



FOOD SECURITY IN THE MEKONG REGION

MEKONG CONNECT

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Editorial Foreword

Welcome to the December 2021 Issue of the Mekong Connect Magazine, a joint publication between the Asian Vision Institute (AVI) and the Konrad Adenauer Stiftung (KAS) Cambodia Office. The magazine publishes two issues per year, which are funded by the KAS Cambodia Office to provide access to readers wishing to gain a better understanding of a wide range of issues in the Mekong region, including climate change, trade, food security, poverty, sustainable development, COVID-19, peace and security, and international cooperation.

In the June 2021 Issue, we noted that the growth and progress achieved over the past two decades had brought remarkable improvement in income per capita and living standards of millions of people in Asia, particularly in Mekong countries. However, the global COVID-19 pandemic has disrupted the development and affected people's livelihoods.

Like the previous Issues, we encourage the authors to provide their different perspectives, advance their arguments, and analyse based on data so that the readers will gain insights and find this magazine interesting and useful.

This December 2021 Issue investigates the issues, dynamics, opportunities, and challenges of food security in Mekong countries. COVID-19 has had adverse impacts on the region. The negative impacts are rising poverty levels and growing food insecurity across the region. However, the Mekong region presents opportunities for boosting food production and supplies. It can become a major powerhouse to produce and supply food for the region and beyond. However, some challenges need to be addressed, such as climate change, floods and droughts, as well as a lack of access to good credit and appropriate technology. The articles in this Issue will illustrate these and other relevant issues about food insecurity. If the Mekong region needs to leverage its advantages, more government and private sector investment in food security are needed. Promoting agriculture and the food industry provides income and employment for people.

This publication collects intellectual capital from researchers, scholars, and policy advisors inside and outside the Mekong region. The extent of social and economic losses from the prolonged pandemic has been discussed, and the authors have offered some practical policy recommendations. In addition to the policy suggestions offered in this Issue, we encourage more robust debates and further studies to be conducted to provide more enriched analysis. This issue is published in printed and digital formats like its preceding ones. The digital version is available for free download on AVI and KAS Cambodia websites.

We would like to acknowledge the intellectual contributions and appreciate the efforts of the following authors to this December Issue, namely Dr Le Trung Kien, Ms Yan Sophorn, Dr Wee Chian Koh, Dr Kimlong Chheng, Mr Sophea Chuon, Ms Setthikun Sun, Ms Monypachpor Ly, Mr Seng Sopheak, Dr Nguyen Thi Thuy Trang, Dr Le Phuong Cat Nhi, Huynh Ho Dai Nghia, Dr John Walsh, Dr Nittana Southiseng, Ms Piyaporn Wongruang, and Mr Sayan Chuenudomsavad. Our special thanks also go to KAS Cambodia's team, namely Dr Daniel Schmücking, Ms Likhedy Touch, and Ms Isabel Weiningger. We also wish to thank AVI President Dr Chheang Vannarith and the AVI Secretariate team for their support and assistance.

MEKONG CONNECT

Volume 3, Issue 2

Contents

- 7** **The Mekong River Basin, Food Security and Sub-regional Cooperation**
Le Trung Kien
- 11** **Food Supply Chain Disruptions and Food Security in the Mekong Region during the COVID-19 Pandemic**
Yann Sophorn
- 16** **The Impact of COVID-19 on Food Security in Cambodia**
Wee Chian Koh
- 23** **Food Security in the Mekong Region: A Case of Cambodia in the Context of COVID-19**
Monypachpor Ly and Kimlong Chheng
- 29** **Food Security and Agriculture in Cambodia: Structural Changes and Impacts**
Sophea Chuon
- 33** **Cambodia's Food Security: COVID-19 and Way Forward**
Setthikun Sun
- 40** **Impacts of Climate Change on Local Livelihoods and Food Security in the Tonle Sap Lake Area**
Seng Sopheak
- 46** **Food Security in Vietnam: Significant Achievements, but Challenges Remain**
Nguyen Thi Thuy Trang
- 52** **Hydropower and Its Impacts on Livelihoods and Food Security in the Mekong Delta**
Le Phuong Cat Nhi
- 57** **The Dual Impact of the COVID-19 Pandemic and Climate Change on Food Security in the Mekong Delta in Vietnam**
Huynh Ho Dai Nghia
- 60** **Food Insecurity in Lao PDR during the COVID-19 Pandemic**
John Walsh and Nittana Southiseng
- 65** **The Free-Flowing Lower Songkhram's Food Security and Way of Life under Threat**
Piyaporn Wongruang and Sayan Chuenudomsavad

THE MEKONG RIVER BASIN, FOOD SECURITY AND SUB- REGIONAL COOPERATION

Le Trung Kien

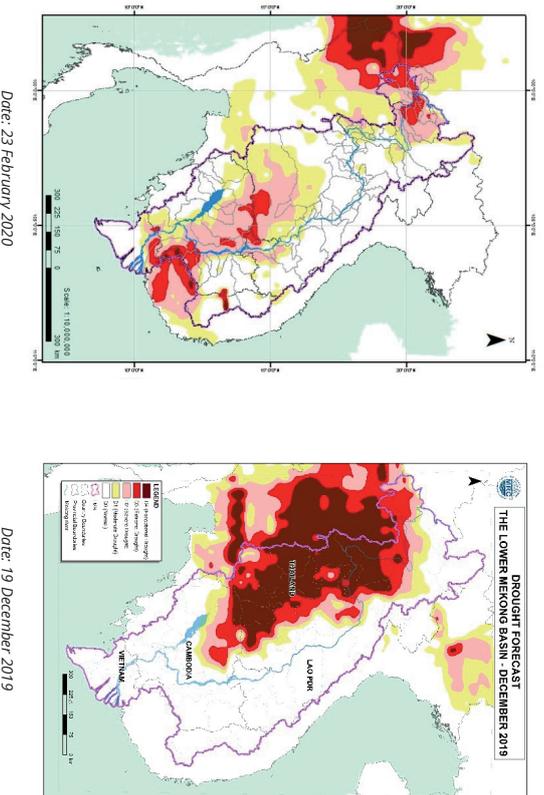
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Food Security in the Mekong River Basin

In recent years, the Mekong sub-region has witnessed unusual fluctuations in water level of the Mekong River. The water level was low to a record level, especially in 2016 and the early rainy season of 2019. In the region, the threat to water for food production comes from the impact of natural factors such as climate change and the socio-economic development activities of countries such as hydropower dams, water transfer, and water diversion.

In particular, the Mekong River basin has faced increasingly severe floods, droughts, and saline intrusion. In 2019, the river was at its lowest in 100 years, posing a threat to the food supply. The livelihoods of tens of millions of people along the river risk hanging on the line. In March 2020, the water level dropped to one metre, the lowest water level in 50 years. In 2021, the Mekong River Commission's (MRC) monthly rainfall observations show that rainfall has been consistently lower than average since November 2020, falling by 25%.

Figure 1: Map of drought in the Mekong sub-region



Source: MRC Drought Forecast.

In Thailand, the water level of the Mekong River has dropped to a shallow level, affecting eight provinces, namely Chiang Rai, Loei, Nong Khai, Mukdahan, Bueng Kan, Nakhon Phanom, Amnat Charoen, and Ubon Ratchathani. The consequence is the lack of water for agricultural production in Northeast Thailand, affecting waterway transport routes and livelihoods. The damage from the drought is expected to reach 1.5 billion USD, accounting for 0.27% of Thailand's GDP. In Cambodia, farmers in two provinces, Pursat and Battambang, on the shores of the Great Lake also face a shortage of water for agriculture. Sovereignty, the Deputy Director of Battambang Department of

Agriculture, said that 360,000 hectares of land used for rice cultivation in the province was affected by the drought. In Laos, drought could reduce crop yields by 30% by 2050.

