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CLIMATE CHANGE, GENDER, AND NUTRITION LINKAGES
Research Priorities in Cambodia

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Agriculture is extremely important to Cambodia, representing at least one-third of the nation's gross domestic product and providing employment to around 60 percent of the labor force. It is perhaps the most sensitive sector to changes in climate, with higher temperatures stressing plants, livestock, and workers, and rainfall variation through droughts and floods leading to crop losses and food insecurity. While it is important to consider the impact of climate change on agricultural production, it is also important to consider other cross-cutting issues to achieve the goals of Feed the Future and the Global Food Security Strategy—especially gender and nutrition. This policy note summarizes assessments of these linkages in Cambodia under the Gender, Climate Change, and Nutrition Integration Initiative (GCAN).

Changes in Climate

Mean yearly temperatures have increased by 0.8°C since 1960, at a rate of about 0.18°C per decade. The temperature has risen at a faster rate in the drier seasons (December-January-February and March-April-May), at 0.20 to 0.23°C per decade, and somewhat more slowly in the wet seasons (June-July-August and September-October-November), at 0.13 to 0.16°C per decade (World Bank 2011).

Looking to the future, from the baseline period of 1960–1990 through to 2050, four prominent climate models from the latest global climate assessment of the Intergovernmental Panel on Climate Change show that the mean daily maximum temperature of the warmest month—the standard indicator of potential heat stress for agriculture—is projected to increase somewhere in the range of 2.7 to 3.9°C nationally, and 2.7 to 4.2°C in the Feed the Future zone of influence (ZOI). Mean yearly rainfall changes are projected to range from an 11mm decline to a 91mm increase nationally, and from a 29mm to 119mm increase in the ZOI (Figure 1).

Aggregated simulation results from the four climate models project adverse effects on the yields of all major crops (Figure 2), but the country's predominant crop, rainfed rice, is projected to be less adversely affected. Yields of rainfed and irrigated rice are projected to decline by 2.3 and 3.2 percent, respectively, compared with baseline levels (that is, without climate change). Other crops are projected to be more profoundly affected. Losses for sugarcane and groundnuts are projected to be around 44 and 22 percent, respectively.

Cambodia's Take on Climate-Smart Agriculture

Climate-Smart Agriculture (CSA) involves practices to increase productivity sustainably; enhance resilience through adaptation; reduce or remove greenhouse gas emissions through mitigation, where possible; and enhance the achievement of national food security and development goals. Cambodia has initiated a national Climate Change Strategic Plan, 2014–2023 (KOC 2013), to achieve its intended nationally determined contribution targets (Box 1). Priority actions focus on developing the knowledge base of its society to promote green, low-carbon, climate-resilient, equitable, and sustainable approaches to agriculture. Some of the CSA practices currently in use in Cambodia include sustainable rice intensification (SRI) and aquaculture.

