21.5
Latin America	7.8	12.4	18.2
North America	20.0	37.1	3.4
Europe	21.9	27.5	6.3

Source: Calculated from FAO Statistics (http://faostat.fao.org).

Figure 2: Production, exports and imports of total cereals by world's regions, 2008



Source: Based on FAO Statistics (http://faostat.fao.org).

the exporting countries shift large areas from foodgrains to biofuels, or cut exports to deal with their own needs, or manage their agriculture inefficiently, or do little to control speculative hoarding.[2] Adverse weather conditions can compound these other effects. In fact, these are exactly the kinds of factors that underlay the 2007/08 price rise.

In 2007/08, almost 100 million tonnes of cereals, or 4.8 per cent of all cereals produced, went into ethanol production, and 33 per cent of the United States' corn production in 2008-09 was similarly used.[3] American farmers, in particular, shifted large areas out of soybean and wheat to maize for biofuel, especially due to government subsidies for growing energy crops. If the shift from food to biofuel persists, it will have a major adverse impact on world food security, especially in poor importing countries. Several countries in Asia (such as China and India) and in Latin America, restricted their exports in varying degree, as a short-term response. This too worsened foodgrain availability for importing countries (von Braun 2005).

To these short-term factors, we need to add long-term ones such as (i) dietary shifts toward meat and milk with rising incomes in developing countries, leading to a higher demand for grain as livestock feed and the land to grow it;[4] (ii) rising world population, which is predicted to be 9 billion by 2050; and (ii) neglect of agriculture in developing countries over a long period, reflected especially in falling public

2 Insecurity in food availability and expectations of rising prices can, in turn, trigger security hoarding by millions of consumers. According to Timmer (2010), this too was an underlying factor in the rice price surge in 2007/08.

3 The figures for all cereals were obtained from Ramesh Chand directly, and those relating to corn from Chand (2009).

4 Estimates by Mark Rosegrant at IFPRI indicate that halving meat consumption in the OECD countries, Brazil and China by 2030 would free over 200 million hectares of land globally, which would otherwise be used for raising livestock. This land, if used for non-meat food production, would make a substantial difference to foodgrain availability globally, and to food security and nutrition in developing countries. (Power point presentation by Mark Rosegrant at the international conference on Agriculture-Nutrition-Health Linkages, New Delhi, February 2011).

investment in agricultural infrastructure. Foodgrain production has not kept pace with requirements. In addition, we have the predicted averse effects of climate change on crop production.

2.2. Predicted crises with climate change

By all predictions, climate change (CC) is likely to have a major negative effect on food security, and is the single most important factor likely to drive food crises in the long-term. The projected drying up of many water sources, increased frequency of droughts and floods, the submersion of some land masses under rising sea levels, and so on, will all stress agricultural systems. Crops will suffer from heat stress and water stress with a rise in temperatures and precipitation.

Although estimates of the extent of CC impact vary, they are consistent in their predictions about which regions will be affected the most. The International Food Policy Research Institute (IFPRI) in Washington DC, for instance, in its 2009 assessments (based on data from the National Centre for Atmospheric Research, which uses IPCC information) predicts that CC will have dramatically adverse effects on food security worldwide, but especially in South Asia and sub-Saharan Africa. In specific terms, yields and production for the most important staples will fall globally, but especially in these two regions (table 2). In 2050, relative to the no climate change (NCC) scenario it is predicted that CC will lead to a lower production of rice, wheat and maize, by around 14 per cent, 49 per cent and 9 per cent respectively in South Asia, and by 15 per cent, 36 per cent and 7 per cent respectively in sub-Saharan Africa. In East Asia and the Pacific, rice production is predicted to be lower by about 11 per cent, although wheat is expected to increase by about 2 per cent due to CC (table 2). By these counts, the world production of rice will be no different in 2050 than in 2000 (figure 3).[5]

Table 2: Climate change effect on 2050 production relative to no climate change effect

Percentage difference

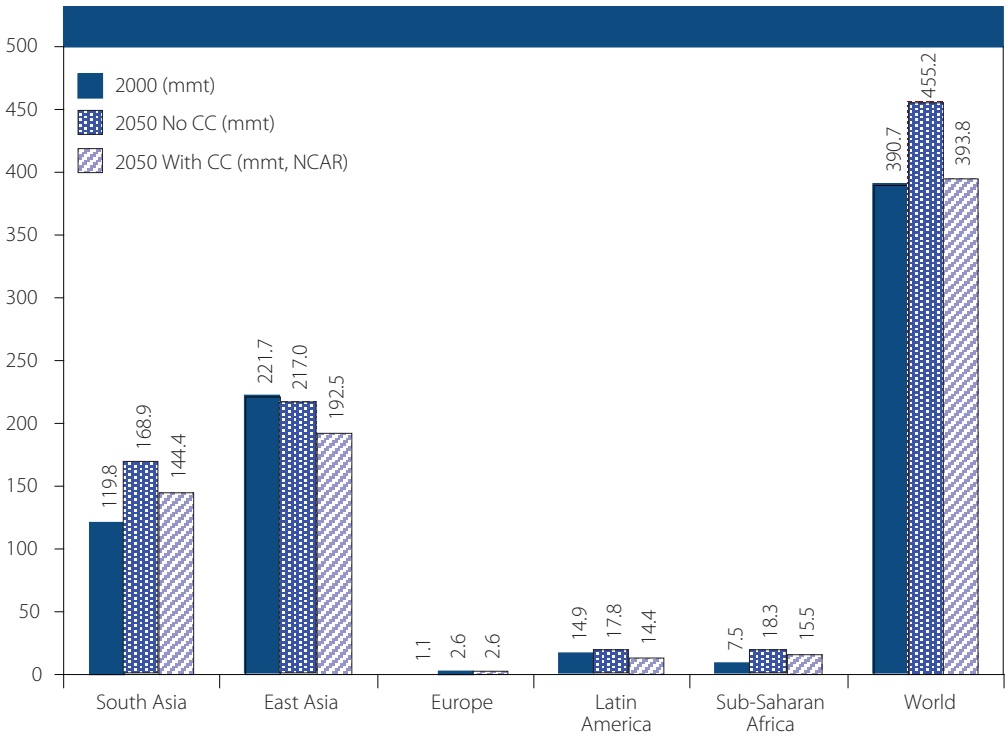
	Rice	*Wheat*	*Maize*
Region			
South Asia	-14.5	-48.8	-8.9
East Asia and Pacific	-11.3	1.8	8.9
Sub-saharan Africa	-15.2	-35.8	-7.1
Latin America	-19.2	17.4	-4.0
World	**-13.5**	**-27.4**	**-0.4**

Source: IFPRI (2009).

In turn, these productivity dampening effects, coupled with growing demand as populations and incomes rise, are expected to trigger substantial price increases in all the major crops—rice, wheat, maize and soybeans. These price increases need not translate to increased production, given supply side constraints faced by small producers who constitute a vast proportion of farmers in developing countries. Also higher feed prices will lead to higher meat prices. Most importantly, it is predicted that output will not keep pace with population increases, leading to a lower availability of per capita calories in 2050 relative to the 2000 levels, throughout the developing world (figure 4). As a result, child malnutrition is estimated to be 20 per cent higher relative to the NCC scenario (IFPRI 2009).

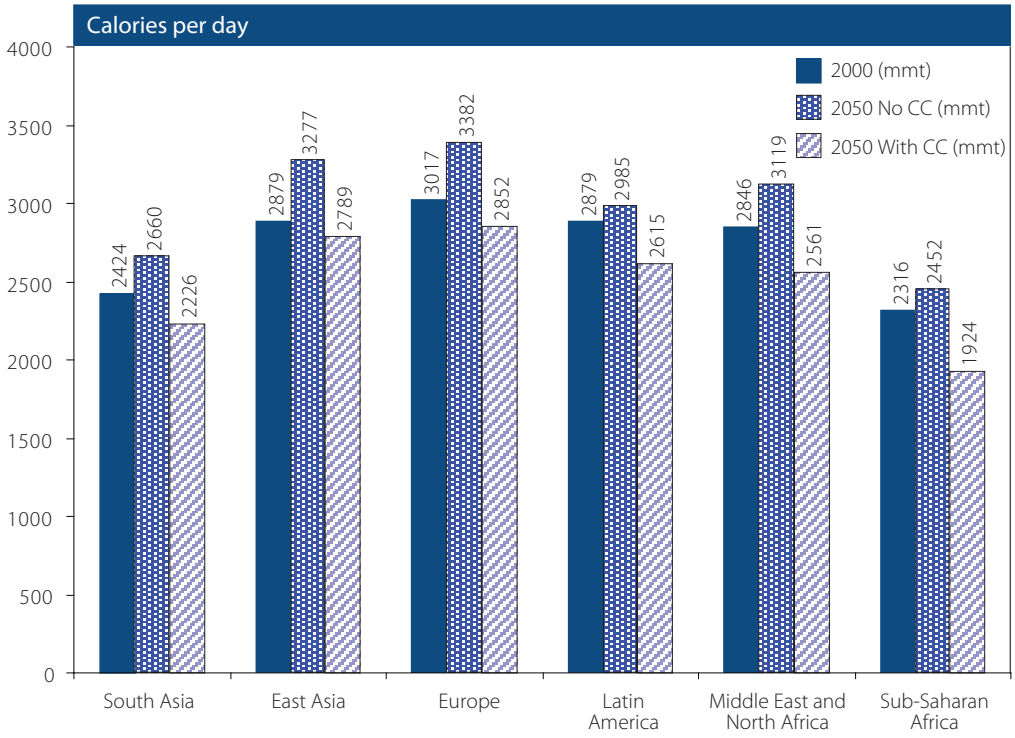
5 IFPRI gives two estimates of climate change effects on crop production, with differing scenarios for (spatially disaggregated) temperature increases, precipitation, and so on. The illustrative estimates I have given are those based on data from the National Centre for Atmospheric Research. Also, the estimates cited do not adjust for 'carbon dioxide fertilization', but estimates adjusted for CO2 fertilization still give adverse predictions for yields in developing countries for the major crops, although less so than the unadjusted figures.

Figure 3: Climate change and rice production



Source: IFPRI (2009).

Figure 4: Climate change and daily per capita calorie availability



Source: IFPRI (2009).

