

THE GENDER DIMENSIONS OF THE RELATIONSHIP BETWEEN CLIMATE CHANGE AND RICE-BASED FARMING SYSTEMS: AN EXPLORATORY ASSESSMENT IN THE MEKONG DELTA

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ABSTRACT

Focus group discussions with 93 women and 112 men participants were conducted with separate groups of men and women farmers from different rice ecologies of deep flood, semi-flood and saline environments in order to assess the gender dimension of the relationship between climate change and rice-based farming systems. These rice ecological areas are affected by the manifestations of climate change in the Mekong Delta, Vietnam. Findings reveal climate change reduces income from rice and other farming enterprises. The coping mechanisms are different for men and women. Women are more engaged in anticipatory strategies such as storing extra seeds for planting, keeping food products, spending less, resorting to small trading business and getting support from the community, friends and relatives. Men have access to information on climate smart technologies, seeds of stress tolerant varieties, formal credit and other sources of income. Thus, gender consideration should be taken into account in disseminating technologies adaptive to climate change in order to help both men and women reduce risks, ensure food security and sustain livelihoods.

Keywords: *climate change, gender, survey, rice based farming systems, Mekong Delta*

INTRODUCTION

Climate change is often seen as a technical problem, requiring technical solutions. But in fact there are many social and political aspects to this complex issue. Similarly, it is often argued that climate change is gender-neutral – that is, it affects women and men in the same ways. Yet, in many cases, communities interact with their physical environment in a gender-differentiated way. Gender roles and relations interact with climate change causes and impacts to varying extents. These are gender-specific resource use-patterns that can degrade the environment, gender –specific effects of climate change, gendered aspects of mitigation and adaptation, gender and decision-making in climate change and human capacity (Dankelman, 2002). In the Mekong Delta, although farming households are the major suppliers of rice to the domestic and international markets, the majority of them have

less than a hectare to cultivate. Within rice farming households, male and female members share labor in rice production and post-harvest operations. Gender roles are based on social and cultural norms which have led to gender disparities in access to and control of assets and resources. Due to their gender-defined roles in society and traditional patterns of marginalization, women are amongst those that are likely to carry the heaviest burdens from these changes and benefit less from the policies and programs on agriculture (UN Vietnam, 2012). Gender-specific differences in adaptive and mitigation capacity must be fully acknowledged and considered in the design and implementation of response strategies. In Vietnam, the National Target Program to Respond to Climate Change (NTP-RCC) emphasizes gender equality as a guiding principle, but it is largely silent as to how this will be realized, with no specific targets or

activities to address women's vulnerability or gender issues, in particular at the community level. Moreover, legislative and policy frameworks on gender, including the Law on Gender Equality (UN Vietnam, 2009) do not address gender issues. There is still limited information on the gender dimension of the causes and impacts of climate change in Vietnam. Women are more likely to use income diversification and community support, while men are more likely to seek financial support as an adaptation strategy. Migration is emerging as an important coping strategy for people facing hardship and environmental changes. Male migration often worsens the situation for women and children left behind. Women migrants often earn less and are often in more vulnerable positions than men (UN Vietnam, 2012).

Under the project "Climate change affecting land use in the Mekong Delta: adaptation of rice-based cropping systems (CLUES), Participatory Community Assessments (PCAs) were conducted by a team of social scientists (Le Canh Dung *et al.*, 2011) to assess communal biophysical and socio-economic conditions closely related to current rice based farming systems (RBFS) production, supportive services and adaptive strategies to climate change impacts. However, except for the information on labor participation and wage rates of men and women, these PCAs lack information about their perceptions and adaptation strategies. In addition, while there have been many studies on gender roles in rice production, post-harvest and processing in South Vietnam, there are no studies which examine how climate change affects men and women differently and whether men and women have different responses to climate change. Men and women's coping mechanisms may also differ based on gender roles and access to and control of assets (Agnes *et al.*, 2010). Thus, understanding how the different social expectations, roles, status and economic power of men and women affect, and are affected differently by climate change will improve actions taken to reduce vulnerability and combat climate change in the rice farming communities.

The objectives of this research are to understand the gender dimension to the relationship between rice based agriculture and climate change, especially to know whether men and women are affected by climate change differently, and to identify the linkages among climate change, gender and food security in rice-based agriculture in the Mekong Delta.