In Viet Nam, the severe drought and saltwater intrusion conditions have significantly affected millions of people's livelihoods and food security in 13 provinces in the Mekong Delta. According to research by the United Nations, the drying up of river branches and canals has resulted in erosion of roads and houses and caused severe water scarcity. The most affected sectors were food consumption, production, agriculture, and livestock. In Ca Mau province, 30,000 hectares of paddy rice risk being damaged or lost. In Ben Tre province, saltwater has intruded 80 km inland affecting thousands of hectares of fruit trees and vegetables. The decrease in rice production in Viet Nam affects the country's food security and regional food security. Viet Nam is the main rice supplier to the Philippines. In 2021, according to the USDA Rice Outlook, the country expects to remain the world's second-largest rice exporter with 6.4 million tons.

Sub-regional Cooperation in Food Security

The water security for food production and people's livelihoods has increasingly become a major issue of concern, requiring a comprehensive approach to address.

First, sub-regional cooperation must identify the key factors that cause the water shortage to map out appropriate solutions. The approach and measures must be based on science, reliable data, and resources. While the impact on agriculture and fishery has become more severe recently, there has not been a widely accepted consensus on the critical reason for the water shortage in the river basin. There is still a debate among stakeholders on whether climate change is the main reason causing droughts more severe in recent years or whether it is mainly because of the hydropower dams that prevent the natural flow of water in the Mekong river or other factors.

Second, it is essential to strengthen the water governance mechanism in the sub-region to ensure food security. The only binding mechanism in the Mekong sub-region is the MRC established by the 1995 Mekong Agreement. The MRC is designed to help build consensus around solutions through basin monitoring, assessment, data and information sharing, and dialogue and cooperation. However, China and Myanmar, the two Mekong River upper stream countries, have not yet been the full member of the MRC. Other cooperation mechanisms can play important roles in complementing the role of the MRC. The Mekong-United States Partnership can play an essential role in improving the Mekong countries' water governance capacity building and providing technical support in agricultural and fishery production technology. The Lancang-Mekong Cooperation (LMC) is the only platform that consists of six the riparian Mekong countries and has water security as one of the key cooperation pillars. The LMC, hence, can play a vital role as the consultation platform to promote trust and collaboration among the upper and lower stream countries in water and food security. In addition, Japan, Australia, Germany are also long-time partners with Mekong countries in this area of cooperation.

Third, Mekong countries should have an approach of water-energy-food security nexus to enhance food production in the region. The food security issue in the Mekong River basin is not a stand-alone challenge but is closely linked to the region's water security and energy demand. In this connection, the riparian countries should strengthen their cooperation to have a master energy development plan, especially on hydropower. In water security cooperation, governments need to coordinate policies through (i) sharing information, hydrometeorological data, and the situation of discharge and water resource exploitation in both rainy and dry seasons; (ii) cooperation in response to floods and droughts, making full use of the communication channel (hotline) in cooperation in handling emergencies in the Mekong River, and building a financial mechanism for disaster risk insurance and support for reconstruction and remediation; and (iii) joint scientific research cooperation.

Fourth, Mekong countries should make use of new technologies in smart and climate-resilient agriculture. A research by Mishra et al. 2021 with more than 1,500 experiments and 15,000 farmers in 11 provinces in the Lower Mekong basin showed that, with a system of rice intensification practices, the average rice yield increased by 52%, and net economic returns were raised by 70%. Labour productivity increased by 64%, water productivity by 61%, and mineral fertiliser use efficiency rose by 163%. New technologies are an indispensable tool to reduce food loss and waste, shift diets, and raise productivity by improving or maintaining soil fertility, enhancing pasture land productivity, and restoring degraded land.

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FOOD SUPPLY CHAIN DISRUPTIONS AND FOOD SECURITY IN THE MEKONG REGION DURING THE COVID-19 PANDEMIC

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Introduction

The Mekong region, also known as the Greater Mekong Subregion (GMS), is home to thousands of habitats, hundreds of species of fish, millions of trees, 200 acres of water land, numerous types of insects, and sources of livestock for over 60 million people living in the countries sharing the Mekong River, including Cambodia, Laos, Myanmar, Thailand, Vietnam, and China (Boupaop and Eckman 2012; Weaver, Ramachandran, and Adriano 2019). For hundreds of years, the countries have drawn benefits from the Mekong River for food provision, development, economy, and society.

Apart from food provision, the Mekong River is a key source for income generation not only for the food industry but also for other river-related businesses such as tourism, transportation, aquaculture, forest and non-timber products, and cash crop plantations (Thu 2020). Local people are economically self-sufficient through these business activities which are their key means to access food.

Notwithstanding, the regional residents have been facing food security issues. The pressure from economic development, water-based energy creation, and climate change has affected its food production. Food insecurity was already a severe problem in the region. A global survey on food security studied 113 countries and gave scores out of 100 and ranked out of 113 based on four measurements, including the issues of food affordability, availability, quality and safety, and natural resources and resilience. It showed that Vietnam scored 60.8 (in 2019) and 60.3 (in 2020) and ranked 63; Myanmar 56.3 (in 2019) and 56.6 (in 2020) and ranked 70; Cambodia 52.4 (in 2019) and 51.5 (in 2020) and ranked 81; Laos 47.5 (in 2019) and 46.4 (in 2020) and ranked 90; and Thailand 62.9 (in 2019) and 64.0 (in 2020) and ranked 51 (The Economist Group 2021).

According to UNICEF, the world has declared:

All people at all times have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life. In other words, if someone/ country is considering obtaining food security, the person/country is necessarily enabled to have availability of food, access to food, utilization of food as a source of nutrition and overall health and stability of food supply.

The presence of COVID-19 has further caused food supply chain disruptions, an emerging cause of food insecurity for people in the region, particularly the most vulnerable groups such as the urban poor, inhabitants in remote areas, migrants, and people working in the informal sectors of the economy (Trensin, Kalibata, and Cole 2020).

Food Supply Chain Disruptions

Fish, rice, and water are the core diets of the communities living along the Mekong River. Moreover, they, particularly rice, are one of the regional exported products to the world. Consequently, any reduction or disruption to them affects regional and world food security.

Cambodia is the most dependent country on fisheries among the lower Mekong basin countries, about 8% of the country's GDP. Similar to Cambodia, millions of Thai and Vietnamese rely on subsistence fishing for food security. Thus, the fishery sector has supported thousands of businesses including small food shops and stalls, boat builders, and gear suppliers (MRC 2018 cited in Thu 2020).

In 2017, around 109 million tons of paddy rice were produced by the countries in the region, with Vietnam, Thailand, and Myanmar being the 5th, 6th, and 7th largest rice producers in the world, respectively. The year after, Thailand and Vietnam became the world's 2nd and 3rd largest exporters by volume, respectively, while Cambodia was the 8th largest exporter (Statista 2018 cited in Thu 2020).

With restrictions imposed on logistics, travel/transportation and movement, and import and export due to the COVID-19 pandemic, these prevention measures have caused further delays and disruptions to the supply of food, limited on food choices, increased food prices, and led to shortage of labour. The number of drivers per vehicle and vehicle movement has been tightened. Many food suppliers have to deploy largely impermanent or part-time employees, particularly for arranging, planting, reaping, preparing, or shipping harvests. The lockdowns, physical distancing, restrictions, and infections have led to the rise in employees' absence from work or a slowdown in the capacity of firms to perform or produce food for the market promptly (Barman, Das, and Kant 2021).

Therefore, the supply chain flow is distracted. More particularly, farming activities that are time-dependent or seasonal, which follow a specific timetable, have to speed up or change to be as mechanical progression and up-skilling of their manpower. Delays in any activity can affect all cycles in the supply chain. As a result, the incomes of farmers, workers, and fishery industries/businesses are heavily affected.

Causes of Food Insecurity

The low food value chain is a cause of food insecurity. According to ILO (2020), workers in ASEAN countries lost working hours from 3.4 per cent to 17.2 per cent in the first nine months of 2020 if compared to the pre-crisis level. Between 390,000 and 570,000 employments were lost in 2020 (ADB 2020). About 30 per cent of households' main earners were not employed in March 2020. Households which had employments earned 13 percentage points lower than before the pandemic. Many households have experienced losses in incomes (World Bank 2021b).