These effects are again likely to fall disproportionately on the poor. Even without CC, extraordinary efforts will be needed to meet the food security demands of the estimated 9 billion people by 2050. This is even more imperative with CC. Indeed, even with the best efforts at mitigating climate change, poor farmers, and especially women and children, are likely to be affected adversely. For sustainability we need long-term efforts to increase production, stabilize availability, and improve distribution. And the key focus of these efforts needs to be on women as farm managers and farm workers as well as consumers and family food managers.

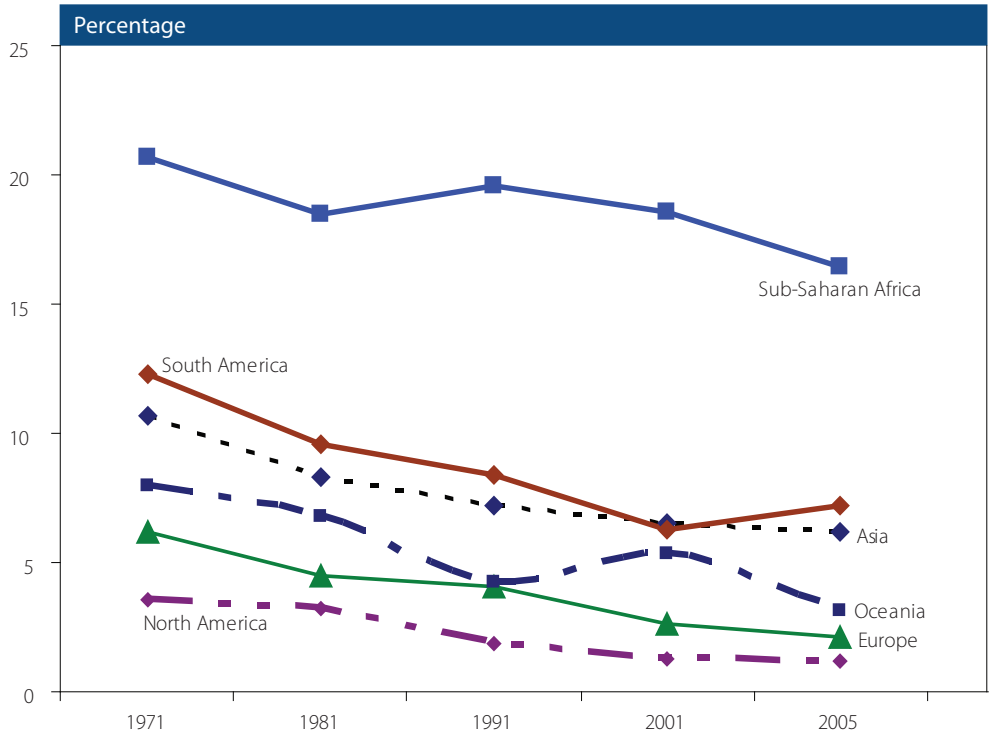
3. Women as food producers, consumers and home food managers

Who produces the world's food? In many developing countries, agriculture has been contributing a decreasing proportion of the GDP, but continues to be a major source of employment and livelihoods. This is especially so in Asia and Africa. In all the world's regional blocks, other than sub-Saharan Africa, agriculture contributes under 10 per cent of the GDP (figure 5). And although everywhere the percentage of workers in agriculture has been declining, it still remains close to 60 per cent in Asia and Africa (figure 6). This divergence between agriculture's GDP contribution and the population it supports, in major developing regions of the world, means that many are trapped in low productivity livelihood options. And there is a gendered nature to this trap, given the feminization of agriculture.

3.1. The feminization of agriculture

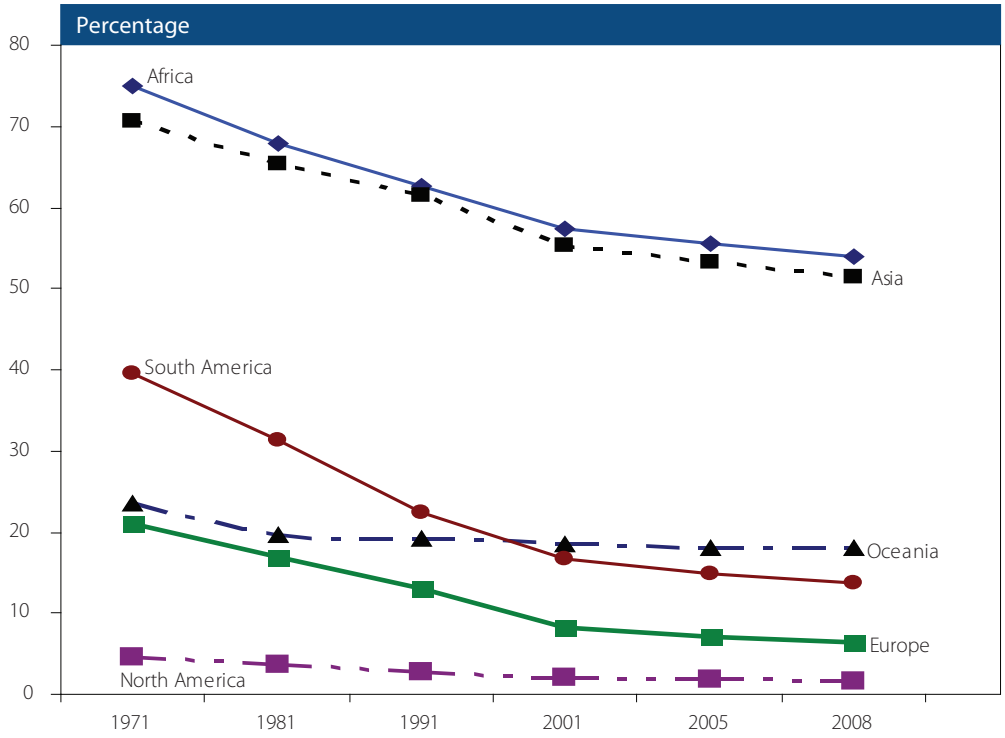
Women workers remain much more dependent on agriculture for survival than male workers, due to their lesser access to non-farm jobs. In Africa in 2008, for instance, 63 per cent of female workers relative to 48 per cent of male workers depended on agriculture-based livelihoods. The figures for Asia are 57 per cent for females

Figure 5: Per cent GDP from agriculture: world's regions



Source: World Resource Institute (WRI) Statistics, see Earth Trends (http://earthtrends.wri.org).

Figure 6: Per cent total labour force in agriculture: world's regions



Source: Based on FAO Statistics (http://faostat.fao.org).

and 48 per cent for males respectively (see figures 7 and 8). In India, in 2004-05, 49 per cent of male workers but 65 per cent of female workers, and 83 per cent of rural female workers were still employed in agriculture.[6]

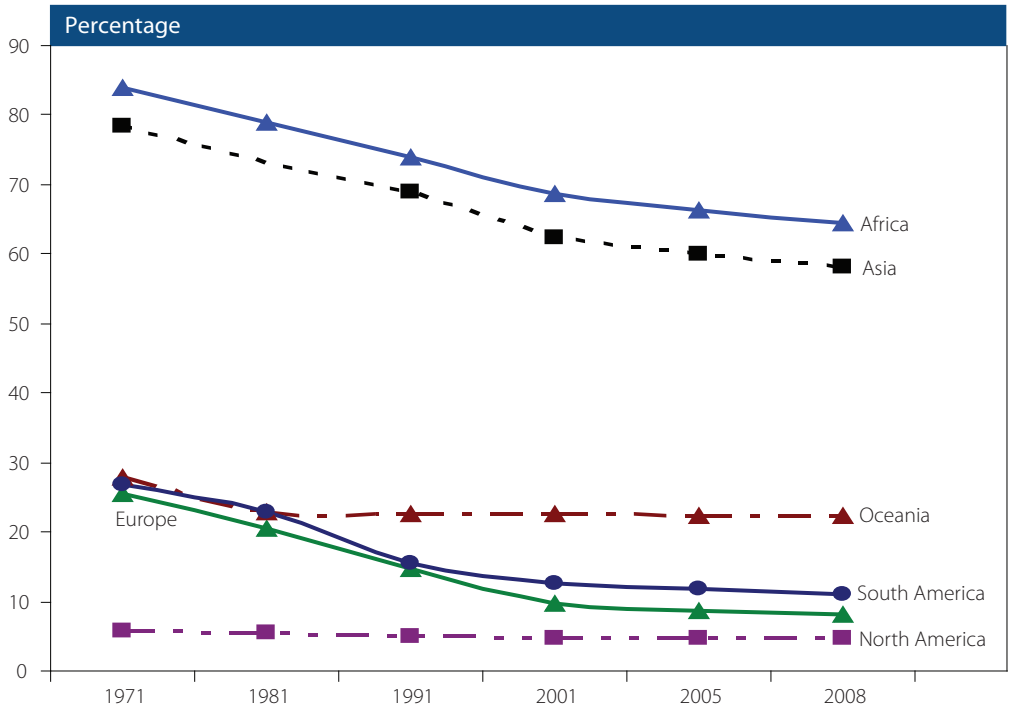
Women now also constitute a substantial proportion of the *total* agricultural labour force. In Asia as a whole, for instance, women constituted 43 per cent of all farm workers in 2008, with percentages as high as 52 in Cambodia and the Lao People's Democratic Republic, 50 in Bangladesh, 49 in Vietnam, and 48 in China (table 3). In the world's major rice producing and exporting regions therefore almost half of agricultural workers are women. In Africa, again, women form almost half the agricultural work force.

Also, based on time use data for parts of Sub-Saharan Africa, India and China, Doss (2010: 9), notes that if we take time spent on food production, processing and preparation, women contributive 60-70 per cent of the total labour needed to bring food to the table in developing countries.

Indeed, not only is our dependence on women's work in agriculture high but it is growing. Men in much greater extent than women have been moving to non-farm jobs. In all parts of the world except Europe, over the past four decades, women workers have been rising as a proportion of the total agricultural work force—in some cases gradually, as in Asia, and in other cases substantially, as in Oceania and South America (figure 9). In other words, we are seeing a move toward the feminization of agriculture (defined here as a rise in the proportion of women in the total agricultural work force, even if the absolute proportion remains half or below). Clearly, the agrarian transition—the shift of workers from agriculture to industry and services, and from rural to urban areas—that is expected with development, has been highly gendered.