METHODOLOGY

Site selection

The study sites in the Mekong Delta are categorized into deep-flooded, semi-flooded and saline-prone areas. The deep-flooded site is located in An Giang province where Tan Thuan village of Ta Danh commune (Tri Ton district) was selected to represent unfavorable rice areas with a double rice system (DRS) and Vinh trung village of Vinh Trach commune (Thoai Son district) represents a favorable rice area with triple rice system (TRS). The semi-flooded sites are Can Tho city with alluvial soil and Hau Giang province with acidic soil. In Thoi Lai district of Can Tho site, Trung Hoa village (Truong Xuan A commune) represents unfavorable rice areas with DRS and Thoi Phuoc B village (Thoi Tan commune) was selected to represent a favorable area with TRS. In Hau Giang province, Hoa Duc village (Hoa An commune, Phung Hiep district) has DRS and Ap 3 village (Vi Dong commune, Vi Thuy district) has TRS. The saline prone site is located in Bac Lieu province. Phuoc Thanh village (Phuoc Long district) with shrimp-rice system (SRS) represents unfavorable rice areas and Ap 21 village (Minh Dieu commune, Hoa Binh district) with TRS represents favorable areas for rice production.

Data collection and analysis

Secondary information about the study sites was collected through key informant interviews with village leaders. Focus group discussions (FGDs) were conducted separately with men and women farmers using a guide. Each group was comprised of 10 to 15 persons. Data were analyzed using simple tabular analysis and frequencies. These FGDs provided insights into

men and women's perceptions, experiences, coping mechanisms to the effects of climate changes as well as climate smart technologies which they want to adapt to changing climate.

RESULTS AND DISCUSSION

Characterization of the study sites

The flooding environments

The flooding environments are categorized into: a) deep- flooded, b) semi-flooded with acidic soil, c) semi-flooded with alluvial soils and d) salinity area. Table 1 shows that the types of flooding, timing of flood, deepest depth and longest duration of flood vary by the flooding environment. Rice cropping intensity differs in each category. The deep-flooded areas with TRS are not affected by floods due to presence of flood control dykes. The deep-flooded areas with DRS and the semi-flooded areas with acid soils are affected by both flash floods and deep floods while the semi-flooded areas with alluvial soils are affected by flash floods. Although the flash floods occurred in a short period from 5 to 15 days, floods damaged the rice seedlings, thus resulting in crop loss. In the salinity areas, the damage was worst. Plants did not recover and resulted to complete crop loss. Thus replanting was necessary.

Farm size

Most farmers possess marginal farms except those in the deep flooded area with DRS and the salinity site with SRS. In the deep flooded area with DRS, farmers possess small farms, and in salinity site with SRS farmers have larger farms. Farmers define small farm size if it is less than 1 ha. All areas are irrigated rice even including the shrimp-rice system in the saline area. However, farmers using the SRS have to wait for rainy season to wash away the salt in the soil before planting rice. Aside from rains, they actively irrigate about 2-3 times with canal water, and then pump water out to wash out salinity (Table 2).

Sources of livelihood

Farming households are predominantly engaged in rice farming. Aquaculture (shrimp) is

dominant in the saline area with a single rice crop per year. More than one-fifth of the farming households in the saline area using TRS are engaged in small trading. In addition, family members of the households are also involved in non-farm hired labor in the home place or migrate to the city either seasonally or long term (> 3 months).

Access to agricultural services

Most of the households have access to agricultural machinery (tractor for land preparation, mechanical thresher, and harvester). Farmers have access to a bank at the districts center. Micro-credit schemes for farmer groups and women's association are available in the semi-flooded areas with acidic soils. Officially registered farmer associations are present in the villages. Seed production teams are only present in the deep-flooded villages. Seed production teams produce certified seeds for farmers in the locality to reduce transportation costs. Having access to certified seeds is an advantage particularly after floods and salinity intrusion wherein seeds are lost or seedlings are damaged.

Gender division of labor in rice production and in other activities

Rice production is very labor intensive. Rice operations have to be done on time particularly for DRS and TRS. Thus, family members, both male and female, work on their own fields. Women participate in most of rice production activities in all study sites. Women in the semi-flood areas and salinity prone areas have higher labor participation than women in the deep-flooded areas. Women do also heavy tasks together with men such as clearing the fields, making internal field ditches, irrigating the fields, and applying fertilizer. More women than men provide labor in pulling seedlings, gap filling, hand-weeding, removing off-types in the field, manual harvesting and drying rice. Aside from doing field work, they also prepare the food and bring the food for hired workers. More men than women provide labor in land preparation, cleaning the fields, internal field ditch making, seed sowing, water management, fertilizer and

pesticide application, mechanical harvesting, hauling and transporting farm products.

