Gender aspects in observing and interpreting drought and saltwater intrusion among agricultural production communities in Tra Vinh Province

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Abstract: *Studies on natural disasters and climate change show that men and women are affected in different ways, and they also have different response capabilities based on their knowledge, resources and social position by each culture. Qualitative research results in Kinh and Khmer communities in Tra Vinh province, whose main livelihood is agricultural production, reveal that there are both similar and different understandings between men and women about extreme drought and saltwater intrusion in the area. The reason for the difference is mainly due to gender stereotypes in the division of family labor.*
Keywords: Gender, Drought, Saltwater Intrusion, Agriculture, Tra Vinh Province

1. Introduction

Tra Vinh Province is located between two large rivers, Co Chien River and Hau River, in the lower Mekong River Basin. It enjoys a tropical monsoon climate with two seasons: a rainy season starts in May and ends in November, while a dry season begins in December and concludes in April of the following year. Since 2015, Tra Vinh province, in particular, and the Mekong Delta, in general, have endured two extreme saline intrusion events during the dry seasons of 2015-2016 and 2019-2020 due to an earlier onset and a prolonged duration of the dry season compared to the usual cycle (UNDP Viet Nam, 2016, 2020). This situation is attributed to climate change, which has resulted in reduced annual rainfall. Additionally, water regulation at upstream hydropower dams has exacerbated water scarcity in the downstream areas, severely impacting local people's life and causing significant damage to agricultural production.

During the dry season of 2015-2016 in Tra Vinh, droughts and saline intrusion affected 29,833.09 hectares of rice (42,240 households), 1,344.96 hectares of vegetables and sugarcane (2,740 households), and 403.47 hectares of fruit trees (803 households). Furthermore, the lack of irrigation water reduced productivity by 10-30%, while aquaculture households (snakeheads, black tiger shrimp, white-leg shrimp, sea crabs, etc.) were also affected due to the sudden increase in salinity. The estimated total damage amounted to VND 1,130.54 billion. During the dry season of 2019-2020, droughts and saline intrusion caused damage to 24,129.019 hectares of rice (mainly winter-spring crops), 77.03 hectares of vegetables, and 271.341 hectares

of fruit trees. The estimated damage reached approximately VND 1,000 billion, of which rice accounted for VND 919 billion (Tra Vinh Department of Agriculture and Rural Development, 2016, 2020).

Climate change, manifested by the increasingly intense and irregular occurrence of extreme weather events such as droughts, storms, floods, and rising sea levels, has been occurring across various regions globally (IPCC, 2014, 2022). Research findings and evaluation reports from numerous development organizations indicate that the challenges and impacts of climate change are not gender-neutral; rather, gender issues and climate change are closely intertwined in multiple dimensions (WomenWatch, 2008; Goh, 2012; IUCN, 2015; UNDP, 2016; Masika, 2017; MacGregor, 2017; Segnestam, 2017; etc.). Both men and women hold critical knowledge in their respective fields and play an active role in adapting to and mitigating climate change risks (Dankelman, 2010). Consequently, enhancing the understanding and capabilities of both men and women is crucial for formulating and implementing policies and programs aimed at comprehensively addressing the gender inequalities of climate change (UNDP, 2016).

The article examines whether there are gender differences in the understanding and interpretation of drought and saline intrusion. It subsequently offers suggestions to further enhance public awareness in light of the increasing prevalence of extreme weather events.

2. Approach, methods, and research area

Ecological anthropology and gender approaches:

Ecological anthropology examines the reciprocal relationship between humans and the natural environment, with a particular focus on ecological knowledge. Various definitions of "ecological knowledge" exist, among which Berkes' (2008) analytical framework provides a comprehensive perspective. This framework identifies four key components of ecological knowledge: First, an understanding of landscapes, weather patterns, and flora and fauna; second, systems and techniques for resource exploitation based on this knowledge; third, social institutions that manage those systems; and fourth, worldviews – a set of beliefs that shapes environmental perceptions and ascribes specific meanings to them.