As food consumers earn less, they have to choose unhealthy coping strategies. The World Bank (2021a) also finds that as retail food prices are higher, more and more households are lowering their food quantity and quality. Besides costing and pricing issues, people in the region experienced decreased in accessibility to certain types of food. Restaurants, markets, food stalls have restricted accessibility. Food choices were limitedly available. Some people have to consume items with a long shelf life, namely dried or canned nourishment. The World Food Program, as reported in World Bank (2021a), estimated a sharp increase in the number of people facing acute food insecurity in the 2020-2021 period.

Factors Leading to Food Security in the Region

It was foreseen that per capita rice consumption is expected to decline as consumers are shifting to other food, approximately 10 per cent lower in 2025 than in 2015 (World Bank 2016). Food preferences have been growing and diversifying over the years. Diets are substitutable. Some crops other than rice have become more beneficial. For example, beans and pulses in the dry season can help producers earn more and higher profits. More importantly, many crops are less costly and water-intensive to produce (Ibid).

However, the food system must sustain the ecosystem. Some suggest a “water-food-energy” nexus, a solution inclusive of water and energy issues. Many mention the importance of a comprehensive and inclusive food supply chain system that considers both strategy and challenges (World Bank 2021a). The system that provides numerical and statistical information to identify outbreaks and outbreak strains allows conducts of effective controls and implementations such as establishing and enforcing movement bans, vaccinations, destruction campaigns, product recalls, and emergency response plans for food safety hazards (Thu 2020).

Others argue that although there have been significant establishments of food safety laws, policies, and regulations in the GMS countries, gaps and disparities within and between countries persist. Many areas of the GMS are challenged by “limited infrastructure and human and institutional capacity—leadership, technical, and operational—to operate effective food control systems that protect consumers, suppliers, and buyers” (Weaver, Ramachandran, and Adriano 2019, p. 95). The authors documented those consumers are sceptical about the current system due to “frequent scandals and reports of food safety failures implicating various certified products” (Ibid).

This is a call for additional legal requirements and reinforcement for improving food security in the region. The laws set standards and requirements for food production, consumption, and distribution to the healthy food industry, farmers, businesses, producers, and supply chains for low cost but healthy food. Besides, the law should restrict insecure food on the market while overseeing production, placement, monitoring, inspection, manufacturing, control, food production-related chemicals, substances, and other activities. Moreover, they promote healthy food, awareness, access, visibility, availability, and stability of food. They also need to encourage, promote, and support local healthy food producers through recognition and marketing. They define what information should be on the package and the registration, inspection, and certification process.

Moreover, as we depend on farmers to continue working on their fields, supermarket cashiers to show up at their workplaces, and drivers to deliver food to markets or front doors, we need to put measures to protect food workers and prevent the spread of COVID-19.

Finally, it is about improving the communication. We need to better deal with low literacy population, and people in rural, remote areas, as well as the most vulnerable groups, producers, and all relevant stakeholders. The “Whole Chain” approach looks at all perspectives to improve the sensitivity of surveillance systems. It aims to better mitigate and manage risks and respond effectively to food safety breakdowns, disease outbreaks, and related events. Therefore, in every player’s interest, issues need to be identified early and dealt with fairly, efficiently, and effectively (Weaver, Ramachandran, and Adriano 2019).

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THE IMPACT OF COVID-19 ON FOOD SECURITY IN CAMBODIA

Wee Chian Koh

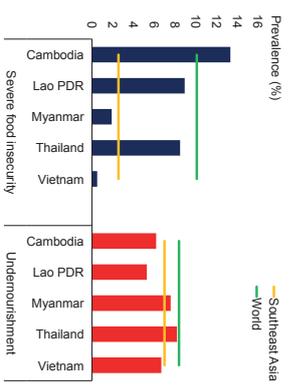
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Introduction

The COVID-19 pandemic has increased food security risks in many parts of the world. Food security means that all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for active and healthy life (FAO 1996). However, border closures, lockdowns, and strict quarantine measures have disrupted food supply chains, from planting and harvesting to processing and distribution, which have limited food availability and accessibility. In addition, employment and income losses have reduced food consumption and nutrition, especially in vulnerable groups such as infants and children, pregnant and lactating women, and poor households, putting them at risk of micronutrient deficiency.

In Cambodia, severe food insecurity and undernourishment prevalence has been among the highest in Southeast Asia even before the pandemic (Figure 1). The situation has likely been made worse by the damage the pandemic has since caused. Cambodia detected its first imported COVID-19 case in Sihanoukville on 27 January 2020. Although no community transmission was detected until the end of November 2020, the global spread of the pandemic since March 2020 led to the implementation of stringent measures, such as travel restrictions, school and business closures, and major public holidays cancellation (Figure 2). The first community transmission cluster was detected in Phnom Penh on 29 November 2020, and cases have continued to surge. As a result, the country was placed under lockdown across the whole of Phnom Penh and Ta Khmau on 15 April 2021. These lockdowns were lifted on 6 May 2021, but restrictions remained in high-risk areas, and “red zones” were established in other parts of the country.

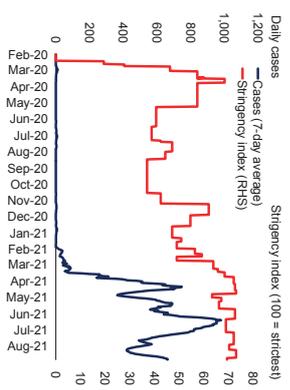
Figure 1. Prevalence of severe food insecurity and undernourishment in 2019



Source: Food and Agriculture Organization of the United Nations.

Note: The severity of food insecurity is measured by the Food Insecurity Experience Scale (FIES) based on direct interviews with individuals or households. Undernourishment means that a person cannot acquire enough food to meet the daily minimum dietary energy requirements to maintain a normally active and healthy life.

Figure 2. Daily COVID-19 cases and stringency of government restrictions



Source: Oxford COVID-19 Government Response Tracker.

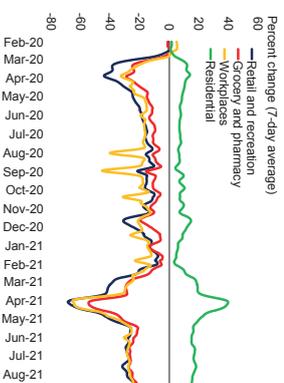
Note: The stringency index is a composite of nine policy measures: school closure, workplace closure, cancellation of public events, restrictions on gatherings, public transport suspension, stay-at-home requirements, restrictions on internal movement, international travel controls, and public info campaigns. The last observation was on 18 September 2021.

Impact on Food Availability and Access

The impact of COVID-19 on food security has been uneven, with urban centres more severely affected due to higher population density, a disproportionately larger share of cases, and more stringent restrictions. Whilst lockdowns may be necessary to curb infections, they caused severe hardships to residents living in the designated red zones, who were even banned from leaving their homes to purchase food (ASEAN Today 2021). Mobility fell sharply in mid-April 2021 following the hard lockdowns (Figure 3). Garment factories ground to a halt, and workers were furloughed. Markets and street vendors were ordered to shut, while transportation of food commodities from other locations into the worst-hit areas was hampered. This led to a shortage of some food supplies and a corresponding increase in retail food prices.

In response, the Ministry of Commerce (MOC) fixed prices for selected food items to stabilise prices during the lockdown. Emergency food assistance consisting of staples such as rice, canned fish, fish sauce, soy sauce, and bottled water were distributed to poor households, but the rations were deemed insufficient. In Phnom Penh, where public protests are rarely allowed, small groups of residents came out to the streets on claims of hunger. After three weeks, the lockdown measures were lifted to appease public opposition to the severity of the restrictions.