Women in the DRS in the semi-flood area and women in saline prone areas provide more labor inputs than those women in other sites. They contribute nearly half of the total labor inputs in rice production. The labor participation of women in rice production activities in all ecosystems is significant for completing suitable interventions. It is observed that women's participation is higher in more difficult areas or areas which are more prone to floods and in marginal or small areas. Women have to work harder, especially in the unfavorable areas to ensure household food security, reduce expenditures for hired labor, and to have income for other family expenses. Women are also custodians of household cash thus they bear the burden of allocating the

limited cash among farm, household and children's needs.

Gender differences in wage rates

Although men and women share the work in almost all field operations, women receive lower wage rates compared to the men. Poor women work as hired labor in weeding, transplanting, gap filling, removing off-types, tasks which are perceived as "light" work, so employers pay them lower wage rates (100,000 VND/day). Men are involved in land preparation, fertilizer and pesticide application and hauling of farm products, which are considered "heavy" tasks in rice production, thus employers pay them higher wages (150,000 VND/day). However, in the case where men and women perform the same task, women are also paid less because of the perception that men are stronger than the women who are physically weaker.

Table 1. Flooding environment in the selected villages in Vietnam

Flooding environment / Rice systems	Deep-flooded		Semi-flooded with acid soil		Semi-flooded with alluvial soil		Salinity	
	DRS	TRS	DRS	TRS	DRS	TRS	TRS	SRS
Types of flooding	Flash flood/ deep flood	No flood	Flash flood (70% of rice area affected) Deep flood (30-40% of rice area affected)	Flash flood (50% of rice area affected) Deep flood (30-40% of rice area affected)	Flash flood	Flash flood	Stagnant	Deep flood
Months flood occurs	December (flash flood) Aug-Oct (deep flood)	No effect	Nov-Dec (flash flood) Aug-Oct (deep flood)	June-July (flash flood) Aug-Oct (deep flood)	June-July	June-July	October	September
Deepest depth (cm)	20 cm (flash flood) 80-100 cm (deep flood)	No effect	80 cm (both flash & deep flood)	20 cm (flash flood) 70-80 cm (deep flood)	50 cm	60-100 cm	50 cm	100 m
Longest flood duration (days)	5 days (flash flood) 45 days (deep flood)	No effect	5 days (flash flood) 45 days (deep flood)	7 days (flash flood) 30 days (deep flood)	15 days	10 days	30	30

Table 2. Distribution of farming households by farm size in selected villages in Vietnam (%)

Classification of farm size	Deep-flooded		Semi-flooded with acidic soils		Semi-flooded with alluvial soils		Salinity	
	DRS	TRS	DRS	TRS	DRS	TRS	TRS	SRS
Marginal (< 1 ha)	30	80	60	60	60	88	50	28
Small (1-2 ha)	40	19	30	35	30	10	40	17
Large (> 2 ha)	30	1	10	5	10	2	10	55
Total	100	100	100	100	100	100	100	100

Participation of men and women in decision-making

It is also important to know wives' participation in decision-making in farm and household activities. As shown in Table 3, women participate in most of the farm and household-related decision-making activities. Although husbands dominate in decisions on "what crop to grow" and "what rice variety to grow", they consult their wives in making these decisions. Wives dominate in decisions related to hiring laborers such as "who, how many workers will be hired and how much to pay". Aside from these making these decisions, they also supervise them as well as prepare their food. Women also dominate in decisions on "whether to sell or consume the harvested crop", "quantity of output to sell and consume", "when and where to sell the harvested crop", "selling the animals" and "what types of food to consume in times of crisis". Thus, they ensure household food security. In times of disasters due to floods and salinity, they bear the burden of looking for food for their families. They are also forced to consume or sell their small animals including poultry at lower prices. On the other hand, men are the major decision makers on "what farm implements to purchase" because these entail large expenditures. Husbands dominate in decisions on the adoption of rice technologies because they have more access to technical knowledge through their participation in agricultural and extension programs. During floods, both husband and wife should be able to make informed decisions in adaptation to climate change. Moreover, when the husband migrates, it is important that the

wife is equipped with technical knowledge (received from training or agricultural extension services) so that she can make timely decisions, particularly in times of floods and salinity intrusion in the fields caused by extreme climate variability. Thus, it is important that both husband and wife should be involved in training activities on climate-smart technologies.