Unlike *sex*, which refers to the biological differences between men and women, *gender* is a social institution, defined as the cultural, social, and psychological characteristics associated with men and women in specific contexts (Lobber, 2000; Lindsey, 2016). In other words, gender represents the social distinctions between women and men, which are formed through teaching and learning, subject to change over time, and vary significantly both within and across cultures. Gender shapes the roles, rights, relationships, and responsibilities assigned to women and men in a particular society and cultural context (ADB, 2015).

The study investigates the knowledge of both men and women in farming communities in Tra Vinh Province regarding the ongoing droughts and saline intrusion through their observations and interpretations of the causes, developments, impacts, and their access to information sources concerning these events.

Methods and research area:

The study primarily employs qualitative methods, utilizing two main tools: In-depth interviews (IDIs) with 20 Kinh and Khmer couples, and focus group discussions (FGDs) consisting of 2 male groups and 2

female groups. Participants were selected from households where agriculture serves as the primary livelihood. The IDIs concentrated on participants' knowledge of droughts and saline intrusion in their localities over the past decade. The research was conducted in June and July 2023 in Nguyet Lang A, Nguyet Lang B hamlets of Binh Phu commune, Càng Long district, and Vàm Ray, Rach Ca hamlets of Ham Tan commune, Tra Cu district, Tra Vinh province. These areas are home to many Kinh and Khmer farmers whose agricultural production is substantially affected by droughts and saline intrusion.

3. Research findings

3.1. Gender aspects in observing and explaining the causes of droughts and saline intrusion

Extreme droughts and saline intrusion are widely recognized by both men and women in the local area. When asked about the causes of these phenomena in the locality, female participants typically provided direct explanations. For instance, one participant noted: *"In my opinion, saline intrusion is the result of the intense heat with no rain"* (IDI, female, born in 1963, Khmer ethnic group, Binh Phu commune). Another stated, *"At that time, there was little rain, which led to severe droughts and increased saline intrusion. I am unsure of the exact cause of saline intrusion, just guess it's due to rising sea levels"* (IDI, female, born in 1984, Khmer ethnic group, Binh Phu commune). Similarly, another participant remarked, *"During that period, the intense heat dried up the rivers, and saltwater intrusion occurred due to winds blowing from the sea towards the land"* (IDI, female, born in 1960, Kinh ethnic group, Binh Phu commune). In contrast, male participants provided more elaborate and in-depth explanations of the underlying causes of droughts and saline intrusion based on their daily long-term observations and experiences therein. As one male respondent explained, *"About 5 years ago, it experienced drought with no water, affecting areas from the South to the North, largely due to climate change. Typically, the harsh dry season would return in every 5-7 years, but now it occurs unpredictably, no longer follows the laws of nature. For instance, when it rains, it rains heavily, and when it is sunny, the sun is very intense. There is no balance"* (IDI, male, born in 1969, Kinh ethnicity, Binh Phu commune). Another male participant observed, *"In 2014-2015, there was a severe drought with no rain but saltwater intrusion. The weather used to be predictable, now it's erratic due to climate change. Reduced rainfall and intensified droughts may also be due to many large trees being cut down (such as dầu - known as Dipterocarpus alatus, dổi - known as Michelia tonkinensis, and còng trees - known as Saman, Rain tree, Monkey pod), or possibly as a result of the excessive waste discharged by factories, which might have reduced rainfall"* (IDI, male, born in 1959, Khmer ethnic group, Binh Phu commune). Both Kinh and Khmer men demonstrated a more nuanced and detailed understanding of changes and trends in weather patterns and natural conditions.

The differences in knowledge stem from the gender-based division of labor within households and traditional labor distribution patterns in the community. The in-depth interviews (IDIs) reveal that most families share the same labor organization patterns: Husbands or sons (male members) are primarily responsible for physically demanding tasks in agricultural production such as digging, building embankments,

sowing seeds, spraying pesticides, and fertilizing crops. Men dedicate more time to agricultural activities, frequently monitoring fields for issues such as pests, diseases, and water levels, and devising appropriate solutions. This is especially crucial during the dry season when rice crops are highly susceptible to diseases, such as rice blast, leaf rollers, and increasing threat of golden apple snails. Additionally, during periods when irrigation is crucial, men often stay by pumps to ensure water is drawn from canals into the fields. As a result, during the dry season, they must spend significant time overseeing the fields. Meanwhile, wives/women typically handle household tasks such as cooking, childcare, livestock rearing, and brewing wines, as well as managing family finances and expenditures. Men serve as the primary labor force in agricultural production and handle physically intensive work, while women participate in supportive tasks, involving more meticulous work. Many women also engage in small business at home or local markets.