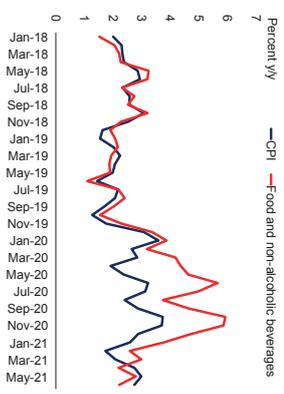
Figure 3. Mobility



Source: Google Community Mobility Reports.

Note: Mobility of selected categories relative to the baseline (corresponding day of the week from 3 January–6 February 2020). The last observation was on 13 September 2021.

Figure 4. Inflation



Source: National Bank of Cambodia, National Institute of Statistics.

Note: The last observation was in June 2021.

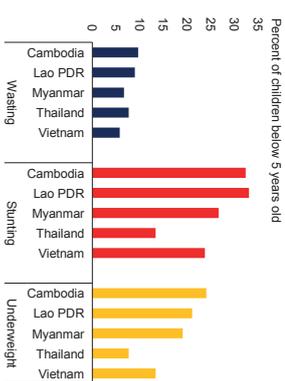
Impact on Nutrition

Before the COVID-19 outbreak, a few million Cambodians were already unable to afford a healthy diet. However, food prices increased markedly in 2020, especially for meat, eggs, fish products, and vegetables (Figure 4). As a result, people were forced to adopt coping strategies, including cutting back on the size and quality of meals. Although prices have since stabilised, some households continue to have low food intake and dietary diversity.

Malnutrition has been a long-term challenge in Cambodia—the proportion of wasting, stunting, and underweight in children below five years old—is among the highest in the region (Figure 5). Much progress has been made over the past decade, but COVID-19 threatens to reverse these development gains. The United Nations COVID-19 socio-economic impact assessment, a nationally representative sample survey, showed that between August 2020 and March 2021, nearly one in four households did not regularly consume Vitamin A and iron-rich foods (United Nations 2021). These impacts are of most concern for more vulnerable household members, especially pregnant women and children. In addition, the proportion of households resorting to negative coping peaked in October 2020 and had not returned to baseline levels in March 2021, suggesting that households continued to struggle to obtain enough food (Figure 6).

During the lockdown in April 2021, a phone-based survey of vulnerable households found that their main concern was lack of food: 77 per cent of respondents reported having insufficient food over the past week (PIN, DCA, and WRC 2021). In addition, about 70 per cent of families in red zone areas lost their jobs, compared to 58 per cent of families in non-red zone areas. Given the scarcity and difficulty to obtain food, exacerbated by income losses, it is not surprising that an overwhelming majority listed food assistance (94 per cent) and cash support (70 per cent) as critical.

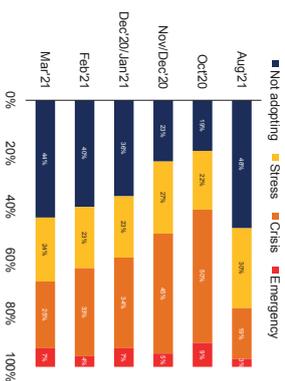
Figure 5. Malnutrition



Source: UNICEF/WHO/WB Joint Child Malnutrition Estimates.

Note: Wasting (low weight-for-height), stunting (low height-for-age), and underweight (low weight-for-age) are conditions whereby a child's growth development is more than two standard deviations below the WHO Child Growth Standards median. Data are based on the latest year available.

Figure 6. Livelihood coping strategies



Source: United Nations COVID-19 Social Impact Assessment.

Impact on the Agriculture Sector

The agriculture sector is of major importance to the Cambodian economy. About three-quarters of the population live in rural areas; Agriculture provided 31.2 per cent of total employment and accounted for 20.7 per cent of gross domestic product (GDP) in 2019 (ADB 2020). Although the agriculture sector has been relatively resilient in the face of the COVID-19 shock, disruptions in agriculture supply chains put workers at high risk of job losses or reduced working hours.

Most Cambodians in rural areas depend on small-scale farming as the main source of income, and a majority of waged agricultural workers are employed seasonally or casually across a range of low-wage, daily paid jobs such as farm labourers, drivers, retailers, or sellers in informal markets (Espino et al. 2021). Although COVID-19 cases have been low in rural communities, mobility restrictions and physical distancing measures have disrupted the national food systems, reducing consumer demand and purchases.

Extension of lockdowns and travel restrictions could create disruptions along the food supply chain. In addition, shortages of labour and farm inputs could reduce the production scale in planting and harvesting, while logistical challenges could pressure farmers to sell produce at low prices. As a result, farm incomes could be hurt, with smallholder farmers more severely affected due to little savings from past harvests. The financial burden of some farmers has also been worsened, and they were forced to sell their livestock and land to pay their debts (RFA 2020).

The government has designated agriculture as a priority sector and has supported farmers by allowing suspension of payments to micro-institutions and allocating land to landless farmers. In addition, non-government organizations (NGOs) and the wider community have also assisted farmers, such as in increasing both the quality and quantity of rice yield through the Improving Market Access for the Poor (IMAAP) project and linking markets to farmers using social media platforms through the Covid Farmer Hacker project (Keng and Rim 2021).

Policy Implications

Policies should continue to focus on improving food availability, accessibility, and affordability, as well as mitigating the socioeconomic impacts on vulnerable groups. Any renewed surge in cases that would necessitate a lockdown should be accompanied by conditionalities to ensure that people have sufficient food and nutrition as well as access to health and psychological support services. At the same time, assistance should be provided to enhance farmers' access to markets, such as encouraging the use of online platforms for information exchange and pooling transportation to sell produce in markets outside lockdown areas. Financial relief and liquidity support should continue to be extended to those under financial distress.

Over the longer term, responses to food insecurity should account for climate change and environmental challenges. The prolonged and severe drought in 2019, worsened by dams on the upper Mekong, is a stark reminder of the threats to the livelihoods of millions of Cambodians. Agricultural technology, such as remote sensing and geographical information system-based crop management, and investment in farm mechanisation can play an important role in raising agricultural productivity.

Cambodia has outpaced many of its Southeast Asian neighbours in vaccine distribution, with more than two-thirds of the population having received at least one dose of the vaccine as of mid-September 2021. An urgent priority is to ensure that the elderly and high-risk individuals are fully vaccinated, and at the same time, implement targeted restrictions to curb infections and save lives until the country has transitioned to an endemic stage to allow safe re-opening of the economy. A sustained recovery of the economy is critical in mitigating food insecurity. Conversely, a sharp economic slowdown could increase poverty by up to 6 percentage points, which translates into nearly one million additional poor and a reversal of six years of progress against poverty (World Bank 2021).

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FOOD SECURITY IN THE MEKONG REGION: A CASE OF CAMBODIA IN THE CONTEXT OF COVID-19

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Introduction

The Greater Mekong Sub-region (GMS) is a global leader in exports of staples such as rice, coffee, and cashew nuts. Diverse types of agri-food trade inside and outside of the GMS are growing rapidly, and infrastructure, trade facilitation, and business environment are improving. However, pests, diseases, and residue problems in the sub-region have impeded production, food safety, and market access. At the same time, local environmental degradation and the impacts of climate change threaten the resilience of some systems (Development Asia 2018). The region has a huge potential for agricultural development due to its abundant water resources, including that from the Mekong River. Countries in the GMS such as Cambodia, Laos, Myanmar, Thailand, Vietnam, and China rely largely on the Mekong River for food security. The river is the main source of food feeding millions of people (Pisces 2016).