Men and women's preference of rice traits

As mentioned in the early section, husbands dominate in decisions on what crops to grow and what rice variety/ies to grow, although they consult their wives. Thus, rice breeders seldom consult the women on what traits they look for in a variety for their environmental condition. However, wives also have their own opinions with regards to preferred rice traits. There are similarities and differences in the rice traits which the men and women want. In the deep flooded areas women prefer traits related to their role in rice production and post-harvest. As unpaid family workers, they prefer a variety which can recover from heavy floods so that they do not need to do gap filling which is a laborious activity. As housekeepers, they want a variety which cooks more quickly, and is dry and not too fluffy when cooked. These traits were not mentioned by men. Men mention that they prefer rice varieties which can flower quickly even during the heavy rainy season. DRS is practiced more in the deep-flooded areas which are unfavorable to rice production. In the deep-flooded areas, farmers need a variety which is easily to grow (can elongate fast to be higher than the water level in the field, and is tolerant to pests). In the favorable area with TRS, men and

women farmers have similar preferences for rice traits. In the semi- flooded area with alluvial soils, the women prefer rice varieties which have good eating quality and have the ability to produce more tillers (greater yield). On the other hand, men prefer varieties with stiff stems (which prevents lodging) with medium plant height (not short). They explained that if the plants are short, then they will be totally submerged during floods. If they are too high, then they can easily lodge especially due to strong winds in the wet season. In the TRS, men and women prefer rice varieties which have high yields and short duration in the field. In semi-flooded area with acid soil, farmers look for varieties which can

withstand the floods and at the same time have high yields. Men consider traits such as resistance to insects, pests, and taller plants to overcome high water level in the rice field. Women mentioned preference for rice varieties which have tolerance to submergence during the wet season. In saline prone areas, men and women prefer varieties which have high yield, resistance to insect/disease, tolerance to salinity, drought, and submergence. Women look for good cooking and eating qualities (rice expands while cooking).

Table 3. Participation of men and women in decision-making

Decision-making topics	Deep flooded		Semi flooded with acid soil		Semi flood with alluvial soil		Salinity	
	<i>DRS</i> (n=21)	<i>TRS</i> (n=22)	<i>DRS</i> (n=26)	<i>TRS</i> (n=27)	<i>DRS</i> (n=30)	<i>TRS</i> (n=26)	<i>TRS</i> (n=25)	<i>Shrimp-rice system</i> (n=28)
What crops to grow	M > W	M > W	W>M	M>W	M only	M=W	M > W	M > W
What rice variety to grow	M > W	M > W	W only	M only	M = W	M>W	M > W	M > W
Hiring laborers	W only	W> M	M only	W only	W> M	W>M	W only	W only
To sell or consume the harvested crop	M = W	W> M	W>M	W only	M = W	W>M	W> M	W> M
Quantity of output to sell and consume	M = W	W> M	W only	W only	M = W	W>M	W> M	W> M
Selling the harvested crop	M = W	W> M	W only	W only	M= W	W>M	W> M	W only
Price to sell the output	M > W	M = W	W only	M>W	W > M	W>M	M = W	M = W
Farm implements to purchase	M > W	M > W	M only	M only	M > W	M>W	M only	M only
Selling animals	W only	W only	W only	M=W	W > M	W only	W only	W only
Adoption of rice technologies	M > W	M > W	M>W	M>W	M > W	M>W	M > W	M > W
Types of food to consume in times of crisis	W only	W only	W>M	W only	W only	W only	W only	W only
Children's education	M = W	W > M	M=W	M=W	W > M	W>M	W > M	W > M
Where to borrow money	M = W	M = W	W>M	W only	W > M	W only	W > M	W only
Number of children to raise	M > W	M > W	W>M	M=W	M > W	M=W	W > M	M=W

M = Men; W = Women

In summary, there are gender differences in the preference for rice traits which should be considered in rice varietal improvement. Men prefer varieties which are tall and can survive in floods while women are more concerned with the eating and cooking qualities of rice variety. Thus eating and cooking qualities should be considered in developing rice varieties tolerant to abiotic stresses.