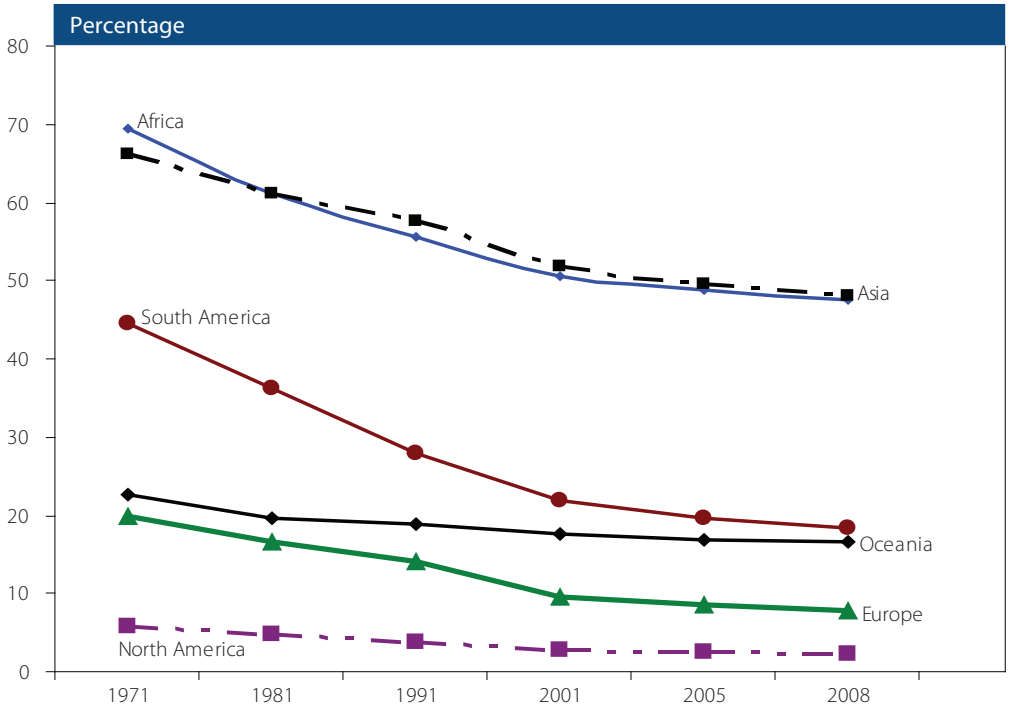
6 Computed from NSSO 2004-5 and population projections from the 2001 census given in GoI (2006)

Figure 7: Female labour force in agriculture as a per cent of economically active female population: world's regions



Source: Based on FAO Statistics (http://faostat.fao.org).

Figure 8: Male labour force in agriculture as a per cent of economically active male population: world's regions



Source: Based on FAO Statistics (http://faostat.fao.org).

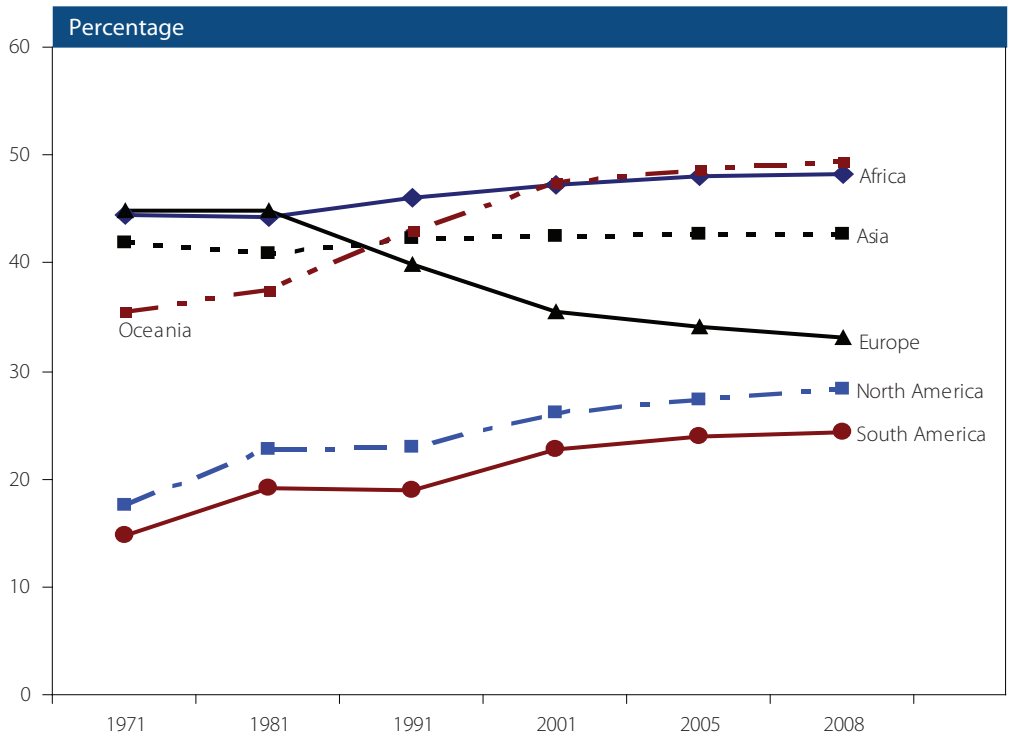
Table 3: Per cent females in total agricultural labour force: Asian countries

Region/Country	*1971*	*1981*	*1991*	*2001*	*2005*	*2008*
South-East Asia						
Cambodia	52.7	57.7	55.5	54.0	52.3	51.6
Indonesia	30.0	33.9	38.9	38.9	39.2	39.2
Lao People's Democratic Republic	48.1	51.4	51.3	52.1	52.6	52.5
Malaysia	38.6	41.1	31.3	25.6	23.3	21.9
Philippines	23.0	27.5	24.2	24.9	24.3	24.0
Thailand	49.9	49.2	47.3	46.1	46.0	45.3
Viet Nam	47.4	50.7	51.1	50.3	49.8	49.4
South Asia						
Bangladesh	42.9	42.8	45.7	46.2	48.3	50.0
Bhutan	39.7	25.9	22.6	24.4	30.0	34.2
India	39.3	32.3	32.5	32.3	39.7[a]	39.7[a]
Nepal	41.5	35.4	39.9	44.3	46.6	47.6
Pakistan	29.9	17.0	19.4	22.6	26.1	28.3
Sri Lanka	20.2	34.6	36.4	34.6	36.1	37.2
East Asia						
China	44.3	45.8	47.3	47.9	48.0	48.0
Asia	**41.9**	**40.9**	**42.3**	**42.4**	**42.6**	**42.6**

Source: Calculations based on FAO Statistics (http://faostat.fao.org).

a Figures for India is calculated from the 2004-05 National Sample Survey data.

Figure 9: Per cent females in total agricultural labour force: world's regions



Source: Based on FAO Statistics (http://faostat.fao.org).

To revive and sustain agricultural growth, as well as adapt to or mitigate climate change, the role of women farmers will thus be central. How effectively they can contribute, however, will depend crucially on their having secure rights in the land they cultivate, as well as access to credit, and inputs such as fertilizers, irrigation, technology, information on new agricultural practices, and marketing infrastructure.

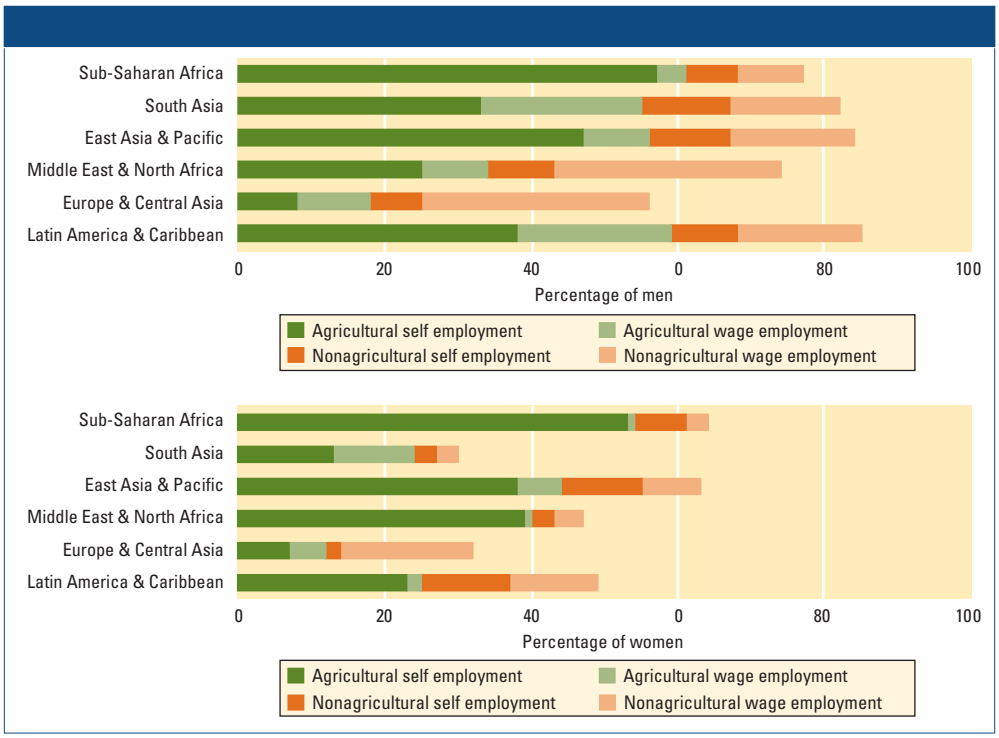
3.2. Production constraints and implications

Although the proportion of women farmers is growing, they face a wide range of gendered constraints which affects their productive potential as agricultural workers.

First, women farmers, like the majority of farmers in developing countries, operate small farms (in India 70 per cent of all farms are one hectare or less in size and 80 per cent are under two hectares). Landlessness has also been growing in many regions. Women, in any case, have historically been largely landless in that most own little or no land themselves. A vast proportion of women farmers work as unpaid labour on family farms, or as landless labourers on the fields of others, or under insecure tenure arrangements on land obtained through the family or markets. Figure 10 gives the proportions of agricultural self-employment and wage labourers, by gender (World Bank 2007: 80). In most regions, the 'self-employed' women are typically those working on family farms where the land is owned by men (be it husbands or male in-laws), rather than by themselves.