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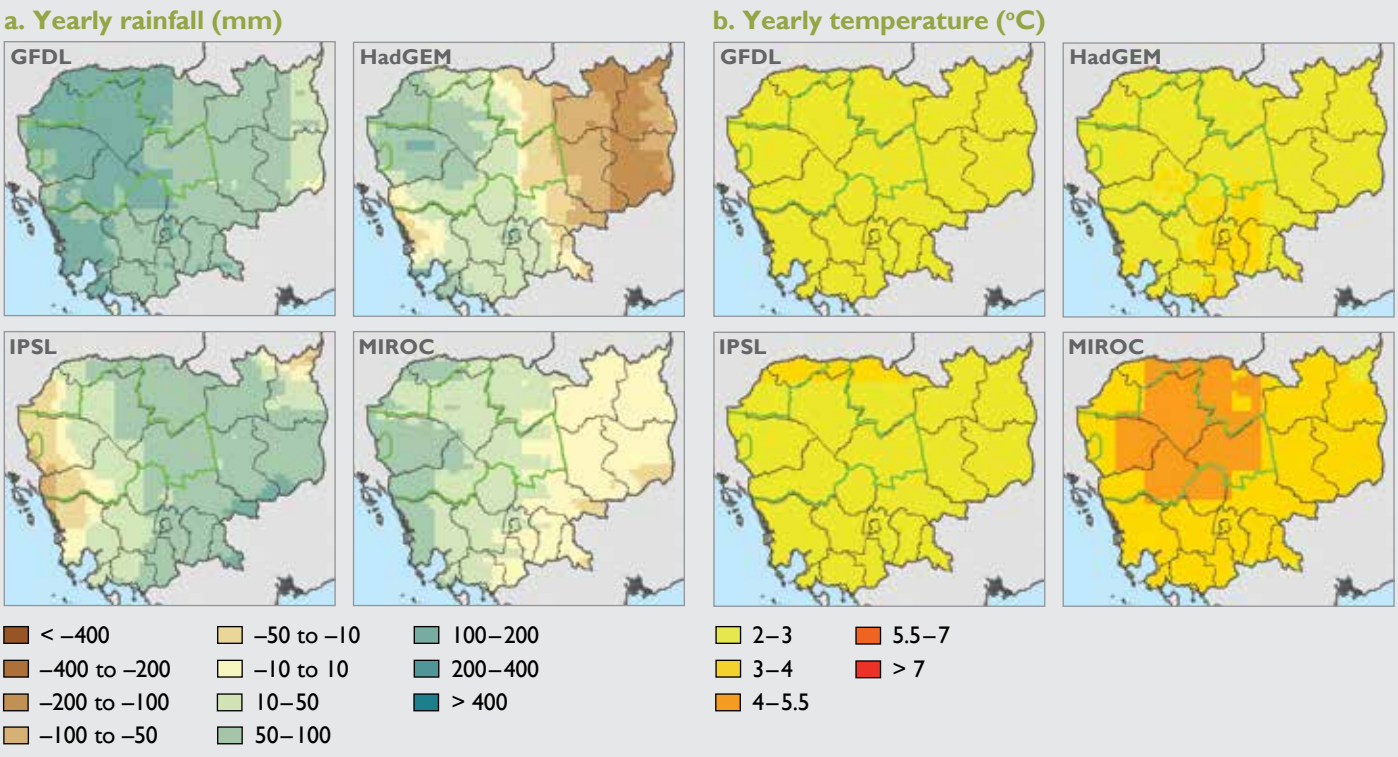
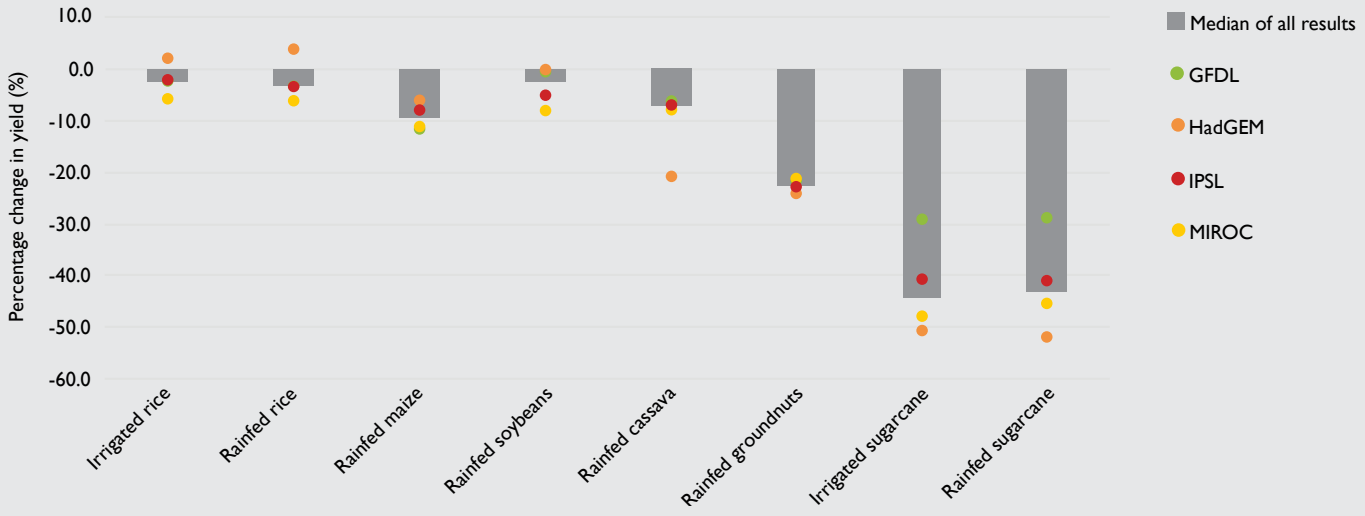
FIGURE 1. Predicted change in rainfall and temperature based on four climate models, 2000–2050