Farmers' awareness and understanding about climate change

Awareness of climate change

Table 4. Farmers' awareness of climate change (%)

Item	Men (n=112)	Women (n=93)
- Have heard of the words "climate change"		
+ Yes	73	53
+ No	27	47
- Source of information about "climate change"		
- Mass media as television, radio, newspapers	67	53
- Friends	6	13
- Family members	27	34

Observations of climate change

Men and women farmers reported similar perceptions of unusual climate variability and long term trends. They observed the change of climate from this year compared with earlier years as unusual. However, men have a better understanding of the words "climate change" than the women. These changes are: it is hotter temperature than before, frequent and longer duration of rainfall thus causing floods, storms are also more frequent and unusual than before. Women farmers are aware of climate changes as storms, rain, wind and temperature which are unusual. Weather is hotter than previous years. Rains in the off season occurred. The earth is getting hotter and the high temperature can be attributed to deforestations and burning of the trees in the jungle. During low temperatures, there are more disease outbreaks which affect rice production.

More than half of men and women farmers have heard the words "climate change". However, more men than women heard about it. Of the men and men farmers who have heard about "climate change", more than half (67%) heard it from mass media while slightly more than half of all women (53%) received this information. A higher proportion (37%) of the women than men (27%) received information from other family members. More women than men heard from family members while more men than women heard from the mass media. (Table 4).

More women than men do not know the causes of climate change. Women mentioned that everything depends on God's will. Men understand that climate changes are caused by human activities such as deforestation through burning of trees, burning of rice straw, burning of fossil fuels, pollution or toxic gases from factories, emission from cars, all of these contributing to rising greenhouse gas emissions which contribute to the destruction of the ozone layer and global warming (Table 5). Thus, there is a need for agricultural research and development programs/projects to provide more information to farmers on the causes and preventive measures to reduce gas emissions and exploitation of the natural resources to reduce global warming.

Effects of climate change on rice farming

Men and women reveal varied effects of climate change on rice farming (Table 6). Nearly half of

the men and women mentioned that frequent and heavy rains have led to poorer harvest or reduced crop yields. More women than men observed that during heavy rains, crops are lost due to poor germination of seeds or poor growth of seedlings. This observation may be more related to women's task such as re-planting of the fields due to poor seedling germination. The effects of climate change mentioned by both women and men are poor crop stand, increasing labor cost due to replanting, delay in land preparation for crop establishment, difficulty in

land preparation, land leveling, clearing the fields, and difficulty in crop establishment. The men mentioned that due to climate change and heavy rains, plant photosynthesis is affected. Women are not aware of this information. On the other hand, women said that due to climate change and thunderstorms, the incidence of deaths among male farmers exposed during field operations is higher due to lightning. This indicates that women pay more attention to farmers' safety and health in the field than men.

Table 5. Causes of climate change (% of respondents)

Reasons (*)	Women (n=93)	Men (n=112)
- Do not know	63	46
- Greenhouse effect which makes temperature hotter	1	4
- Gas emissions, air pollution from exhaust from cars and motorbikes	1	3
- Deforestation through burning of trees	3	1
- Burning of rice straw, burning of fossil fuels	11	10
Gas emissions from factories and improper management of wastes; increasing number of factors which pollute the environment	17	33
- Destruction of ozone layer result to very hot weather in the dry season	-	3
- Everything depend on God's will	10	-

(*) Multiple responses

Table 6. Farmers' knowledge about the effects of climate change on rice farming (% of respondents)

Effects of climate change	Women (n=93)	Men (n=112)
- Frequent rainfall and floods delay land preparation for crop establishment; because difficulty in land preparation, land leveling and field clearing.	5	6
- Frequent and heavy rains increase cost of labor in field operations	2	1
- Reduce rice yield; yield loss	46	49
- Weak plants	6	14
- More difficulty in crop establishment; increases cost of labor due to gap filling	5	8
- Photosynthesis process of plant is not good under heavy and frequent rainfall		1
- Complete crop loss, loss of rice seedlings; seeds cannot germinate if it is too hot or heavy rainfall	34	21
- Thunder storm/lightning is dangerous and may lead to death of farmers who work in open fields	2	-

Farmers' perceptions about the effects of floods on crops, animals and household income