Although few countries collect country-level gender-disaggregated data on land or asset ownership, information gleaned from those that do, and from small-scale studies in others, show a substantial gender inequality. In most of South Asia, except Sri Lanka, for instance, few women own land (Agarwal 1994). In Nepal—a rare country which collected information on landownership by gender in its 2001 census—women

Figure 10: Self-employed and wage workers by gender and sectors: world's regions



Source: *Agriculture for Development, World Development Report 2008* (World Bank 2007: 80).

Notes: Regional averages based on available household surveys for 66 countries (ages 15 to 64). The omitted group includes individuals out of the labor force and individuals whose economic activity is not defined. Activity refers to the individual's reported principal activity.

were found to own land in only 11 per cent of all rural households and 14 per cent of landowning rural households in 2001 (Allendorf 2007). In India, although there are no comprehensive data for ownership holdings, the Agricultural Census 1995-96 shows that women held only 9.5 per cent of all operational (i.e. cultivated) land holdings (GoI 1995-96). In rural China, women constitute an estimated 70 per cent of those without access to their own land under the family land use allotment system (Li 2003: 4).

Within Asia as a whole, the gender gap is much larger in South Asia than in Southeast Asia; and within South Asia the gap is larger in the northern belt (northwest India, Bangladesh, and Pakistan) than in south India and Sri Lanka (Agarwal 1994). Underlying these regional variations are differences in laws, culture (especially post-marital residence and the ideology of female seclusion), ecology (e.g. women's work contribution is more visible in rice farming systems), ethnic and religious diversity, political freedoms and overall development.[7] In Africa again, wherever there are data, we see substantial gender gaps. Deere and Doss (2006) note that in Ghana women held land in only 10 per cent of the households relative to 16-23 per cent among men. In Kenya, women are 5 per cent of registered landholders. In Latin America, too there are notable gender inequalities in land ownership (Deere and de Leon 2001; Lastarria-Cornhiel and Manji 2010). In addition, even when women have access to land, their control over it (say, in terms of rights to lease, mortgage, or sell it, or use it as collateral) tends to be more restricted than men's (see e.g. Saito, Mekonnen and Spurling 1994, for Nigeria and Kenya).[8]

A comparison of land held by male and female headed households is also revealing.[9] According to data complied by the FAO for 20 countries, based on household surveys, male headed households (MHHs) operate much larger land holdings on average than female headed households (FHHs). In Bangladesh, Ecuador and Pakistan, for instance, the holdings of male household heads are twice those of female household heads (FAO 2011: 23-24; see also studies for other developing countries summarized in Anriquez 2010). Moreover, Anriquez (2010) finds that rural FHHs have a higher share of dependents who are elderly (over 64 years of age), while rural MHHs have a higher share of dependents who are children. FHHs are thus likely to be more labour constrained than MHHs who would have access to youth labour as the children grow to adulthood.

Second, there are well-documented gender inequalities and male bias in women farmers' access to technical information, credit, extension services, critical inputs such as fertilizers and water, and marketing (World Bank 2009, FAO 2011, Peterman, Behrman and Quisumbing 2009). Membership in rural cooperatives which provide inputs is also predominantly male in most countries.[10] In addition, there are significant gender differences in tools owned by male and female farmers. In Kenya, for instance, the value of farm equipment owned by FHHs was found to be half that owned by MHHs (Saito, Mekonnen and Spurling 1994: 23).[11] In Gambia, less than 1 per cent of women farmers were found to own a weeder, seeder or

7 In Sri Lanka, for instance, historically all communities, irrespective of religion, recognized women's land claims, and the country's favourable social indicators (over 90 per cent female literacy, gender-balanced sex ratios) cannot be delinked from Sri Lankan women's historical advantage in command over productive assets.

8 When household heads were excluded from the sample, Saito, Mekonnen and Spurling (1994: 48) found notable gender differences even in terms of rights to improve the land: a substantially lower percentage of women farmers than male farmers had such rights. This has important implications for relative productivity on the farms.

9 However, this does not tell us how much of all land is held by women, or what percentage of all women hold land, for which we need data on intra-household ownership and not just by head of household.

10 For some African countries, see Saito, Mekonnen and Spurling (1994).

11 Most women surveyed used simple tools and few owned tractors or oxen.

multiuse agricultural implement, compared with 12, 27 and 18 per cent respectively of male farmers (cited in Peterman, Behrman and Quisumbing 2009: 28). At the same time, in a rare study which examined the productive efficiency of men and women in using potato digging equipment, women were found to be several times more productive than the men by all the measures used. For instance, women and men took 69 and 185 hours respectively for the same job; and women's potato digging yield rate was 23.9 kg per 20 meters while men's was 18.2 (Agarwal 1983: 56).

Third, women face social restrictions in public participation and mobility in many regions (such as in northern South Asia, the Middle East and North Africa). This adversely affects their ability to freely procure inputs or sell their produce or hire labour. In other words, it restricts their ability to function fully as farmers (Agarwal 1994, FAO 2011, World Bank 2009).

Fourth, these disadvantages, in turn, restrict women's ability to take advantage of opportunities for higher value production. Lack of secure land rights and other resources, for instance, can exclude women farmers from contract farming arrangements, as recent research in Kenya and Senegal indicates (Dolan 2001, Maertens and Swinnen 2009), even while they put in much of the labour on family farms where men hold the contracts (FAO 2011). Women are also constrained in their ability to adopt high yielding varieties and improved management systems due to poorer access to extension services (see Doss 2001, for African women farmers).

Without steps to bridge these gender gaps in access to production inputs and services, the growing proportion of women in farming will remain confined to low productivity agriculture. Infrastructural development and other measures taken to revive agriculture will not reach them. Given the existing and growing importance of women in food production systems, this will grossly undercut the world potential for increasing agricultural output, ensuring food security, and promoting measures to mitigate climate change.

In contrast, a substantial body of evidence is now available to indicate that reducing gender inequalities in access to land, agricultural inputs, and support systems can have a significantly positive effect on farm productivity. In contexts where men and women cultivate both separate and joint plots, as is common in sub-Saharan Africa, the effects are especially revealing. There are now a large number of studies for sub-Saharan Africa which measure productivity differences between male and female farmers. The studies vary in their methodologies, and in what they measure (some examine gender differences in individual crop yields, others all farm output, yet others farm incomes), but all of them are based on medium to large sized samples and statistical analysis. Typically the differences measured relate to a comparison of female and male headed households, but a few studies measure differences between plots managed by men and women within the same extended household.

In terms of results, a fair number of studies show no statistically significant differences in managerial efficiency by the gender of the farmer in terms of crop yields or production.[12] Some show mixed effects, for instance, no significant effect at the household level, but significant effects by the gender of the plot manager (see e.g. Saito, Mekonnen and Spurling 1994 for Nigeria). The majority of studies, however, find lower yields on women's plots/farms, but attributable to one or more of the following constraints: women's lower access to

12 See e.g. Adesina and Djanto (1997) for Cote D'Ivoire; Adeleke, *et al.* (2008) for Nigeria; Kumase, Bisseleua and Klasen (2008) for the Cameroon; Moock (1976), and Bindlish and Evenson (1993) for Kenya; and Quisumbing, *et al.* (2001) and Hill and Vigneri (2009) for Ghana.

inputs, especially fertilizers; insecure land rights; lower access to male labour, oxen labour, and extension services; and difficulties in ensuring timely ploughing, weeding, or transportation.[13]

A few studies even show that if women had access to the same inputs and extension services they would have higher outputs than male farmers.[14] Dey (1992) finds that in Kenya maize yields were almost 7 per cent more on female-managed farms than on male-managed ones, when they had the same access to extension. In Burkina Faso, Udry, *et al*. (1995) estimated that output could be increased by 10-15 per cent if factors of production (such as manure and fertilizers) were reallocated from men's plots to women's plots in the same household. Quisumbing (1996) concludes that if Kenyan women farmers had the same access as male farmers to agricultural inputs and experience, their crop yields could increase by up to 23 per cent. This could have led to a doubling of Kenya's GDP growth rate in 2004 from 4.3 to 8.3 per cent (World Bank 2009: 16).

There can also be an intra-household incentive effect if women have control over the products of their labour. In Kenya, for instance, the introduction of weeding technology in maize production raised yields on women's plots by 56 per cent where women controlled the output, and only by 15 per cent on the men's plots where too women weeded but men got the proceeds (Elson 1995). Since men tend to use more inputs and should therefore produce more output, this substantial difference may be seen as a disincentive effect when women do not receive compensation for their efforts within the family.

Studies in Asia are more sparse, but some work in East Asia shows that women farmers are as productive as male farmers,[15] or would be as productive with the same access to inputs and services (see Thapa 2008 for Nepal). A different kind of pointer is found from work in South Asia which shows that groups of women, farming collectively, have helped bring large tracts of fallow land under cultivation and enhanced household and community food security (see Agarwal 2003, and also section 4.3 of this paper).

The overwhelming conclusion derived from the existing body of work is that if women had the same access to inputs as men, production would increase substantially on their farms. According to FAO's 2011 *State of Food and Agriculture Report*, reducing the constraints faced by women farmers could raise yields on their farms by 20 to 30 per cent and raise agricultural output in developing countries between 2.5 to 4 per cent, thus making a substantial impact on food output and food security globally (FAO 2011).

3.3. Unequal food access

The second face of food insecurity, and of the longer-term food crises, is the lack of *access* to food, despite aggregate availability. There are high inequalities in food access across countries, within countries, and within households. By FAO's calculations for 2001-2003, there are an estimated 854 million undernourished persons across the world, of which 820 million are in developing countries, largely due to poverty (FAO 2006).