Source: Authors based on Müller and Robertson (2014).

Notes: GFDL = Geophysical Fluid Dynamics Laboratory; HadGEM = Hadley Centre Global Environmental Model; IPSL = L'Institut Pierre-Simon Laplace; MIROC = Model for Interdisciplinary Research on Climate. Simulations are based on Representative Concentration Pathway 8.5. The zone of influence is delineated by the green lines.

FIGURE 2. Percentage change in yields due to climate change based on four climate models, 2000–2050



Source: Devised by authors based on Rosenzweig et al. (2014) using weights from MapSPAM harvested area (You et al. 2014).

Notes: : GFDL = Geophysical Fluid Dynamics Laboratory; HadGEM = Hadley Centre Global Environmental Model; IPSL = L'Institut Pierre-Simon Laplace; and MIROC = Model for Interdisciplinary Research on Climate.

Box 1. Climate-Smart Agriculture in Cambodia's nationally determined contribution document

The key activities on agriculture proposed in Cambodia's (intended) nationally determined contribution document include (KOC 2015):

1. developing climate-proof agricultural systems to adapt to changes in water variability and enhance crop yields;
2. promoting climate-resilient agriculture in coastal areas by building sea dykes and scaling-up climate-smart farming systems;
3. developing crop varieties suitable to the country's agro-ecological zones and resilient to climate change;
4. promoting aquaculture production systems and practices that are adaptive to climate change;
5. increasing the use of mobile pumping stations and permanent stations in responding to mini-droughts, and promoting groundwater research in response to drought and climate risk;
6. strengthening early warning systems and climate information dissemination; and
7. developing and rehabilitating flood protection dykes for agricultural and urban development.

Climate-smart villages have been established in Cambodia under the CGIAR Research Program on Climate Change, Agriculture and Food Security in Southeast Asia. Rohal Suong is one such village where two community ponds are being rehabilitated (Eam 2016). The first, Boeung Voer pond, will be used to irrigate crops, and the second, known as the school pond, will be used as a fish refuge. These ponds will also allow farmers—including women and low-income families—to grow vegetables for household consumption and sale, with the aim of promoting gender equality and supplementing village incomes.

Aquaculture is becoming an important source for increasing fish production for food security and improving livelihoods for farmers in Cambodia. The government has been promoting a range of aquaculture approaches through the Aquaculture Development Plan of Cambodia, 2000–2020, with strong potential for rural expansion through rice-field fisheries, dry-season fish refuge management, and school fish ponds (Joffre et al. 2010). The main aquaculture systems in Cambodia are cage and pen culture, intensive pond culture, integrated rice/fish farming, freshwater prawn and shrimp farming, and marine fish culture. Some of the major constraints to the development of aquaculture in Cambodia are an inadequate supply of water in the remote areas of the Mekong River system, lack of access to credit for farmers, lack of marketing and distribution channels, an inadequate and unreliable supply of good quality seed, inadequate knowledge of aquaculture technology, and frequent occurrences of Epizootic Ulcerative Syndrome—an infection caused by fungi (FAO 2015).