More men than women said that floods are more frequent due to high tides, high rainfall, high amount of water flow from the upper streams and unexpected floods. The water in the river rose due to high rainfall. More women than men observed that unexpected floods occurred in the last 10 years (Table 7). Household income in a flood year declined by about 20% as compared to normal years. Rice income declined by about 20%. Incomes from animal/wage labor/others declined by about 23% due to floods. Both women and men farmers said that the variation of flooding, especially of unexpected floods, caused destruction of the dykes, reduced rice

production and yield and the number of animals raised. The incidence of animal disease and mortality was higher due to severe floods, especially the chicks which drowned. This resulted in low income of women because women in the deep flood and semi flood areas are more responsible for pig and chicken rearing (Chi and Yamada, 2003). Therefore, farmers had lower income and less nutritious food. There were fewer opportunities to work off-farm due to severe floods. Off-farm income declined by 50% during severe flood. Floods also affected the roads which made transport and mobility difficult. In general, due to high rainfall and floods, the small children and the elderly were more susceptible to illness.

Table 7. Farmers' perception on the status of flood within the last 10 years in deep-flooded and semi-flooded areas (% of responses)

The status of floods	Women (n=70)	Men (n=82)
Floods are more frequent due to high tides, high rainfall, high amount water flow from upper-stream	44	56
There are unexpected floods occurred in the last 10 years	56	44

Farmer's perceptions about the effects of salinity on crop, animals and household income

In the saline prone areas, more women than men said that due to saline soils, they have to wait for rains in addition to pumping fresh water from the irrigation canals to the fields to plant rice. More women than men in the saline area worried that the rice plants would die after sowing due to floods. More men than women pointed out that during low rainfall months and hot weather, the intrusion of salt water is deeper when compared to normal years. Both men and women said that at the onset of rice planting season, if the rains come late and fresh water is not available, rice sowing gets delayed (Table 8). Thus, they want rice varieties which can survive salinity and also have good rice yields. Both men and women said that rice yields were lower due to the severe salinity causing delayed sowing leading to high incidence of insect pest and bird attack. The

shrimp and poultry production were reduced because of diseases caused by hot weather and a high level of salinity. FGDs revealed that household income was reduced by about 30% when severe salinity, shortage of fresh water and less rains occur. Rice income is reduced about 35% and other incomes reduced by 30% in years with severe salinity and a shortage of fresh water and less rain.

Coping mechanisms

More men than women followed the recommendation of agricultural extension workers such as reducing the amount of nitrogen fertilizer, reducing seed rate, and using rice varieties which are resistant to pests and which can fit into the cropping systems. More men than women pumped water out from the paddy fields to avoid submergence or inundation. They selected rice varieties which can recover/survive under submergence

conditions, repaired and maintained canals for better drainage, managed crops better, observed weather conditions, observed plant growth and visited the fields frequently, applied chemicals, and used chemicals to prevent disease. On the other hand, more women than men stored more seeds to be planted for the next season. Women preferred to use high seed rates to have more seedlings for re-planting in anticipation of

damage or loss of seedlings. They avoided sowing during bad weather. Nearly half of women (46%) and more than one-fourth (28%) of men do not know what to do or cannot do anything to cope with the effects of climate change. Thus there is a need to identify and validate suitable climate smart technologies in these different rice environments prone to floods and salinity (Table 9).

Table 8. Farmers' perception on the status of salinity, water level within the last 10 years and their effects in salinity area (% of responses)

Perceptions	Women (n=23)	Men (n=30)
- Due to saline soils, they have to wait for rains aside from pumping fresh water from the irrigation canals to the fields to plant rice	18	9
- If rains come late and fresh water is not available, rice sowing gets delayed	25	28
- During low rainfall months and hot weather, the intrusion of salt water is deeper as compared to normal years	36	49
- Rice plants would die after sowing due to floods	21	14

Table 9. Coping mechanisms of women and men in response to floods and salinity (% of responses)

Coping mechanisms (*)	Women (n=93)	Men (n=112)
Followed the recommendation of agricultural extension workers technicians such as reducing the amount of nitrogen fertilizer, reducing seed rate, choosing rice varieties which are resistant to pests, and which can fit into the cropping systems	30	38
Pumped water out of the fields to avoid submergence or inundation. They selected rice varieties which can recover/survive under submergence conditions, repaired and maintained canal for better drainage, managed crops better plant growth, and visited the field frequently, applied chemicals, used chemicals to prevent disease	5	14
Stored more seeds to be planted for the next season. Used high seed rates to have more seedlings for re-planting to cope in case of damaged or loss of seedlings	5	1
Avoided sowing during bad weather	3	1
Do not know what to do; cannot do anything	46	28