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13 See, for instance, Kinkingninhoun-Mêdagbé, *et al*. (2008) for Benin; Udry, *et al*. (1995) and Akresh (2008) for Burkina Faso; Kumase, Bisseleua and Klasen (2008) for the Cameroon; Tiruneh, *et al*. (2001) and Holden, Shiferaw and Pender (2001) for the Ethiopia highlands; Goldstein and Udry (2008) for Ghana; Saito, Mekonnen and Spurling (1994), Moock (1976), Alene, *et al*. (2008), and Ongaro (1990) for Kenya; Gilbert, Sakala and Benson (2002) for Malawi; Timothy and Adeoti (2006), Oladeebo and Fajuyigbe (2007) and Saito, Mekonnen and Spurling (1994) for Nigeria; Lilja, Randolph and Diallo (1998) for Senegal; and Horrell and Krishnan (2007) for Zimbabwe.

14 See Kumase, Bisseleua and Klasen (2008) for the Cameroon; Moock (1976) and Dey (1992) for Kenya; and Udry, *et al*. (1995) for Burkina Faso.

15 See e.g. Zhang, de Brauw and Rozelle (2004) for China, and Jamison and Lau (1982) for the Republic of South Korea.

An increase in the productivity of small farmers can reduce poverty and also increase food access among such households. But for ensuring food security for agricultural labourers and non-agricultural workers who do not grow their own food, increasing access to food will require enhancing their access to economic resources and employment, as well as improving rural roads for transporting grain where needed most, and establishing public distribution systems that work. Moreover, simply increasing household level access is not enough, since there are poor women and female children even within non-poor families, due to well known *intra*-household distributional inequalities in resources for food and health care.

It also needs recognition that in many developing countries non-marketed foods gathered from forests and commons provide an important supplement to diets and hence to food security.[16] The degradation and decline of forests and commons, coupled with women's declining access to common pool resources, means a fall in such supplements, especially in the diets of women in poor households (Agarwal 2000, 2010a).

All this strongly points to the critical need to reduce gendered inequalities in direct access to the means to acquire food. This is important in itself. But additionally, women's enhanced access to such means can bring diverse intergenerational benefits. Mothers who are well nourished during pregnancy and lactation, for instance, enhance the life chances and growth abilities of children. Assets and incomes in mothers' hands are also found to have significantly greater beneficial effects on the nutrition, survival, and health of children, than assets and incomes in fathers' hands.[17] In addition, women owning land face significantly lower risk of domestic violence, which, in turn, would reduce their own and their children's health and nutrition risks linked with such violence (Agarwal and Panda 2007). Increasing women's direct access to food will, however, involve improving women farmer's productivity; raising the capacity of women in non-farm households to obtain food through the market, by enhancing their incomes and assets; improving women's access to food items from common pool resources; and initiating schemes that directly raise food availability for women in poor households.

4. Overcoming the constraints

How do we overcome gendered constraints to enhancing food security? As noted, this will involve two major facets of policy. First, increasing the productivity of women as farmers, and second improving women's access to food, irrespective of whether they are farmers. Women can contribute to the alleviation of the food crises both as producers and as the main agents for improving their own and their families' food security.

4.1. Women as farmers: increasing productivity

This will require several steps, in particular the following:

- Recognizing women as farmers and not simply as farm helpers.
- Improving women's direct access to land and providing them security of tenure.

16 See e.g. Jodha (1986), Agarwal (1990), Agarwal (2010a) and Mazhar, *et al.* (2007). Mazhar, *et al.* (2007) found in a survey in Andhra Pradesh (south India), that village women could identify seventy-nine species of uncultivated leafy greens that they gathered for food, in addition to roots, tubers, and fruits; and in Bangladesh's Tangain district, such uncultivated plants provided, on average, 65 per cent of the food weight of poor landless households and 34 per cent of the food weight of better-off landed households.

17 See Strauss and Beegle (1996) for India; Thomas (1990, 1994) for Brazil; and Quisumbing and Maluccio (2000) for Bangladesh, Indonesia, Ethiopia, and South Africa.

- Increasing women's direct access to production credit, agricultural inputs, technology, technical information on improved agricultural practices, and marketing outlets.
- Directing more agricultural research and development to crops women's cultivate and based on a better understanding of women's farming systems.
- Institutional innovations, in particular promoting a group approach to farm investment and farming.

Consider each in turn.

First, the dominant perception of women as farm helpers and not as farmers can seriously affect the way in which assets, information and productive inputs are directed to farming families. Based on this perception, farming related services tend to be directed to household men rather than to women farmers themselves. These perceptions need to be changed. NGOs and the media can both play constructive roles in this respect.

Second, improving women's direct access to land and assets will require acting on three major sources of land: the family (via gift or inheritance), the state (via land transfers) and the market (via purchase or lease). Access via families depends especially on inheritance laws and their effective implementation. Such laws are gender equal in many countries of Asia and Latin America,[18] and are moving in that direction in many others. In India, for instance, the 2005 amendment of the Hindu Succession Act made inheritance laws relating to all property, including agricultural land, gender equal, for over 80 per cent of Indian women who are Hindus (Agarwal 2005a).[19] There are, however, substantial gaps between de jure and de facto rights in most countries, due to poor legal implementation and social barriers, including male bias in bequeathing property within families.[20] Exceptions include countries such as Bhutan, where women own an estimated 70 per cent of the land (FAO n.d.-b.), and Sri Lanka where most women from landed families inherit some land, even if unequal to men (Agarwal 1994). The effective implementation of laws will require not only transforming social norms and attitudes, but also spreading legal literacy, providing legal aid, and gender-sensitizing land registration officials and the judiciary. In promoting these measures again, the media and civil society organizations can play a significant role.

The state and the market are important additional sources of immovable assets for women. At present, agricultural land distributed by governments under their anti-poverty, land reform or resettlement schemes goes largely to men, and limitedly to women, either individually or jointly with husbands. Land titles transferred solely to women could go some way toward compensating for male bias in inheritance. Governments can also facilitate women's market access to land through subsidized grant-cum-credit schemes for purchasing or leasing in land.

In countries where land access is mediated via clans or families, as in many communities of sub-Saharan Africa, and where women (as noted) are among the main food producers, increasing security of tenure on an individual basis is likely to prove more difficult (see also Saito, Mekonnen and Spurling 1994). Here efforts at creating group rights for women (as discussed below) may prove more effective.

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18 For instance, in Asia, Bhutan, Vietnam, and most communities in the Philippines and Sri Lanka have gender equal laws. See Deere and de Leon (2001) for Latin America, and Lastarria-Cornhiel and Manji 2010, for several countries.

19 In India, inheritance laws vary by religion. Those relating to Hindus, Christians and Parsis have been amended now to make them gender-equal, but inequalities remain for Muslims and tribal communities (Agarwal 2005b).

20 See Agarwal (1994) for India, Pakistan, Bangladesh, Nepal, and Sri Lanka; Estudillo, Quisumbing and Otsuka (2001) for the Philippines; and various CEDAW reports for a number of other countries.

Third, women farmers' access to credit, production inputs, technical information and marketing needs substantial improvement. This would involve many steps, such as:

- Enhancing women's membership in credit and service cooperatives where these exist, and creating all-women service cooperatives that provide inputs and help with marketing, where needed;
- Reorienting village-level technical information dissemination systems. In India, for instance, agricultural extension is provided by village level workers (VLWs) who are responsible for disseminating information on new technology to farmers. At least since the 1980s, many have pointed out the need for gender-sensitizing VLWs (and especially involving women VLWs) to reach women farmers. Agricultural extension systems, however, which were key elements in promoting the green-revolution technology and practices, have seriously eroded with time and need reviving. This is an opportunity for placing a clear emphasis on reaching information to women farmers.
- Provide training directly to women farmers in new farm practices, rather than training their husbands on the assumption that the latter will convey the skills to their spouses.

The effectiveness of all of these steps can be greatly enhanced, however, by promoting a new institutional approach to farming, namely a *group* approach for increasing women's access to assets and raising their farm productivity. This could prove to be more economically effective and socially empowering than women working on individual plots or solely on family farms.

4.2. Potential benefits of a group approach

There are many potential advantages to working together in small groups compared with individual family farms, all along the value chain in crop production. At a minimum, a group approach could help small and marginal women farmers to pool financial resources for purchasing inputs and farm machinery and for investing in crop insurance. Groups can also improve women's clout and bargaining power with government agencies and so improve their access to formal credit, inputs and information (see also Braverman, *et al*. 1991). In addition, by pooling financial resources and negotiating jointly, groups can prove much more effective than individuals in purchasing or leasing in land. This process could be furthered with state-subsidized credit for land purchase or leasing in by groups.

It is, however, with group farming, based on pooling owned land or jointly leasing land, that we can expect the most gains in terms of productivity increases and social empowerment, as compared with single family production units. Although group farming is likely to prove more difficult to achieve than cooperation for obtaining inputs or marketing, this leap can be beneficial for several reasons. Overall, it would help women farmers overcome the constraints they face in operating individually, such as their lack of control over land and major assets, resource and financial limitations in input purchase and capital investment, social restrictions on mobility and public interaction, and greater vulnerability to market swings or climatic shifts. It would enable them to take advantage of economies of scale;[21] help them spread the risk of farming among a larger number; facilitate experimentation with higher value, more risk-prone crops with larger payoffs; enlarge choices for crop diversification; allow labour sharing; bring together a greater diversity of talents and knowledge; and bring into the fold women with leadership qualities or scarce managerial skills. Labour

21 See e.g. Foster and Rosenzweig (2010). Although their focus is not group farming, their results are relevant. Based on panel data for 17 Indian states, for 1999 to 2008, they find that even the consolidation of marginal farms to reach 5 acres in size can significantly increase profits per acre. Other cost-saving benefits are observed with slightly larger farms of say 15 to 20 acres. (1 acre = 0.4047 hectares).

shortages during peak seasons could also be overcome more effectively, both because more labour would be available within the group and because labour could be saved.[22]

Moreover, a group would be better placed to enter into non-exploitative contract farming arrangements which are now spreading in many developing countries, and which (as noted earlier) typically exclude small farmers, especially women, or include them under exploitative conditions.[23] At present, women often lose out in farm households which undertake contract farming, since their workload increases while men control the cash generated (Collins 1993, FAO 2011). Within a group, it would also be easier to transfer knowledge about improved farming techniques to a second generation, including to adolescent girls who could be future farmers and farm managers. In addition, groups would be able to deal better with short-term shocks, such as rising food prices, and the long-term effects of climate change. Indeed, a group approach is essential for undertaking measures to mitigate climate change effects, since the conservation of soils, water, forests, and so on, require collective effort.