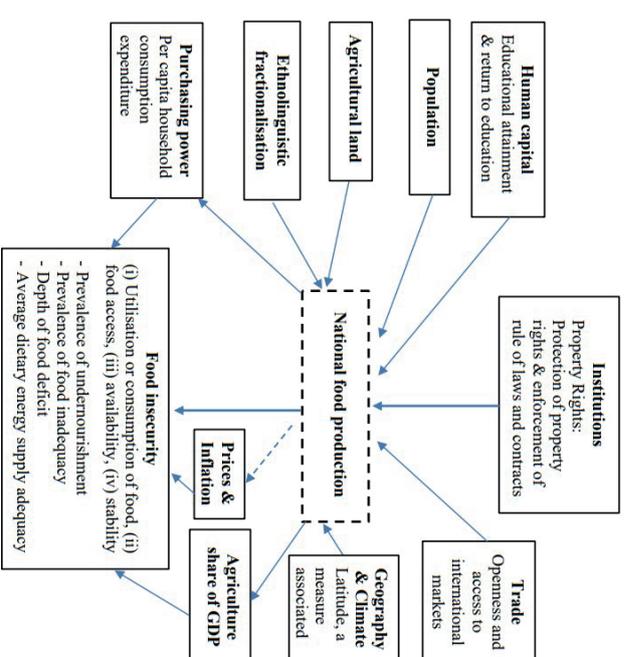
In the GMS, food security is a pertinent issue, at least to some of the riparian states, especially when considering that agriculture sustains the livelihoods of as much as 60 per cent of the Mekong River basin's population, and approximately 20 per cent of the basin's population live below the poverty line. Up to 15 per cent are malnourished. Agricultural produce mainly rice crops constitute almost 25 per cent of the world's total rice market. Cassava, sugar cane, soybean, and maize are additional crops grown in the river basin.

The Mekong River sustains highly productive inland fisheries, which yield approximately two million tons of fish and 500,000 metric tons of aquatic resources per year, excluding yields from aquaculture. In the context of the riparian states, both chronic and transitory food insecurity deserves attention due to livelihoods' dependence on agriculture and aquaculture and the vulnerability of the basin areas to the effects of climate change and natural disasters. Other potential drivers of food insecurity include water insecurity, conflicts, insecurity in private property rights, and a lack of inter-government support and public-private partnership.

Factors Influencing Food Production and Food Security

Several factors influence national food production, food prices, and inflation. They determine the four food security dimensions of a country. The diagram below explains these and other factors in a snapshot.

Figure 1: Factors influencing national food production



Source: Cheng 2018.

A framework in Ecker and Diao (2011) mentions the multidimensionality of food security, the cross-sectoral nature of food insecurity, and the interaction between macro- and micro-levels of economic and social activities and policy actions. From a regional perspective, the connection between the economic process and improved nutrition among the GMS Member States can be substantially different. However, a regional food security programme such as a regional cooperation framework focusing on investment in food security has not been materialised.

In addition, there are several other reasons why food insecurity prevails. In the Mekong region and other parts of the world, political instability strongly affects the natural resources that provide food for the populace. For example, civil wars, internal conflicts, and political instability have been major causes of chronic famine. Moreover, natural disasters are another major factor affecting food security. Over the last decade, more intense and frequent storms, floods, and droughts have damaged many key food production areas in the Mekong region, such as the rice-growing plains of central Thailand and southern Laos and the fertile deltas of the Mekong and Red Rivers in Vietnam. In the Mekong region, the damage to infrastructure and farms by the increasing frequency of natural disasters has worsened food insecurity.

In Cambodia, about 79 per cent of the population live in rural areas, and 65 per cent depend on agriculture, fishing, and forestry for livelihoods (Daniel 2016). Natural disasters, such as floods and droughts, often threaten Mekong countries and cause a significant damage to the food system. For instance, the region suffered one of its worst ever-recorded droughts in 2015. Although the monsoon rains have provided some water for irrigation and household consumption, the effects of the drought, and subsequent salinity intrusion, are a major challenge for the Mekong Delta in Vietnam, raising fears of an extended food security crisis across the region. In addition, climate change and abnormal weather patterns are expected to cause substantial changes to growing conditions for different crops, livestock, and fisheries.

The Effect of COVID-19 on Agriculture and Food Availability and Food Security: The Case of Cambodia

Mekong countries have not been spared by COVID-19, putting great pressure on exploitations of natural resources and depleted investment in agricultural development. In what follows, we present the case of Cambodia amidst the COVID-19 pandemic to get a glimpse of how a regional country has coped with the impacts of the pandemic on food security.

The first case of COVID-19 was detected on 27 January 2020 on a Chinese man that flew from China to Shanoukville (Aun 2020). The community outbreaks and emergence of new variants of the virus led to several travel restrictions for inbound and internal travels, border closure, and the closure of schools and businesses. The Cambodian government imposed strict quarantine measures and lockdowns of Phnom Penh and restricted travels between provinces during the peak of the community outbreak. However, the government was doing its best to ensure people's continued accessibility to food, water, health care and care assistance. The United Nations Commission on Economic, Social and Cultural Rights (CESCR) stated that the right to food should include "physical and economic access to adequate food or means to obtain it at all times" by everyone. The Cambodian government responded to the challenges faced by the people and regions under lockdowns to ensure continuity of services for the elderly, people with disabilities, and other people dependent on home and community services and supports. During the COVID-19 pandemic, the Cambodian government has taken measures to prevent the spread of COVID-19 while reducing its impact on food security in the country as well as in the region.

Cambodia's development in terms of food and nutrition can be compared with other Asian countries. However, Cambodia's average gross domestic product per capita remains low. A quarter of the population still live below the international poverty level of \$1.25 a day, particularly in rural areas (Ly 2016). Hunger and deficiency disease area units still prevail. One in four Cambodians is underfed; four in one hundred kids under five area units are underfed, and nine in a hundred kids die before the age of five (Population Reference Bureau 2002).

In Cambodia, more than 20 per cent of the country's GDP and 30 per cent of the population are employed in the agricultural sector. For the past 30 years before COVID-19, this ASEAN Member State had a strong annual economic growth at an average rate of 7.5 per cent and saw a decrease in the poverty rate from around 50 per cent to less than ten per cent of the population in 2019. However, with the pandemic, Cambodia's financial and economic systems have been affected (Norrajuddin 2021).

In Cambodia, the economic impact of COVID-19 has made it more difficult for vulnerable families to access food, as many people lost their jobs or earned less income. The government has taken swift actions to respond to the crisis and has introduced an additional social safety net to help the poor during this critical time. Although Cambodia has achieved impressive economic success and food security, the nutritional status remains uneven across the country and among the diverse socio-economic groups. Food availability and dietary diversity for the rural poor, pregnant women, and children under five remain a concern. Overweight and obesity is a growing concern about inadequate healthy diets and consumption patterns (Sen 2021).

About 15 per cent of the country's 16 million people, or over two million people nationwide, are malnourished. Moreover, rice and seasonal deficits have contributed to food insecurity. For example, two-thirds of the nation's 1.6 million households face seasonal deficits each year. Many Cambodians eat rice. Rice alone accounts for up to 30 per cent of household spending. Cambodia has about 6 million hectares of agricultural land and abundant water resources.

Besides, chronic malnutrition and stunting present another major concern. Approximately 40 per cent of Cambodian children suffer from chronic malnutrition, which impedes growth and cognitive development in 32 per cent of Cambodian children under five years of age. This high statistic is mainly related to nutritional deficiencies. This stunting contributes to increasing infant mortality rates because children are more susceptible (Benson 2020).

Cambodia has suffered a double hit to food security due to the pandemic and disruptions caused by the pandemic. The food supply-side activities are slowing due to a shortage of labour in the agricultural sector due to COVID-19 preventive measures. On top of that, the drought problem caused by climate change and water shortage in the region will substantially affect income equality and food supply chains. With unemployment induced by business closures, factory shutdowns, for instance, the demand for food such as rice and fish has reduced (Dahlyia 2020). This has a spiral downside effect on food value chains in the country. Another negative impact of COVID-19 has been observed in food prices in Cambodia since early 2020, especially for meat, egg and fish products, and fresh vegetables in Phnom Penh. Although the prices have been relatively stable due to government interventions, many households have reduced their food intake and dietary diversity in certain food categories, such as food rich in protein, vitamin A, and iron, the greatest concern to vulnerable household members, especially pregnant women and children (WTO 2021).