The Center for Study and Development in Agriculture has played a major role in introducing and promoting SRI methods in Cambodia, using farmer-to-farmer extension approaches to train rice growers. SRI was officially endorsed as a rice production strategy by the Cambodian government in 2005 and was also included in the national strategy for agricultural development. As of 2015, more than 200,000 rice farmers throughout Cambodia were using SRI principles to improve rice production (SRI-Rice 2015). SRI methods have enabled farmers to double their rice yields compared with conventional methods, while also reducing their requirements for seed and other inputs (SRI-Rice 2015). Field trials indicate that organic and mixed SRI have reduced emissions by over 20 percent (Neate 2013). Some of the constraints to SRI in Cambodia are increased labor requirements for weeding, transplanting, and water management; inadequate water supply; insufficient availability of inputs, such as animal manure; and differing understanding and interpretation of SRI among stakeholders (Chhay 2010).

Gender, Youth, and Social Inclusion

One objective of Cambodia's strategic plan on climate change is to reduce associated gender vulnerability and health risks (KOC 2013). A strong focus on gender by the Cambodian Government led to the development of the Gender and Climate Change Strategic Plan, 2014–2023 (MWA 2013), as well as a near-term Gender and Climate Change Action Plan, 2014–2018 (MWA 2014). The action plan highlights six priorities, including integrating gender into climate adaptation and mitigation plans, increasing women's decisionmaking power at all levels, improving data on gendered roles in adapting to climate change, designing gender indicators for a national monitoring and evaluation framework on climate change, and designing gender-responsive climate change adaptation and mitigation projects. These actions are important steps in increasing the understanding of gender-based and social differences in the impacts of climate change, and using this knowledge to reduce specific areas of vulnerability, to develop adaptive capacities, and to refine the targeting of related policies and programs.

The evidence base, while still evolving, suggests that these vulnerabilities and capacities are likely to vary by age and gender. Given that 43 percent of people in agricultural households are under the age of 29 years, the constraints and preferences of a very young rural population need to be considered if climate adaptation policies are to be effective. Further, this young population presents specific challenges for women, who bear primary responsibility for the unpaid work

of caring for economically dependent family members (those under 15 years or over 60 years of age), who constitute 32 percent of the rural population. Women in the ZOI spend an average of 1.3 hours per day caregiving, compared with 11 minutes per day for men. In addition, poor women spend significantly more of their time providing unpaid care to dependents than do nonpoor women (1.8 versus 1.2 hours per day) (Komatsu, Malapit, and Theis 2017). This means that women are likely to have less time for economic or community activities, which can constrain their adaptive capacity by limiting their access to information, community institutions, social capital, and income sources (Table 1).

Most employed women over 15 years old (75 percent) work in the agriculture, forestry, and fishing sectors—the majority (68 percent) as unpaid family workers (NIS 2009). Nevertheless, women lack access to information on agricultural production. The Ministry of Women's Affairs (MWA 2008) found that only 10 percent of recipients of agricultural extension services were female. Because women often manage separate livelihood activities and at some point may become household heads, they also need information about adaptive agricultural strategies and disaster risk reduction. Importantly, the channels of delivery of this information need to be tailored to women, and the content needs to be relevant to women's specific roles and responsibilities. In addition, supporting women's meaningful involvement in decentralized institutions—such as farmers' water-user committees and commune committees for disaster management—could ensure that women's needs are represented in community decisionmaking, that information is disseminated to women, and that these institutions increase their accountability to women (Plummer and Tritt, n.d.). Formalizing a role for women's groups or commune committees for women and children as a means of monitoring and ensuring the accountability of these institutions could be one approach.

Cambodia's Nutrition Profile

Cambodia's nutrition profile indicates severe nutritional deficiencies (Table 2). High rates of stunting in under five-year-old children and anemia in women of reproductive age should be prioritized in policies and interventions. Key micronutrient deficiencies include iron-deficiency anemia, which affects 56 percent of children, and anemia not specific to iron-deficiency, which affects 44 percent of women of reproductive age (Wieringa et al. 2016). Interventions should focus on the 1,000 day "window of opportunity" from pregnancy to a child's second birthday, emphasizing a combination of nutrition-specific and nutrition-sensitive approaches.