In addition, saline intrusion is also attributed to the irrigation infrastructure including sluices and saltwater barriers, as well as canal systems. In Binh Phu commune, Càng Long district, the construction of the Láng Thé sluice and saltwater barriers has reduced the incidence of saline intrusion into fields. This is because when the salinity of the river exceeds 4‰, the authorities close the sluice gates: *"There used to be saline intrusion due to the absence of sluices. However, in the last 10 years, the salinity would be tested outside the sluices. If the salinity levels are high, the sluice gates will be closed to prevent saltwater intrusion. Only when salinity decreases, will water be allowed in* (IDI, female, born in 1962, Kinh people, Binh Phu commune). *"In recent years, droughts and salinity haven't occurred frequently; fresh water supply is more stable thanks to the saltwater barriers"* (IDI, female, born in 1984, Khmer people, Binh Phu commune).

Conversely, Ham Tan commune, Tra Cu district has no closed saltwater barriers and sluices, saline intrusion is significantly affected by tidal regimes and changes in rainfall. Additionally, the clearing of canals to connect the waterway transport system has exacerbated salinity levels: *"Before the canals were cleared, the water was only slightly brackish, with salinity around 4-5‰, and it would become fresh again at around 6‰. Now, the salinity has risen to over 10‰, and sometimes reached 15-20‰"* (IDI, male, born in 1968, Kinh people, Ham Tan commune).

Thus, each gender is associated with different roles and responsibilities in agricultural production, contributing to differences in their understanding of droughts and saline intrusion. Furthermore, the survey results indicate variations in the interpretation of the causes and developments of these phenomena among communities, influenced by their geographic locations and the characteristics of their irrigation infrastructure.

3.2. Gender dimensions of accessing information about droughts and saline intrusion

The primary source of information regarding droughts and saltwater intrusion for both men and women in the area comes from local authorities, primarily through the "loudspeaker system"[1]. This method

[1] The "loudspeaker system" represents a "manual" method of information dissemination, characterized by its repetitive implementation and the delivery of direct, localized information closely associated with agricultural production activities in the region.

involves local officials traveling around villages on motorcycles equipped with loudspeakers to disseminate warnings and announcements about droughts, saltwater intrusion, and agricultural schedules to the community. This approach ensures that locals stay informed and can prepare for necessary actions. One male respondent shared, *"The announcements usually provide information on natural disasters such as droughts, heavy rains, saltwater intrusion, and storms, enabling people to respond and become more proactive. For example, if a drought is expected in 10 days, we take advantage of the time to complete tasks in advance. Or if heavy rain is predicted in 10 days, we hurry to spray pesticides and finish everything early so that when the rain comes, we are free. This information helps us be more proactive. Otherwise, it would be difficult to know what to do"* (Male respondent, born in 1969, Kinh people, Binh Phu commune).

According to survey respondents, *"Listening to information from the local loudspeaker is the most common and accurate source; we do not rely on any other sources. Seasonal schedules are announced every season"* (Female respondent, Binh Phu commune). Another respondent remarked, *"Information about droughts and saltwater intrusion primarily comes from village announcements. I seldom watch television or attend local meetings, whereas my wife attends more frequently since she has more time"* (Male respondent, born in 1974, Khmer ethnic group, Ham Tan commune).

Furthermore, women predominantly attend meetings intended to disseminate information on climate change and environmental sanitation, held by officials at the People's Committee headquarters. Survey participants attributed this gender disparity to men being frequently engaged in farm or construction work during the off-season, while women are more likely to be at home. A local official, the head of Nguyet Lang B hamlet, reported that women constitute approximately 80% of participants in village or commune-level meetings.