Conclusion

The GMS has a huge potential for agriculture due to its abundant water resources, including that from the Mekong River. However, the COVID-19 pandemic has caused a major problem for all countries, including Mekong countries, creating some undesirable impacts on society and food security in each country. Concerning food production and food value chains, the governments in the region need to promote agricultural modernisation to support production, related values and agro-processing to ensure adequate food production and dietary diversity. Among the priorities, the governments should focus mainly on food production, supply value chains, and final food products available to the markets to prevent food shortages and prevent food price crises.

The food governance system with regard to natural resource use requires a serious examination of food system actors, activities, natural resources, and environmental impacts, especially the sustainable use of natural resources in the production of food. Climate change, socio-economic changes, and increasing natural resource pressure pose chronic and transient food security challenges in the Mekong region. To address these challenges effectively, there should be a strong food governance system regulating actors, government agencies, producers, suppliers, corporations, and consumers in the region.

A system of monitoring and evaluation of the changes caused by natural or human factors is key to assessing the systematic relationships between food security, health, diets, nutrition, and livelihoods in the region and achieving sustainability and efficiency of natural resources in the food system. Moreover, institutional and legal options for achieving more sustainable food systems and encouraging investment in food security would add value to the policy options of the region and the promotion of the region as a food production powerhouse.

For the longer term, the governments in the Mekong region should focus more on the environment and the climate change problem. Moreover, key policies and measures targeting food security should include markets for agricultural and fishery resources that support the sustainability of the agricultural and natural resources. Besides, the governments should support more investment and public private partnership programmes to bolster the resilience of the food system and investment promotion in agriculture and agro-processing sectors to provide income and employment for people and enhance the modernisation process of food industries in the region.

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FOOD SECURITY AND AGRICULTURE IN CAMBODIA: STRUCTURAL CHANGES AND IMPACTS

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Introduction

The agricultural sector has contributed enormously to the economy and poverty alleviation, absorbing thousands of labour force. Rural infrastructure, including irrigation systems, has been improved gradually, facilitating the country's flow of goods and services and enhancing agricultural yields. The poverty rate has plummeted significantly over the past ten years, making GDP per capita increase markedly to \$1,561 in 2018. The unemployment rate remains at around 1% - 2% in both urban and rural areas (NIS and MoP 2019). However, these improvements could not respond to the current demands for food. Cambodia still imports agricultural commodities from other countries to meet the local needs. During the COVID-19 crisis, productions were disrupted, and Cambodian migrant workers, especially from Thailand, returned home. It was predicted that food consumption in the middle class. However, structural changes have occurred in Cambodia's agricultural sector, which would cause the current challenges to become long-term constraints in achieving food security and food diversification in the agricultural sector in the future. Therefore, this article examines the structural changes in the agricultural sector and why they matter for food security.

Structural Changes in Agricultural Sector

In the last ten years, Cambodia's agricultural sector has had many structural changes. The total population has risen from 13 million in 2008 to about 16 million in 2019, excluding migrant workers (over 1 million) (NIS and MoP 2020). However, the rural population, either making a living on or engaging in agriculture, has declined dramatically, with 20% and 10%, respectively, in 2008. As of 2019, only 6.1% live in rural areas, and only 7.4% (or 1,726,000 households) of rural households engaged in agriculture. Most (1,328,000 families) live in Plain Zone and Tonle Sap Lake Zone. Surprisingly, only 33% of them produce agricultural products for sale while the rest for home consumption (NIS, MoP, and MoAFF 2020).

Although the sector continues providing many job opportunities for local people, the proportion of employment has declined significantly. The number of jobs in the agricultural sector decreased nearly 20%, from 71.3% in 2008 to 53.4% in 2019 (NIS and MoP 2020). Most of those involved in this sector are unskilled and received low education. Those participating actively in the agricultural work are migrant workers, accounting for about 40%. The average number of external workers hired by households is 4 in the rainy season and 2 in the dry season (NIS, MoP, and MoAFF 2020). This decline could motivate more rural people to migrate to work in other sectors, either in the country or abroad, since incomes in those areas are higher. If this trend continues in the long term, there will be a shortage of labour force in the sector, and the number of households engaging in the sector would decrease significantly.

Moreover, the number of households occupying agricultural lands is quite low, and not all the land has been used for agricultural purposes. In 2013, almost 50% of farming households had less than one hectare of agricultural land; the other 45% possessed the agrarian land between 1 - 3.99 hectares; and only 0.24% had 20 or more hectares of agricultural land (in 2013, 2.1 million households were engaged in agriculture) (NIS and MoP 2015). However, only 27% of those with less than one hectare of agricultural land did farming and only 6.1% for households with 20 hectares or more. Compared to 2008, there is a marked decrease in those holding agricultural land. In 2019, 12% of households engaged in agriculture had parcels, and 35% had home lots and parcels, while more than 80% in 2013 (1.9 million households had agricultural land and 253,437 households had residential land). On average, a household has 2.2 hectares of farmland (NIS, MoP, and MoAFF 2020), which is less than in 2013, 2.5 hectares (NIS and MoP 2015). These structural changes caused Cambodia's agricultural production to become far smaller than in 2008.

Challenges in Agricultural Sector

Apart from the changes mentioned above, there are challenges in the agricultural sector that would become binding constraints to food security. The capacity of farmers to produce and supply agricultural products to the market is still limited. Many farmers' knowledge of agriculture is also limited, meaning they cannot produce adequate commodities to meet the current demands. New knowledge is available, including technologies, which can help farmers increase their agricultural yields. However, most of those engaged in agriculture received low education, making it difficult to acquire and use that knowledge. Currently, most farmers can only harvest crops once a year. As a result, agricultural yields could not reach the expected outputs, which ultimately could not be regularly supplied to the market. One hectare of rice yields only 2.6 tons per year. In addition, the quality is difficult to compete with imported agricultural commodities. This suggests that in the face of structural changes and lack of training to farmers, especially smallholder farmers, the demand for inputs such as fertilisers, pesticides, and herbicides, which are all imported, will increase in the future. This would make the prices of Cambodia's agricultural commodities difficult to compete with other countries if the prices of those inputs increase. Overuse of fertilisers and pesticides could have negative impacts on yields, land, and quality of crops. Currently, farmers use 34.3 kg of agricultural fertiliser per hectare, which is far behind neighbouring countries.

In addition, farmers continue to practice traditional ways of farming. Until now, many farmers have relied largely on water which is another challenge that needs to be addressed in structural changes. Water access is still limited, especially during the dry season. According to a report by the ADB in 2019, about 33% (1.3 million hectares) of the total agricultural area (3.98 million hectares) are located in 2,480 irrigation systems, and 90% of them are not performing well or dysfunctional. Consequently, rice in the dry season accounts for only 18% of total rice production in Cambodia (ADB 2019). Due to the uncertainty of water supply, farmers are reluctant to invest in high-value crops. In 2019, most farmers grew rice (over 1 million grow non-aromatic rice while just about 200,000 grow aromatic rice), mangoes, bananas, coconut, cassava, and cashew. As for rice, most farmers in the provinces along the Cambodia-Vietnam border grow low-value rice crops. Livestock, vegetables, and other crops improved slightly. The average poultry per farm is 28.5, and only 13% of households are engaged in aquaculture (NIS, MoP, and MoAFF 2020).

Furthermore, Cambodia's agriculture is affected by various shocks. Floods have been frequent since 1999. Thousands of hectares of rice fields are affected every year. In 2020, floods affected 314,000 hectares of rice fields, of which 133,000 hectares were damaged. Drought, which is considered a serious natural disaster, also destroys farmers' crops. From July 2018 to June 2019, 65% (384,000 households) of households engaged in agriculture experienced severe drought. In 2019, the drought wiped out 71,474 hectares of rice fields, a loss of \$37 million. Many farmers also met crop diseases, livestock/poultry diseases, and insect infestation annually. During the above period, 22% (132,000 households) of agricultural households encountered diseased animals, 24% experienced insect infestation, and 9% (56,000 households) met crop diseases (Ibid).