Working in a group can also help women overcome disabling social norms which restrict their public interactions in conservative cultures, by drawing on the support of other women. In the management of community forests, for instance, in mixed gender groups, women are found more likely to attend meetings, speak up for their interests and take on leadership roles, such as becoming office bearers, where they constitute a critical mass of 25-30 per cent of the members (Agarwal 2010a, 2010b).

These benefits of joint investment and collective cultivation need not be confined to land owners; they could also extend to the landless leasing in land. Overall, as a group, the poor would be better protected both as producers and as consumers. Currently, the poor are net buyers and not net sellers of foodgrains. Acting collectively, as producers they would have better prospects of moving from being deficit to surplus farmers, for all the reasons outlined above. As consumers, they could more effectively undertake income smoothing. Intergenerational benefits can also accrue, in that daughters of successful women farmers would be better placed to move out of agriculture to skilled non-farm jobs, propelling a more gender-balanced agrarian transition.

In other words, a group approach would be effective not only in helping women farmers overcome the productivity constraints identified by the growing body of empirical work reviewed earlier; it would also have longer-term benefits not measured in that literature.

4.3. Successful examples of group farming

On the ground, there are diverse examples of farmers successfully cooperating, ranging from jointly investing in farm inputs, to pooling previously owned, newly purchased or leased-in land for collective cultivation. Successful group farming can be found especially in two contexts: one in transition economies and the other in parts of South Asia. In the former the groups are constituted of families, and in the latter they are constituted of poor rural women (for details, see also Agarwal 2010c).

The first type of example relates to countries in Central Asia, Eastern Europe and Latin America (e.g. Kyrgyzstan, Romania, East Germany and Nicaragua) which undertook large-scale collectivization during the 1950s to 1970s, but de-collectivized in the 1980s and 1990s, enabling farmers to revert to individual

22 On the labour saving effect of consolidating and enlarging farm size, see Foster and Rosenzweig (2010).

23 For Mexico, see specially, Runsten and Key (1996); for India, see Singh (2000) and Kumar (2006); and for Africa see Dolan (2001) and Maertens and Swinnen (2009).

family farming. Many, however, chose to form new group enterprises (with friends, relatives or neighbours), pooling their land and other resources to farm collectively on the restituted land, or continued in much downsized former collectives. The productivity in these group enterprises is found to be significantly higher than in individual family farms, since as a group they could overcome constraints arising from small land size, or labour shortages, or lack of access to machinery, and so on (for a detailed discussion, see Agarwal 2010c). Although this set of examples relates to family group farming rather than to all-women groups, it is important as part of the wider argument that group farming (voluntarily undertaken) can enhance household food security.

The second type of example, drawn from India, has several distinct features, the most important being that the groups are constituted only of women. Here the age-old assumption that farms are to be cultivated only on a family basis was abandoned to encourage and support farming by groups of women. The examples are worth dwelling on in more detail, given that our discussion here is particularly on overcoming gender inequality.

The earliest and best known initiative comes from Andhra Pradesh in south India. With the support of the Deccan Development Society (DDS), a non-governmental organization (NGO) which works in Medak district (a drought-prone tract), poor, low-caste women have been leasing in or purchasing land in groups of 5 to 15 women, through various government schemes which provided subsidized credit and/or grants (Agarwal 2003, 2010c). The central plank of DDS' approach is to ensure food security in an environmentally friendly way, through organic farming and multiple cropping. In 2008 the group leasing programme covered 26 villages, cultivating around 85 hectares. About 25 per cent of the rent is paid by group members, and the rest is covered by interest free loans from DDS, which the groups repay in instalments. Very poor women can repay their share through labour. All tasks are shared except ploughing for which they hire tractor services. After paying the rent and other costs, as well as DDS's loan, and keeping aside grain for seed, the harvest of each crop is shared equally among the members. The state government has also allowed women's groups to use loan money from other anti-poverty schemes for land leasing.

In addition, women are doing group farming on land purchased through a state government scheme that provides subsidized credit to landless, low caste women for collectively buying agricultural land. Half the money is a grant and half a loan, repayable within 20 years. The purchased land is registered in equal portions in individual women's names but they cultivate it as a group. In 2008, 25 women's groups (of 10-12 women each) were cultivating about 225 ha of purchased land in 21 villages. None of these women could have bought land or cultivated it as productively on an individual basis. Usually leasing precedes purchase. As a lease group the women can also hone their farming skills, build trust and solidarity, and tackle conflicts and free riding, before venturing into purchase. Defaulters can be evicted. Standard collective action problems are solved by peer pressure: for instance, work shirkers are penalized in the groups' weekly meetings. Some groups plant up to 24 crop varieties a year (the seeds of which they preserve), thus reducing the risk of crop failure and providing a balanced subsistence diet.

Working together has enhanced women's ability to survey land, hire tractors, share labour, meet government officials, buy inputs and market the produce. Collective cultivation allows them flexibility in labour time, cost sharing, and the pooling of their differential skills in farming, accounting, and public dealing. The groups are voluntary in nature, socio-economically homogenous, constituted of women who know each other, small sized in both membership and production units, participatory in decision-making, and equitable in the distribution of the produce. Group members report improvement in family diets, healthcare

and children's education; a reduction in spousal desertion and violence; and enhanced social status in the community.

Group farming is also being undertaken by women elsewhere in India, such as through a project begun in 1999 by the United Nations Development Programme and Government of India (UNDP-GoI) involving 42,000 women living in around 1000 villages in three states of India (Burra 2004). Although UNDP is no longer involved, and it is now under the Government of India's Mahila Samakya Programme (education for women's equality programme), group cultivation continues in many villages. In one of the states—Andhra Pradesh—around 7500 women farmers are today doing collective farming in groups of 25–30 women each, on approximately 425 hectares of dryland in 250 villages.[24] About 40 per cent of the land was earlier fallow. The land is typically obtained on short to medium term leases from farmers in the village, but in some cases the women have also pooled their own degraded land which had been lying uncultivated due to input constraints. Although vulnerable to weather conditions and poor soils, group farming has provided an important source of supplementary livelihood to these women who, on an individual basis, would have had little access to land, or the possibility of making it productive. There is also community gain since the women's groups have brought into cultivation substantial amounts of fallow land.

Yet another notable initiative was taken a few years ago by the government of Kerala (again in south India) for supporting the landless and landpoor, and especially women, to lease in land for collective farming, under its Kudumbashree programme. The government facilitates group formation, and helps the groups obtain land on lease and access inputs through various government schemes. Since last year, group leasing has also been linked with the Joint Liability Group (JLG) scheme of the National Bank for Agriculture and Rural Development (NABARD). Those who register as a JLG can access subsidized credit from NABARD for leasing land collectively. Although accurate figures are difficult to obtain, there are reported to be several thousand women leasing in land for collective farming in small groups, under this initiative. Again, this is often fallow land which they have made cultivable.

Examples of women's groups leasing in land for joint cultivation can also be found in Bangladesh. A recent evaluation of IFAD-funded projects in Bangladesh pointed to the potential of poor women working in cooperative arrangements, if provided with adequate credit.[25] In sub-Saharan Africa, where communal systems of land ownership are still widespread, the possibility of women farming collectively similarly warrants exploration.

All the above examples, in different ways, demonstrate the potential of farmers voluntarily working together in agricultural production collectivities for the output and food security gains they bring, and the resource constraints they help overcome. It is possible that farmers may be more open to land pooling where they are initially landless and receive land from the State or acquire it jointly, than where they have been longstanding owners, habituated to individual cultivation. But even among the latter, rising food prices or new production opportunities, opened up by higher value crops or contract farming, or an ecological crisis arising from climate change and requiring mitigation/adaptation, could create conditions where collective approaches become attractive. Where families pool land under predominantly male management, however, although the potential productivity gains can be realized, the gender-equity effects may be limited, in contrast to women-only farming groups.

24 These are the latest figures provided by the head of the Andhra Pradesh Mahila Samakya programme.

25 IFAD 2009 Evaluation Bangladesh. http: //www.ifad.org/evaluation/public_html/eksyst/doc/country/pi/bangladesh/cesba94e_3.htm]. Last accessed on 14 September 2009.

Basically a group approach, if promoted by governments and civil society organisations, can help landless or landpoor women gain access to land and other productive assets through the market. And those who already have some land could use it more productively. The geographic spread and reach of such innovative approaches, however, needs to be increased. One promising route lies in encouraging women's groups formed around credit or other needs to take up group farming. To some extent, as noted above in the India examples, this is already beginning to happen. But it could be taken further. India, for instance, has about 2.5 million Self-help Groups (SHGs), of which 2.2 million are women-only groups. Typically, they are economically homogenous, constituted of 10-12 self-selected women who pool their savings and rotate lending within the group. One village can have several SHGs. Groups that have a proven record of working together for about six months are eligible to apply for a bank loan as a proportion of their group savings deposit. Loans, if taken, go to the whole group which then decides its use. So far most SHGs have taken loans mainly for family-based enterprises, but SHGs have enormous potential for collective enterprises, including group farming.

4.4. Women as consumers and food managers: improving access

Women's role in mitigating hunger for themselves and their families is partly served by increasing their access to assets and land and enhancing their farm productivity and control over incomes. But there are also large numbers of rural women who depend for their food security on wage employment and non-farm self-employment. In addition, there are urban women and their families who depend on the food they can purchase. Here food security is directly linked to how many jobs go to women, and whether the schemes that provide work or direct access to food are directed at women.

In recognition of women's special role in mitigating family hunger, some countries have initiated measures which directly increase women's resources, such as the schemes for making conditional cash transfers to women (World Bank 2001), although evaluations of cash transfer schemes in Latin America indicate that there is scope for substantial improvement.[26] The National Rural Employment Guarantee Act (NREGA) in India, which guarantees 100 days of employment for one person per household, although not specifically directed at women, has attracted a notable percentage of women workers in several states. Khera and Nayak's (2009: 52) study of six Indian states found that on average 32 per cent of the workers under NREGA were women, and the scheme is especially important for vulnerable categories of women, such as widows. India has also taken measures to improve the nutritional status of pregnant and lactating women via micronutrient and food supplements provided through the Integrated Child Development Services Programme.