The in-depth interviews indicate that while men regularly access information through television and radio broadcasts and demonstrate an awareness of environmental issues and climate change, most of them reports limited engagement with these media. It is primarily attributed to their daytime involvement in agricultural work, leaving them with only the evening hours to watch the news.

Overall, forecasts, warnings, and announcements from local authorities serve as the principal source of information accessed by both men and women, which is particularly useful for men when making decisions related to agricultural production. In addition to the limited time available for accessing alternative information sources, a significant contributing factor in Binh Phu commune of Càng Long district is that agricultural schedules and activities are predominantly governed by water management plans developed by the Agricultural Extension Sub-department in collaboration with the District Department of Agriculture and Rural Development.

In Ham Tan commune, Tra Cu district, men primarily rely on daily observations to monitor water salinity, employing manual salinity measurement tools (such as salinity meters or taste tests), in addition to information disseminated via loudspeaker broadcasts. One respondent stated: *"I seldom listen to weather forecasts due to lack of time; after working all day, I am too*

fatigued to engage with media and often go straight to sleep. Salinity is measured with a salinity meter that costs approximately VND 80,000. Initially, I test salinity by tasting, and if the water is too salty, precise measurements are then taken" (Male respondent, born in 1968, Kinh ethnic group, Ham Tan commune). Another respondent noted: *"The water is increasingly saline, which is believed to be due to climate change and abnormal weather patterns. I am not well-informed about these issues and rarely seek information from media or television, relying instead on direct observations"* (Male respondent, born in 1969, Kinh ethnic group, Ham Tan commune).

For men working in the fields, they typically rely on firsthand experience accumulated over many years to gauge information about droughts, saltwater intrusion, and weather changes. This knowledge from experience has traditionally supported their assessments of these phenomena. However, the growing unpredictability of weather patterns has diminished the accuracy of such conventional forecasts. Consequently, information provided by local authorities has become increasingly essential for managing agricultural activities.

3.3. Gender perspectives on reporting damage from droughts and saltwater intrusion

The prolonged droughts and saltwater intrusion have resulted in a shortage of fresh water for both production and daily life, causing particularly adverse effects on agricultural production. This direct impact of droughts and saltwater intrusion is universally recognized by the respondants. In this regard, no gender-based differences are observed. However, the severity of the impact on households and resident communities varies depending on factors such as geographic location, site-specific conditions, and type of agricultural production carried out by the households.

Specifically, in terms of geographical location, areas equipped with saltwater barriers (such as Binh Phu commune) or fields located near large water channels tend to experience less severe impacts and damage compared to those outside such barriers or fields situated at the end of the water sources.

Regarding the effects of droughts and saltwater intrusion on households, survey results reveal varying degrees of damage: *"During that period, extreme heat caused the canals to dry up, leading to a shortage of water for both domestic use and agriculture. Consequently, rice crops were severely affected, with losses exceeding 50%, and some experienced total crop failure. For instance, a typical field that produces 10 sacks of rice might yield only 5 sacks under such conditions"* (Male respondent, born in 1969, Kinh people, Binh Phu commune). *"The year 2020 was particularly devastating, with the summer-autumn rice crop suffering 70% damage, resulting in only a few sacks of rice for consumption"* (Female respondent, born in 1959, Khmer ethnic group, Binh Phu commune).

In Ham Tan commune, where saltwater barriers are absent, residents engaged in rice cultivation alongside shrimp and fish farming, as well as sugarcane production, have experienced severe damage: *"The saltwater intrusion led to the death of rice crops and fish in the ponds, resulting in significant financial losses. Following the intrusion, we had to abandon the fishponds, and it took a considerable time before we could restart aquaculture. Additionally, the saltwater affected the sugarcane crops, leading to a failed harvest. Previously, we could earn VND*

4-5 million per 0.1 ha, but during that period, we only made a profit of VND 1 million per 0.1 ha" (Female respondent, born in 1969, Kinh people, Ham Tan commune). "The saltwater intrusion that year made rice cultivation impossible. Although we had a good harvest the previous season, the subsequent season's yield was entirely ruined. We had no choice but to abandon the fields" (Male respondent, born in 1974, Khmer ethnic group, Ham Tan commune).