The prices of Cambodia's agricultural products fluctuate significantly. Most farmers face very low prices and find it difficult to sell their agricultural goods to the market. This could result from the lack of processing factories, which is a massive market for many of Cambodia's agricultural products, while they are difficult to participate in the market. Compared to imported agricultural goods, Cambodian agricultural products are more expensive. Consequently, few farmers could gain benefits from agriculture. In 2019, only 13% of farming households received higher incomes than a year ago. Most farmers living along the border sell their crops without processing to neighbouring countries, including Thailand and Vietnam. If these issues continue, the number of households engaged in agriculture would continue to decline, and more agricultural land could be used for non-agricultural purposes. Ultimately, food security in Cambodia would be entirely dependent on imports.

Policy Recommendations

In short, many changes have occurred in the agricultural sector. Besides, existing challenges have provided low incentives for farmers, especially smallholder farmers, to engage in the sector. If there are not any solutions, existing challenges will become binding constraints to the enhancement of the sector. The structural changes would continue and weaken the agricultural production chain and motivate more smallholder farmers to leave the sector. As a result, Cambodia will rely almost entirely on imports to meet domestic demand. Therefore, to build a robust agricultural sector and food security, the government needs to ensure that farmers' market participation is enhanced, prices of those agricultural commodities can compete with imported products, and the balance between domestic supply and imports is well managed based on characteristics of local productions. By doing so, the government should consider the following suggestions: (i) reforming the investment climate in the agriculture sector to attract agricultural processing factories, which are a key market share for local farmers; (ii) conducting the market estimation on the demand for agricultural products, both domestic and foreign markets; (iii) disseminating agricultural market information related to market demand to farmers; (iv) ensuring the stability of farmers' agricultural prices; (v) providing agricultural-related training to farmers; and (vi) encouraging universities to conduct experiments of new agricultural techniques/technologies to enhance agricultural yields and provide training on those skills to farmers.

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CAMBODIA'S FOOD SECURITY: COVID-19 AND WAY FORWARD

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Introduction

The COVID-19 pandemic could be considered a setback to international development. However, looking on its bright side, it draws attention to non-traditional security, which requires huge investment by the state and relevant stakeholders. Those non-traditional security dimensions that require special attention are health security and food security affected by the pandemic.

Food is a fundamental element for basic livelihoods and development. Therefore, ensuring food security does contribute to raising the living standard and sustainable development. Food security is defined as a condition whereby people secure access to adequate, safe, and nutritious food based on their demands in both physical and economic terms to pursue a healthy and active livelihood (Food and Agriculture Organization 2006; OECD, n.d.). Food security covers four dimensions, including Physical Availability that can be achieved through food production and trade available to supply the market; Economic and Physical Access, which stresses the capability of the citizens to get access to food on the market; Utilization, which is the intake of adequate nutritious food for a healthy life; and Stability that discusses the access to proportionate nutrition and livelihood stability, which will not threaten political, economic and environmental aspects (Food and Agriculture Organization 2006).

The key to fulfilling food security may rest on the success in the agriculture sector, which is considered a long-term economic engine of Cambodia. This sector alone generated 23.38% of the GDP and absorbed approximately 30.77% of the labour force available in Cambodia's market (Pletcher 2019a; Pletcher 2019b). Nonetheless, following the USAID data, about one-fifth of Cambodians have experienced food insecurity, consuming less than the necessary dairy consumption requirement (USAID 2021).

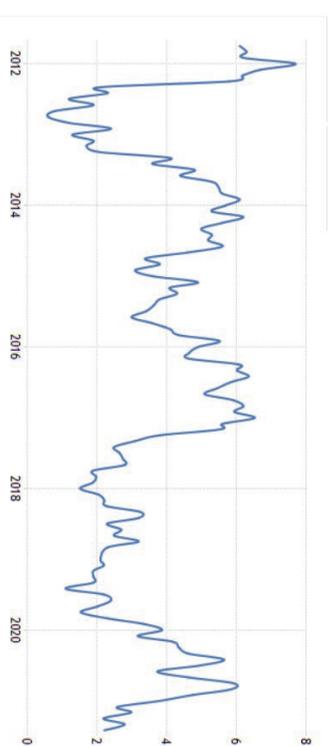
Food Security in Cambodia before COVID-19

Addressing food security is not new in Cambodia's priority of concern. A decade ago, under the International Initiative of Millennium Development Goals (MDGs) 1, Cambodia managed to achieve the target (1a) of lifting half of its population, who had lived below the national poverty line, as well as the target (1b) of bringing down the percentage of people living with hunger (United Nations 2019). However, backed in 2014, Cambodia reported encountering cases of food insecurity which caused 32% of children aged under 5 stunted, despite a rapid progress in the reduction of the stunted level of over 40% (Ibid.). Nonetheless, the country has been working toward improving nutrition, ending stunting, and raising the income of the poorest 20% of the population.

Food insecurity has been mentioned to have yet taken a huge toll on Cambodia. That is based on the fact that approximately 65 per cent of the population heavily depend on agriculture and fisheries to generate incomes and support their families (USAID 2021). Rice, the main dietary consumption, is the main agricultural product produced by households, while fisheries can be drawn from fishing activities in the Mekong River and the Tonle Sap. In 2019, rice production was recorded at 10.9 million tonnes (Knoema 2019). Approximately 5,285,000 tonnes of fish were harvested by the Cambodians in 2018 (General Department of Cadastre and Geography 2018). Both the Mekong River and the Tonle Sap provide water for livelihoods, crops, especially rice, and fish, which creates a perception among the population that Cambodia has sufficient rice and fish supply to the market. This perception means that food insecurity might not occur. However, the output itself does not reflect the real situation of food insecurity. Available data showed otherwise. Concerns have been expressed in regard to over fishing activities in the Mekong River and the Tonle Sap. Besides, the impact of climate change such as the late arrival of rainy season, as well as the dam activities along the Mekong River, have affected water supply and fisheries in Cambodia.

Addressing food insecurity is an ongoing effort in addressing poverty and hunger, corresponding to food availability and accessibility. Based on a progress report by the Cambodian government, the poverty reduction rate improved drastically over the year, corresponding with the annual rapid economic growth. Between 2007 and 2014, the poverty rate slumped from roughly 50 per cent to 13.5 per cent (United Nations 2019). Nonetheless, the World Bank suggested that the population was still prone to external shocks because the reported improvement rate of the population escaping poverty was only a small margin. It estimated that 4.5 million people would slump back into poverty in the event of any major external shock (World Bank 2021). Although Cambodia's economy before Covid-19 had improved with a 7% of annual growth and the GDP per capita of \$1,643, food inflation could still be a key factor impacting food security. Over the past decade before the pandemic, the National Institute of Statistics in Cambodia showed that the food price fluctuated drastically (see Figure 1) (Trading Economics 2021). Nonetheless, despite the food inflation, expenditure for food consumption seemed to illustrate the positive sign whereby the food consumption per person was recorded at \$500.2 in 2018, which was only at the rate of approximately \$300 in 2014.

Figure 1. General overview of consumer price index on food, 2012-2020



Source: TRADINGECONOMICS.COM / National Institute of Statistics of Cambodia.

Food Security Amidst COVID-19

During the pandemic, the World Bank reported an increase in the poverty rate. At least "150,000 households (0.5 million people) have been identified as newly poor between June 2020 and January 2021", based on the number of households that received government support during the pandemic (World Bank 2021). Furthermore, the survey conducted by the World Bank and the National Institute of Statistics in December 2020 and January 2021 demonstrated that half of the respondents had reported a plummet in their households' income compared to early 2020, as the pandemic situation in Cambodia became more serious (Ibid.). This implies a potential issue in food security, as the families may have to cope with the decline in their incomes through reducing their living expenses, including on daily food consumption and nutrition, which may have affected, to some extent, children, women, and adults.