The diet of agricultural households is mainly composed of cereals (predominantly rice), vegetables, fish, meat, and—to a lesser extent—fruit, root crops, and legumes (NIS-MAFF 2015). Stunting is negatively associated with dietary diversity. In particular, the consumption of animal-source foods was found to be a protective factor against stunting and underweight in children (Darapheak et al. 2013). Fish is the primary source of protein for children. The consumption of pulses, an important source of both protein and micronutrients, is low. In 2014, 30 percent of Cambodian children (6–23 months old) met the minimum standard with respect to three infant and young child feeding practices: food diversity, feeding frequency, and consumption of breast milk or other types of milk or milk

TABLE 1. Women's empowerment in agriculture, 2011/12

Indicator	Score/share
Women's empowerment in agriculture index score	0.98
Share of women with adequate empowerment	92.6%
Share of women with gender parity	94.7%
Average gap in empowerment score between men and women in households without gender parity	0.15

Source: Malapit et al. (2014).

TABLE 2. Cambodia's nutrition profile

Indicator	National prevalence (%)	Rank	Prevalence in the zone of influence (%)
Wasting in under five-year olds	10	103/130	10
Stunting in under five-year olds	32	95/132	34
Anemia in children aged 6–59 months	56	–	Not reported
Anemia in women of reproductive age	44	160/185	Not reported
Adult overweight and obesity (women only)	18	4/190	18
Adult obesity (women only)	3	6/190	3

Sources: Data on national prevalence and ranking of wasting and stunting in children and anemia, overweight, and obesity in women are from IFPRI (2016); data on anemia in children are from Wieringa et al. (2016); and data on the zone of influence are from Feed the Future Cambodia (2015).

products (NIS–DGH–DHS 2015). Only 48 percent of children received foods from the minimum number of food groups for their age (NIS–DGH–DHS 2015). Households in higher wealth quintiles consume a more diverse diet and significantly more animal-source foods than do households in lower wealth quintiles (Darapheak et al. 2013).

Large regional differences in feeding practices exist (NIS–DGH–DHS 2015), as well as access to improved water, sanitation, and hygiene facilities, with higher access in urban areas (NIS–DGH–DHS 2015). Both of these factors have implications for nutritional status. Moreover, key drivers of change in nutritional status differ between severely and moderately stunted children, and between rural and urban areas, emphasizing that different interventions are needed in different contexts (Zanello, Srinivasan, and Shankar 2016). In the rural setting, maternal best practices and parental characteristics (that is, parental education levels) are key factors in the incidence of severe stunting. In urban settings, maternal best practices and parental characteristics are important, but household wealth is more important, especially in the case of severe stunting. Regarding moderate stunting, improvements in health infrastructure—principally improved water, sanitation, and hygiene facilities—are crucial in driving the process of change (Zanello, Srinivasan, and Shankar 2016). "One size fits all" approaches to improving nutritional status do not work.

The main causes of food shortages in agricultural households include low levels of food production due to lack of capital and land area, and crop losses due to heavy rain, drought, or pests (NIS–MAFF 2015). These factors often have negative implications for nutritional status, and might be further exacerbated by climate change.

Suggested Research Priorities Moving Forward

The following short- and longer-term areas of research are suggested to strengthen insights across the climate–gender–nutrition nexus, and to advance evidence-based programming that integrates these themes in Cambodia:

1. opportunities to harmonize social protection, disaster risk reduction, and climate adaptation in Cambodia and how gender and nutrition can be integrated;
2. whether CSA will widen or close the gender empowerment gap, given that the costs and benefits of CSA approaches are not distributed equally across all household members (for example, technologies such as SRI affect men's and women's time use and, in turn, women's empowerment and nutrition outcomes);
3. documentation of differences in men's and women's perceptions of climate change and their adaptive capacity in terms of preferences and constraints;
4. documentation of differences in men's and women's mechanisms for coping with climate-related shocks, along with the associated impacts on nutrition and women's empowerment; and
5. new research on the factors that make community-based adaptation institutions effective and inclusive (especially in light of Cambodia's recent history of population displacement), including an investigation of what works to make these institutions more representative and accountable, and indicators that should be used to monitor and evaluate them.

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