In Rach Ca hamlet of Ham Tan commune, situated near the Hau River, rising salinity has caused severe damage to households specializing in snakeheads, white shrimp, and giant river prawns: *"Since 2015, saltwater intrusion has become more frequent, with salinity levels increasing markedly. Before 2015, salinity was relatively low, peaking at only 6-7‰. However, since then, salinity levels have risen unpredictably, exceeding 10‰. High salinity benefits shrimp but severely affects snakeheads and crops. During this period, sugarcane suffered slight damage, fish died en masse, and coconut trees bore no fruit. Excessive salinity leads to fish mortality and hinders shrimp growth"* (Male respondent, born in 1969, Kinh people, Ham Tan commune).

For households engage in crop cultivation, water scarcity during dry seasons results in wilting plants and reduces yields.

In addition, water shortages in dry season introduce further economic challenges for these households. First and foremost, fuel and energy costs rise. The lack of fresh water compels families to use pumps to extract water from rivers, canals, or ditches, leading to higher fuel expenses. Even with an irrigation system in Binh Phu commune, local families often purchase gasoline or diesel-powered pumps to ensure a sufficient water supply for their crops during dry season. Besides the cost of fuel for these pumps, there are additional expenses for electricity to operate water motors for domestic purposes, irrigation, and livestock. As one respondent noted: *"Among the three cropping seasons, the summer-autumn season incurs the highest costs due to delayed rainfall. When planting occurs in March with insufficient rain, we must use diesel and gasoline-powered pumps. For 1.5 ha, we pump water twice a week throughout the season. Since the fields dry out every 3-4 days, continuous pumping is required. In the other two seasons, less pumping is needed thanks to regular rainfall"* (Male respondent, born in 1959, Khmer ethnic group, Binh Phu commune). Moreover, the costs of agricultural inputs have risen. Water shortages slow rice growth, leading to higher incidences of pests and diseases, which in turn raises the costs of fertilizers and pesticides. For households growing vegetables, costs also rise due to the need for continuous purchases of seeds, plant protection products, cover nets, and irrigation piping.

Furthermore, the scarcity of water during dry season exacerbates competition for irrigation resources among households located in different locations. For instance, households with fields situated at the head of a canal or near a canal find it easier to access and pump more water than those with fields located at the end of the canal or farther from water sources. The latter may have to wait until the former have finished pumping before they can irrigate their own fields or incur additional expenses to purchase pipes for water transportation. As one respondent explained: *"Some fields are close to the canal whereas those are farther, from several tens to a few hundred meters away. Smaller canals do not have*

enough water like larger ones for dozens of pumps. People at the beginning of the canal can pump a lot of water, meanwhile those further down the cannal have to wait for the pumping above to finish before they can pump" (Male respondent, born in 1959, Khmer ethnic group, Binh Phu commune).

Droughts and saltwater intrusion not only reduce household incomes but also pose significant challenges in agricultural production across various dimensions. These conditions exacerbate the vulnerability of agricultural communities in the research area, who are already contending with market fluctuations such as rapidly increasing agricultural input costs and stagnant rice prices.

4. Conclusion

The case study demonstrates that both men and women recognize extreme droughts and saltwater intrusion in the area due to the direct effects on their household economies. The extent of damage from these events varies according to the type of agricultural practices adopted by the households and their place of residence.

In terms of elucidating the causes and development of droughts and saltwater intrusion, gender disparities become evident. These differences are attributable to traditional gender roles within family labor division, observed in both Kinh and Khmer communities. Men, primarily responsible for and actively involved in agricultural production, are more frequently engaged in observing weather developments than women. Consequently, they provide more detailed and comprehensive explanations of weather changes and the underlying causes. Additionally, the research findings indicate that loudspeaker announcements from local authorities are the principal sources of information about droughts and saltwater intrusion for the public. In contrast, fewer people access information from meetings, radio, or television broadcasts. Part of the reason is that local people are busy with work and have little time to follow news from those information channels ❑

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(continued from page 30)

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