(*) Multiple responses

Other responses to climate change

Aside from coping mechanisms to reduce the damage to crops, farmers used other coping

mechanisms. These are: taking loans, migration, getting support from friends, relatives and community, small trading, working as hired laborers, spending less and storing food and

other necessities in anticipation of climate events (Table 10). Male out-migration increased work for women. During climate change which caused severe flood or salinity, farmers are faced with a shortage of cash and they are compelled to borrow cash from the banks. In the deep-flooded areas, a lower proportion of farmers borrow capital compared with farmers in semi-flooded areas. Farmers in deep-flooded areas have more land than those in the other areas and thus, cash is less of a problem. More men than women took loans from the bank, and

migrated, except in the saline prone areas. Women are engaged in repairing fish nets, drying fish and storing them, collecting wild vegetables and wild edible flower for family food; collecting and conserving small pieces of wood for fuel, removing water from the boat and working as hired labor. Meanwhile men fish in the rivers and in the rice fields. On the other hand, more women than men get support from their social networks within their villages, earn income from small trading, spend less and store food and other necessities.

Table 10. Other coping mechanisms by farmers (% responses)

Coping mechanisms (*)	Deep-flooded (n=43)		Semi-flooded (n=109)		Salinity (n=53)	
	Women (n=23)	Men (n=20)	Women (n=59)	Men (n=50)	Women (n=23)	Men (n=30)
Took loans from the bank	45	71	47	79	48	66
Migrated to neighboring communes, other towns, other provinces	25	30	32	33	54	40
Got support from friends, relatives, community	15	4	20	4	33	21
Earned income from small trading	30	18	26	7	31	13
Worked as hired labors	8	11	12	18	4	8
Spent less	66	38	67	46	62	41
Stored food and other necessities	43	37	60	56	50	32

(*) Multiple responses

Climate- smart agricultural technologies

Women and men are aware that there are climate- smart technologies which can help them cope with the consequences of climate change (Table 11). In all ecosystems except in the salinity areas, more women than men want to have short- duration stress tolerant rice varieties with high yield and pest resistance. More men than women mentioned that they want to change to upland crops. However in deep flooded areas and salinity areas only a low proportion of them mentioned this, while more than one-third of them in the semi-flooded area mentioned this desire. This indicates that

changing from rice to upland crop is not possible in deep flood areas. In the salinity areas, farmers grow upland crops in the backyard or on bunds. They grow upland crops for additional income to cope with climate change. More women than men in flood prone areas and more men than women in salinity areas want to change the planting schedule to avoid crop loss due to climate variability. More men than women mentioned soil management techniques which can address acidity and salinity problems. More women than men want to know more animal health management techniques to help prevent livestock and poultry mortality and diseases.

Table 11. Climate-smart agricultural technologies which farmers want to adopt (% responses)

Technologies (*)	Deep-flooded (n=43)		Semi-flooded (n=109)		Salinity (n=53)	
	Women (n=23)	Men (n=20)	Women (n=59)	Women (n=23)	Men (n=20)	Women (n=59)
Stress tolerant rice varieties, short duration, high yield, pest resistance	56	48	53	39	39	56
Change to upland crop	10	15	39	32	14	27
Change planting schedule to avoid crop loss due to stresses	52	46	53	48	45	61
Soil management techniques addressing acidity, salinity problems	42	57	59	59	64	70
Water management	40	59	53	58	53	60
Animal health management	34	20	56	54	41	41

(*) Multiple responses

SUMMARY AND INSIGHTS

Based on focus groups discussions with men and women, we have the following insights:

1. Men and women farmers both reported that they experienced climate change in terms of unusual occurrence of floods and salinity.

2. Floods and salinity led to the reduction in rice yields and household income. More women than men observed that small animals and poultry (chicken and duck) were negatively affected by floods. However, more men than women observed that fish or shrimp production were negatively affected by salinity. These differences are associated with gender division since women are mainly responsible for taking care of small animals (pig) and poultry.

3. Men and women experience different effects of climate change based on gender roles in crop production and post-harvest activities.