Many of the general schemes being discussed by governments and international agencies for enhancing food security could also gain by greater involvement of women or taking the particular needs of women farmers into account. This includes not only tailoring access to credit, inputs, information delivery and marketing to women farmers, as already discussed above, but also setting up local and regional food banks and improved networks of public distribution systems through women's groups. In addition, agricultural research and development (R & D) efforts would be more effective if R & D institutions, as well as extension services, worked with a better understanding of women's farming systems, including practices of multi-cropping. This is especially needed in parts of Africa, where there are notable differences in the crops grown mainly by women and those grown mainly by men. Doss (2001), for instance, after reviewing an extensive literature on African women farmers, covering 25 years, emphasizes the need for developing technologies and crop varieties which specifically take into account the constraints women farmers face. Devising effective ways of delivering extension advice on new agricultural practices is also important (Gilbert, Salaka and Benson 2002).

26 See e.g. Slater (2008), Soares (2007).

The benefits of concerted efforts to take account of local contexts and women's constraints, in designing technology dissemination programmes, is well demonstrated by the efforts of five agencies in sub-Saharan Africa, which helped large numbers of women adopt improved technology. Underlying the success were a range of factors, including the use of existing women's networks to identify women's needs and reach them quickly, consultation with potential beneficiaries to identify their work constraints, developing and selecting appropriate technology to overcome those constraints, and paying special attention to poorer women (Saito, Mekonnen and Spurling 1994: 69).

Similarly, in many regions women could be especially effective in creating local buffer stocks and regional food banks, if infrastructure for food storage were directed toward women's groups. Many of India's self-help groups, for instance, have formed federations (regional networks of SHGs) which could be involved in this effort. Recent studies show that 55-60 per cent of SHG members are poor and socially disadvantaged women (EDA 2006, NCAER 2008), but even when not constituted entirely of the poor they can reach the poor. For example, in Andhra Pradesh in South India, women's SHG federations have been buying foodgrains in bulk and selling them to poor members at a nominal price or on short-term credit, thus contributing to income-smoothing (Nair and Shah 2007). The DDS women's groups described earlier have also helped set up community grain funds (Agarwal 2003).

Many other innovative measures could be initiated, depending on country contexts. Essentially, what is urgently needed is viewing agriculture and agricultural farming systems through a gender lens, in order to reveal the many ways in which women farmers are contributing to food systems globally, and to find mechanisms for making their efforts more effective. This will also increase our chances of achieving several millennium development goals, such as, ending poverty and hunger, enhancing gender equality, and (indirectly) improving child health and maternal health.

Finally, there is an overarching need to improve the statistical data base for assessing and monitoring women's access to land, farm credit, inputs, technical information and marketing.

5. Concluding comments

The crisis of food security is both the most basic of policy issues and the most complex. Gender inequalities are a significant part of the problem and reducing those inequalities will be a critical part of the solution. The inequalities women face as producers reduces the potential productivity of agriculture and hence of overall food availability in countries, regions and globally. It does so both by failing to take account of the specific constraints that women farmers face, even as our dependence on women farmers is growing; and by failing to recognize that in particular contexts the productivity gains would be higher if existing inputs were directed at women. Estimates indicate the potential of very substantial productivity gains if we bridge the gender gaps in land security, and in access to credit, inputs, technology, extension and other services. Women-inclusive policies in natural resource governance are also found to bring substantial gains, especially in the conservation of forests.

Similarly, the inequalities women face as consumers adversely affects both their own well-being as well as that of future generations of children who inherit the disabilities arising from poor maternal health. Reducing inequalities embedded in women's access to income-earning opportunities and productive assets would not only benefit women themselves but also their children, by enhancing women's bargaining power

within the home and so their ability to direct more household resources to children's well-being. Reducing gender inequalities faced by women as workers and farmers is therefore an imperative both for its intrinsic importance and for its wider implications. Doing so thus needs to be a central feature of any strategy for tacking the food crises and creating a food secure world.

References

Adeleke, O.A., O.I. Adesiyan, O.A. Olaniyi, K.O. Adelalu, and H.M. Matanmi (2008). Gender Differentials in the Productivity of Cereal Crop Farmers: A Case Study of Maize Farmers in Oluyole Local Government Area of Oyo State. *Agricultural Journal*, 3 (3): 193–198.

Adesina, A.A. and K.K. Djato (1997). Relative Efficiency of Women as Farm Managers: Profit Function Analysis in Côte d'Ivoire. *Agricultural Economics*, 16 (1): 47–53.

Agarwal, Bina (1983). *Mechanization in Indian Agriculture.* Allied Publishers: New Delhi.

Agarwal, Bina (1990). Social Security and the Family: Coping with Seasonality and Calamity in Rural India. *The Journal of Peasant Studies*, 17 (3): 341-412.

Agarwal, Bina (1994). *A Field of One's Own: Gender and Land Rights in South Asia*. Cambridge University Press, Cambridge.

Agarwal, Bina (2000). Participatory Exclusion, Community Forestry and Gender: An Analysis and Conceptual Framework. *World Development*, 29 (10): 1623-1648.

Agarwal, Bina (2003). Gender and Land Rights Revisited: Exploring New Prospects via the State, Family and Market. *Journal of Agrarian Change*, 3 (1-2): 184-224.

Agarwal, Bina (2005a). A Landmark Step to Gender Equality. *The Hindu*, *Sunday Magazine*, 25 September.

Agarwal, Bina (2005b). Women's Inheritance: Next Steps. *Indian Express*, 17 October.

Agarwal, Bina (2010a). *Gender and Green Governance: The Political Economy of Women's Presence Within and Beyond Community Forestry.* Oxford University Press: Oxford.

Agarwal, Bina (2010b). Does Women's Proportional Strength Affect their Participation? Governing Local Forests in South Asia. *World Development*, 38 (1): 98-112.

Agarwal, Bina (2010c). Rethinking Agricultural Production Collectivities. *Economic and Political Weekly*, 27 February, 55 (9): 64-78.

Agarwal, Bina (2011). How Will the World Feed Itself? Roundtable contribution in R.M. Solow and J-P Touffut (eds). *The Shape of the Division of Labour: Nations, Industries and Households*. Edward Elgar: USA and UK.

Agarwal, Bina, and Pradeep Panda (2007). Toward Freedom from Domestic Violence: The Neglected Obvious. *Journal of Human Development*, 8 (3): 359-388.

Akresh, Richard (2008). (In)Efficiency in Intrahousehold Allocations. Working Paper, Department of Economics, University of Illinois at Urbana Champaign.

Alene, A.D., V.M. Manyong, G.O. Omanya, H.D. Mignouna, M. Bokanga and G.D. Odhiambo (2008). Economic Efficiency and Supply Response of Women as Farm Managers: Comparative Evidence from Western Kenya. *World Development*, 36 (7): 1247–1260.

Allendorf, Keera (2007). Do Women's Land Rights Promote Empowerment and Child Health in Nepal? *World Development*, 35 (11): 1975-1988.

Anriquez, G.À Paraître (2010). Rural Feminization and the Gender Burden: A Cross-country Examination. Background paper, 2011 *State of Food and Agriculture Report* (SOFA Report), FAO, Rome.

Bindlish,Vishva, Robert Evenson and Mathurin Gbetibouo (1993). Evaluation of T and V-based extension in Burkina Faso. World Bank Technical Paper No. 226, Africa Technical Department Series, World Bank, Washington, DC.

Braverman, A., J.L. Guasch, M. Huppi, and L. Pohlmeier (1991). Promoting Rural Cooperatives in Developing Countries. Discussion Paper No. 121, World Bank, Washington DC.

Burra, Neera (2004). Empowering Women for Household Food Security: UNDP's Experience. United Nations Development Programme, Delhi.

Chand, Ramesh (2009). Challenges to Ensuring Food Security Through Wheat. CAB Reviews: Perspectives in Agriculture, *Veterinary Science, Nutrition and Natural Resources*, 4 (65): 1-13. See http: //www.cabi.org/cabreviews.

Collins, J.L. (1993). Gender, Contracts and Wage Work – Agricultural Restructuring in Brazil's Sao Francisco Valley. *Development and Change*, 24 (1): 53-82.

Deere, C.D., and Magdalena de Leon (2001). *Empowering Women: Land and Property Rights in Latin America.* University of Pittsburgh Press: Pittsburgh.

Deere, C.D. and C.R. Doss (2006). The Gender Asset Gap: What Do We Know and Why Does it Matter? *Feminist Economics*, 12 (1-2): 1-50.

Dey, Jennie (1992). Gender Asymmetries in Intra-Household Resource Allocation in Sub-Saharan Africa: Some Policy Implications for Land and Labour Productivity. Paper presented at IFPRI workshop on Intra-Household Resource Allocation.

Dolan, C.S. (2001). The "Good Wife": Struggles over Resources in the Kenyan Horticultural Sector. *Journal of Development Studies*, 37 (3): 39–10.

Doss. C.R. (2001). Designing Agricultural Technology for African Women Farmers: Lessons from 25 Years of Experience. *World Development*, 29 (12): 2075-2092

Doss, C.R. (2010). If Women Hold Up Half the Sky, How Much of the World's Food Do They Produce? Background paper, 2011 *State of Food and Agriculture Report* (*SOFA Report*), FAO, Rome.

EDA (2006). Self Help Groups in India: A Study of Lights and Shades, mimeo, EDA Rural Systems Private Ltd. Gurgaon, and Andhra Pradesh Mahila Abhivruddhi Society, Hyderabad.

Elson, Diane (1995). Gender Awareness in Modelling Structural Adjustment. *World Development*. 23 (11): 1851-1868.

Estudillo, J.P., A.R. Quisumbing and Keijiro Otsuka (2001). Gender Differences in Land Inheritance and Schooling Investments in the Rural Philippines. *Land Economics*, 77 (1): 130-143.

FAO (2006). *The State of Food Insecurity in the World.* Food and Agricultural Organisation, FAO, Rome.

FAO (2011). *The State of Food and Agriculture.* FAO, Rome.

Foster, A.D., and M.R. Rosenzweig (2010). Is There Surplus Labour in Rural India. Discussion Paper No. 991, Economic Growth Centre, Yale University, New Haven.