4. Men and women have different coping mechanisms in response to climate change. Men secure loans from formal banks, migrate to other communes or districts for non-farm work. Women use more anticipatory strategies such as storing more seeds, food and family necessities, spending less, engaging in small trading and relying on their social networks (family, friends and community) for support. More men than

women follow the recommendation of extension workers in reducing the amount of nitrogen fertilizer, reducing seed rate, choosing rice varieties which are resistant to pests and which can fit into the cropping systems. More men than women pump water out from the paddy fields to avoid submergence or inundation. They select rice varieties which can recover/ survive under submergence conditions, repair and maintain canals for better drainage, manage crops better, observe weather conditions, observe plant growth and visit the fields frequently, apply chemicals, and use chemicals to prevent disease. Men are aware that burning of rice straw increases gas emission thus further leading to climate change. On the other hand, more women than men store more seeds to be planted for the next season. Women prefer to use high seed rates to have more seedlings for re-planting to cope with the case of dead seedlings. They avoid sowing during bad weather.

5. Aside from coping mechanisms to reduce the damage to crops, farmers use other coping mechanisms. These are: getting loans, migration, getting support from friends, relatives and community, small trading, working as hired laborers, spending less and storing food and other necessities in anticipation of climate events. More men than women took loans from the bank, and migrated, except in the

saline prone areas. Women are engaged in repairing fish nets, drying fish and storing them, collecting wild vegetables and wild edible flowers for family food; collecting and conserving small pieces of wood for fuel, removing water from the boat and working as hired labor. Meanwhile men do fishing in the river and in the rice field. On the other hand, more women than men get support from their social networks within their villages, earn income from small trading, spend less and store food and other necessities.

6. Women and men are aware that there are climate smart technologies. In all ecosystems, more women than men want to have stress tolerant rice varieties with short duration, high yield and resistance to pest. More men than women mentioned that they want to change to upland crops. More women than men in flood prone area and more men than women in salinity area want to change the planting schedule to avoid crop loss from variations in salinity, drought, flood (as planting earlier and later than the normal to avoid the extreme of salinity, drought or flood). More men than women mentioned technologies of soil management to reduce acidity or salinity and technique of water management (as reduction of water) meanwhile more women than men want to know more animal health management techniques to help prevent mortality and diseases.

RECOMMENDATIONS FOR FUTURE RESEARCH

1. Conduct in-depth micro level studies to understand the differences in climate variabilities, vulnerability, impact and response mechanisms, with a gender dimension.
2. Develop a gendered impact pathway to achieving food security through climate-smart technologies.
3. Identify climate-smart technologies, participatory approaches and associated training activities to enable both men and women

farmers to better adapt to climate change, ensure food security, reduce poverty.

4. Develop gender-equity monitoring and evaluation indicators to assess impact

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TÓM TẮT

Đánh giá tầm quan trọng của giới trong mối liên quan giữa biến đổi khí hậu và hệ thống canh tác trên nền lúa ở ĐBSCL

Phỏng vấn riêng nhóm nữ và nam với 93 nữ và 112 nam nông dân tham gia được tiến hành tại các vùng sinh thái khác nhau như vùng ngập sâu, ngập trung bình và mặn để đánh giá tầm quan trọng của giới trong mối liên quan giữa biến đổi khí hậu và hệ thống canh tác trên nền lúa ở Đồng bằng sông Cửu Long. Biến đổi khí hậu làm giảm thu nhập từ lúa và các hoạt động sản xuất nông nghiệp và làm thuê khác của nam nữ nông dân. Cơ chế ứng phó với biến đổi khí hậu của nam nông dân có liên quan nhiều đến sự tiếp nhận và áp dụng các tiến bộ kỹ thuật, vay tiền và lao động xa nhà trong khi đó nữ nông dân đối phó bằng cách các biện pháp phòng xa như dự trữ thêm hạt thóc, lương thực và các nhu yếu phẩm khác, phụ nữ cũng tiêu xài tiền một cách tiết kiệm, buôn bán nhỏ và nhận sự giúp đỡ của cộng đồng, bạn bè và họ hàng. Do đó, vấn đề giới cần được quan tâm trong việc chuyển giao các biện pháp ứng phó với biến đổi khí hậu để giúp họ giảm thiểu rủi ro từ biến đổi khí hậu hiện tại, đảm bảo cuộc sống ổn định.