Gilbert, R.A., W.D. Sakala and T.D. Benson (2002). Gender Analysis of a Nationwide Cropping System Trial Survey in Malawi. *African Studies Quarterly*, 6 (1-2): 223-243.

GoI (Government of India). *1995-1996 Agricultural Census of India*. Ministry of Agriculture, Government of India, New Delhi.

GoI (Government of India) (2006). *Census of India 2001: Population Projections for India and States 2001-2026*, Report of the technical group on population projections, National Commission on Population, Government of India, Delhi.

Goldstein, Markus and Christopher Udry (2008). The Profits of Power: Land Rights and Agricultural Investment in Ghana. *Journal of the Political Economy*, 116 (6): 981–1022.

Hill, R.V., and Marcella Vigneri (2009). Mainstreaming Gender Sensitivity in Cash Crop Market Supply Chains. Background paper, 2011 *SOFA Report.* FAO, Rome.

Holden, Stein, Bekele Shiferaw and John Pender (2001). Market Imperfections and Land Productivity in the Ethiopian Highlands. *Journal of Agricultural Economics*, 52 (3): 53–70.

Horrell, Sara, and Pramila Krishnan (2007). Poverty and Productivity in Female-headed Households in Zimbabwe. *Journal of Development Studies*, 43 (8): 1351–1380.

Ivanic, Maros, and Will Martin (2008). Implications of Higher Global Food Prices for Poverty in Low-Income countries. Policy Research Working Paper Series 4594, World Bank, Washington DC.

Jamison, D.T., and C.J. Lau (1982). *Farmer Education and Farm Efficiency*. Johns Hopkins University Press: Baltimore MD.

Jodha, N. S. (1986). Common Property Resources and the Rural Poor. *Economic and Political Weekly*, 21 (27): 1169–1181.

NSSO (National Sample Survey Organisation) (2005). *Employment and Unemployment Situation in India* (July 2004 - June 2005), NSS 61th Round, NSSO, GoI, New Delhi.

IFAD (2009). Evaluation: Bangladesh. [http: //www.ifad.org/evaluation/public_html/eksyst/doc/country/pi/bangladesh/cesba94e_3.htm]. Last accessed on 14 September 2009.

IFPRI (2009). *Climate Change: Impact on Agriculture and Costs of Adaptation*. International Food Policy Research Institute, Washington DC.

Khera, Reetika, and Nandini Nayak (2009). Women Workers and their Perceptions of National Rural Employment Guarantee Act. *Economic and Political Weekly*, 44 (43), 24 October.

Kinkingninhoun-Mêdagbé, F.M., A. Diagne, F. Simtowe, A.R. Agboh-Noameshie and P.Y. Adegbola (2008). Gender discrimination and its impact on income, productivity and technical efficiency: Evidence from Benin. *Agriculture and Human Values*, 27 (1): 57–69.

Kumar, Pramod (2006). Contract farming in India: Options and Implications for Small and Large Farmers. Institute of Economic Growth Working Paper No. E/267/2006, Delhi.

Kumase, W.N., Herve Bisseleua and Stefan Klasen (2008). Opportunities and Constraints in Agriculture: A Gendered Analysis of Cocoa Production in Southern Cameroon. Discussion Paper No. 27. Courant Research Centre, University of Göttingen, Göttingen, Sweden.

Lastarria-Cornhiel, Susana, and Abreema Manji (2010). Land Tenure, Land Policy, and Gender in Rural Areas. Background paper, 2011 *SOFA Report,* FAO, Rome.

Li, Zongmin (2003). Women's Land Tenure Rights in Rural China: A Synthesis. Mimeo, Ford Foundation, Beijing.

Lilja, N. K., T.F. Randolph and Abrahmane Diallo (1998). Estimating Gender Differences in Agricultural Productivity: Biases Due to Omission of Gender-Influenced Variables and Endogeneity of Regressors. Paper submitted to the American Agricultural Economics Association meeting, Salt Lake City, Utah, USA, 2–5 August.

Maertens, Miet, and J.F.M. Swinnen (2009). Are Modern Supply Chains Bearers Of Gender Inequality? Paper presented at the ILO-FAO workshop 'Gender Dimension of Rural Employment'. 30 March–3 April, Rome.

Mazhar, Farhad, Daniel Buckles, P. V. Satheesh and Farida Akhter (2007). *Food Sovereignty and Uncultivated Biodiversity in South Asia.* IDRC, Ottawa.

Moock, P.R. (1976). The Efficiency of Women Farm Managers Kenya. *American Journal of Agricultural Economics,* 58 (5): 831-835

Nair, Ajai, and Parmesh Shah (2007). Self-help Works. *Times of India*, 27 December.

NCAER (2008). *Impact and Sustainability of SHG Bank Linkage Programme.* National Council of Applied Economics Research, New Delhi.

Oladeebo, J.O., and A .A. Fajuyigb (2007). Technical Efficiency of Men and Women Upland Rice Farmers in Osun State, Nigeria. *Journal of Human Ecology*, 22 (2): 93–100.

Ongaro, W.A. (1990). Modern Maize Technology, Yield Variations and Efficiency Differentials: A Case of Small Farms in Western Kenya. *Eastern Africa Economic Review*, 6 (1): 11–29.

Peterman, Amber, Julia Behrman and A. R. Quisumbing (2009). A Review of Empirical Evidence on Gender Differences in Non-Land Agricultural Inputs, Technology and Services in Developing Countries. Background paper, 2011 *SOFA Report,* FAO, Rome.

Quisumbing, A. R. (1996). Male-Female Differences in Agricultural Productivity: Methodological Issues and Empirical Evidence. *World Development*, 24 (10): 1579-1595.

Quisumbing, A. R., and J.A. Maluccio (2000). Intrahousehold Allocation and Gender Relations: New Empirical Evidence. Discussion Paper, IFPRI, Washington DC.

Quisumbing, A.R., Ellen Payongayong, J.B. Aidoo and Keijiro Otsuka (2001). Women's Land Rights in the Transition to Individualized Ownership: Implications for the Management of Tree Resources in Western Ghana. *Economic Development and Cultural Change*, 50 (1): 157-182.

Quisumbing, A.R., R.S. Meinzen-Dick, Lucy Bassett, Michael Usnick, Lauren Pandolfelli, Cheryl Morden and Harold Alderman, (2008). Helping Women Respond to the Global Food Price Crises. Policy Brief 7, IFPRI, Washington DC.

Runsten, David, and Nigel Key (1996). Contract Farming in Developing Countries: Theoretical Aspects Analysis of some Mexican Cases. Economic Commission for Latin America and the Caribbean, RLC/96/14-RLCP-01.

Saito, K.A., Hailu Mekonnen and Daphne Spurling (1994). Raising the productivity of women farmers in sub-Saharan Africa. World Bank Discussion Papers, Africa Technical Department Series No. 230, World Bank, Washington DC.

Singh, Sukhpal (2000). Theory and Practice of Contract Farming: A Review. *Journal of Social and Economic Development*, 3 (2): 228-246.

Slater, Rachel (2008). Cash Transfers, Social Protection and Poverty Reduction. Overseas Development Institute background paper commissioned for the UNRISD Flagship Report on Poverty, UNRISD, Geneva.

Soares, Sergei (2007). Conditional Cash Transfers in Brazil, Chile and Mexico: Impacts upon Inequality. Working Paper No. 35, Institute of Applied Economic Research, IPEA, International Poverty Centre, UNDP, Brazil.

Strauss, John, and Kathleen Beegle (1996). Intrahousehold Allocations: A Review of Theories, Empirical Evidence and Policy Issues. MSU International Development Working Paper No. 62, Dept. of Agricultural Economics, Michigan State University, East Lansing.

Thomas, Duncan (1990). Intra-household Resource Allocation: An Inferential Approach. *Journal of Human Resources*, 25 (4): 635-663.

Thomas, Duncan (1994). Like Father Like Son, or, Like Mother Like Daughter: Parental Education and Child Health. *Journal of Human Resources*, 29 (4): 950-988.

Thapa, Sridhar (2008). Gender Differentials in Agricultural Productivity: Evidence from Nepalese Households Data. Munich Personal ReREC Archive, MRPA Paper No. 13722.

Timothy, A.T., and A.I. Adeoti (2006). Gender Inequalities and Economic Efficiency: New Evidence from Cassava-based Farm Holdings in Rural South-western Nigeria. *African Development Review*, 18 (3): 428-443.

Timmer, C.P. (2010). Reflections on Food Crises Past. *Food Policy*, 35: 1-11.

Tiruneh, Addis, Teklu Tesfaye, Wilfred Mwangi and Hugo Verkuijl (2001). Gender Differentials in Agricultural Production and Decision-making Among Smallholders in Ada, Lume and Gimbichu Woredas of the Central Highlands of Ethiopia. International Maize and Wheat Improvement Center and Ethiopian Research Organization.

Udry, Christopher, John Hoddinott, Harold Alderman and Lawrence Haddad (1995). Gender Differentials in Farm Productivity: Implications for Household Efficiency and Agricultural Policy. *Food Policy*, 20 (5): 407-423.

von Braun, Joachim (2005). The World Food Situation: An Overview. Paper prepared for CGIAR Annual General Meeting, Marrakech, Morocco, December 6.

von Braun, Joachim (2008). Rising Food Prices: What Should be Done? *Eurochoices,* 7 (2): 30-35.

von Braun, Joachim (2008-09). Food-Security Risks Must be Comprehensively Addressed, Annual Report Essay 2008-09, IFPRI, Washington DC.

World Bank (2001) Brazil: An Assessment of the Bolsa Escula Programs. Report No. 20208-BR. World Bank, Latin America and the Caribbean Regional Office.

World Bank (2007). *World Development Report 2008: Agriculture for Development*. World Bank: Washington DC.

World Bank (2009). *Gender in Agriculture Sourcebook.* Vols 1 and 2. World Bank, Washington DC.

UNDP (2008). Increasing Food Prices and Food Security: Diagnostic Issues and Policy Options. Paper prepared under coordination of the UNDP Task Force on High Food Prices, chaired by Selim Jahan, Director, UNDP, New York.

Zhang, Linxiu, Alan de Brauw and Scott Rozelle (2004). China's Rural Labor Market Development and its Gender Implications. *China Economic Review*, 15 (2): 230–247.