Supply-side conditions

During the community lockdowns and travel ban between provinces, 17 major markets were closed down to curb the spread of the COVID-19 outbreak, which severely affected suppliers and supply chains. “Farmers are watching vegetables spoil in their fields”, as local buyers had little physical access to the fresh food (Turton and Phorn 2021). Thus, the demand side was affected, while the food suppliers experienced economic pressure from having their supplies out of reach of the demands. According to the United Nations Development Program, roughly 70 per cent of the farmers in Cambodia took out loans and repaid those debts once the harvest season was over on the basis that they could earn enough revenue to engage in subsistence agriculture by primarily taking loans and repaying them after the harvest season (UNDP Climate Change Adaptation 2019). Additionally, the situation of the Mekong River has deteriorated thus affecting the fertile condition of roughly 45,000 hectares of paddy fields, which pushed farmers into poverty, debt, whereby the food supplies have a high price but with not much surplus amount. Worse, the farmers’ incomes are halved during the pandemic (Ibid).

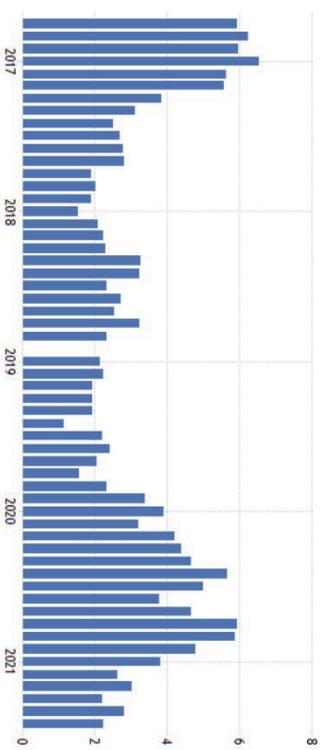
Nationwide, there are 1,517,000 out of 1,726,000 households with agriculture holding that plant and harvest crops for livelihoods (Ministry of Foreign Affairs and International Cooperation 2021). 61% of the harvest is for families’ consumption, whereas the remaining 39% is for sale (Ibid). In terms of livestock and poultry raising, 75% of the households with agricultural holding make their living by raising cattle or poultry, while 16% of the households carry out fishing activities (Ibid). As a result, the total livestock raised is recorded at average of 38,923,400 animals while the number of fisheries activities were unknown (Ibid). Nonetheless, the Ministry of Agriculture revealed that in the first quarter of 2021, agricultural export grew to \$2.09 billion, implying the supplies of agricultural products, to a certain extent, were not in shortage (Badzmielowski 2021). Thus, it means that the supply-side conditions of food security remain resilient.

Demand-side conditions

Amidst the pandemic, people’s living standards in Cambodia have been severely impacted as the crisis put extreme pressure on the economy. The ADB and IMF estimated that approximately 390,000 to 570,000 jobs were lost in 2020. The affected sectors included manufacturing, tourism and hospitality, construction, services and transportation (ADB 2020). Before the pandemic, the sectors mentioned above covered about 60 per cent of economic activities, absorbing 45 per cent of the labour force. Although the Ministry of Planning of Cambodia reported that the unemployment rate was only at 1.4% in 2020, which was much lower than what has been estimated by the ADB and IMF, the socio-economic impacts were nonetheless worsened by the pandemic.

In 2020, food inflation in Cambodia was remarkably high in comparison to the previous year. In 2019, the food inflation was at an average of approximately 2 per cent; however, in 2020, the figure jumped twofold (Trading Economics 2021) (see Figure 2). This resulted from the issue of accessibility on the demand side, considering that the family’s breadwinners may have lost their jobs or coped with the economic pressure by cutting the cost of living, which may consequently lead to food insecurity at the household level. However, in fact-crosschecking with the United Nations Socio-Economic Impact Assessment report, prices of meat, eggs, fish, and fresh vegetables did increase noticeably around the country, but only for a short period before being stabilised (UNICEF 2021).

Figure 2. Food inflation during the pandemic (2020–2021) in comparison to the pre-pandemic



Source: TRADINGECONOMICS.COM / National Institute of Statistics of Cambodia.

Nevertheless, as the economic impacts have yet to improve due to the continuity in community outbreaks, lockdowns, and global demand and supply chain disruption, as well as travel restrictions in some parts of the world, people have little choice but to resort to the unhealthy coping strategies that threaten food security in many countries. Those coping strategies include food borrowing, food consumption reduction, and finding cheap alternatives to fulfil the daily dietary needs to support their households to pull through the crisis (UNICEF 2021). Those dietary reductions were identified as nutritious food types high in proteins such as vitamin A and iron, which are essential for health for pregnant women and children (Ibid). Based on the United Nations, between August and November, the rate of women unable to intake minimum diverse diets grew from 30% to 50% (Ibid). UNICEF also highlighted, “Small size (1–3 members) and households with members having disabilities were more likely to have poor food security and nutrition outcomes... At the end of 2020, only half of the Cambodian women aged 15–49 consumed a sufficiently diverse diet (down from 70% earlier in the year).” (United Nations 2021)

Adding to such concerns, international media also called for attention to food insecurity issues experienced during the community lockdowns, in which vulnerable groups and prone-to-community outbreak zone (aka red zone) were prevented from leaving their houses or travelling outside their zone. Categorized as red zones, there were a total of six communes with a total population of over 300,000 people, in which 50,000 families were affected in Phnom Penh and 5,000 households in Sihanouk Ville (Human Rights Watch 2021; Turton and Phorn 2021). In response to the food insecurity issues, the authorities and NGOs distributed food packages in the red zones. The Ministry of Commerce also created an online platform for households to place order for foodstuff such as rice, noodles, canned fish, preserved radish, fish sauce, soy sauce, and pure drinking water to meet the short-term lockdown demands (Turton and Phorn 2021).

Way Forward

Under the Sustainable Development Goals (SDGs), Cambodia’s government has set new targets and indicators to end poverty and hunger in the country, corresponding to the issue of food security in the country. As part of the national sustainable development goals of CSDGs, the government has been working to end malnutrition by addressing the issue of stunting and wasting in children under five years old and ensuring inclusiveness of food security among the vulnerable population such as women, children, and elderly people (United Nations 2019). The Rectangular Strategy Phase IV itself also stresses the government’s commitment to ensuring that the population will have sufficient nutritious food for human development. Therefore, numerous food security policies have been put in place, such as the National Strategy for Food Security and Nutrition 2014–2018, which aimed at achieving and ensuring the four main elements of food security for all Cambodians by 2018, the National Strategy for Food Security and Nutrition 2019–2023 to eradicate malnutrition, and several more policies (OECD 2016; FAO 2020). In the commitment to meet the set goals, the

government should focus on incorporating technology into agriculture and promoting innovation to turn agricultural products to be higher value-added products.

To ensure food security and build resilience for farmers against external shocks, we need to guarantee the smooth flow of supplies to meet demands, the accessibility of the supplies, and a stable income for farmers. Therefore, the article has the following policy suggestions:

- 1). Technology adoption in agriculture: Agricultural technologies have been recognised as a means to ensuring sustainable and massive agricultural supplies. Studies suggested that these can comprise introducing "drought-tolerant seed varieties, drip irrigation, and the precision application of fertilizers and agrochemicals, as well as practices such as integrated pest management, conservation farming, and improved watershed and soil management," or "zero tillage, conventional breeding, genetic modification, integrated soil fertility management, irrigation technologies, water harvesting and organic agriculture" (Meadu 2012, Weisenfeld and Wetterberg 2015). These technologies have all shown positive changes in the agricultural sector (Ibid). However, it should be noted that technology incorporation is only a solution to the supply-side condition. It may not lift the population, specifically poor farmers, out of miserable life conditions, as agricultural products are low-added value products with price fluctuation.

- 2). Speeding up the growth of agro-industry in Cambodia: Understanding the concern raised in the earlier recommendations, we should incorporate a policy to foster agro-industry in Cambodia. This is the process of turning agricultural products that are low in value into high value-added products. Agro-industry is at an infant stage but has full potential, as noted by the government. Therefore, speeding the growth of agro-industry is a priority to ensure better livelihoods for the population, in which a huge population still depends on agriculture. While acknowledging rice as Cambodia's main export product, there has been a suggestion to produce other outputs from rice such as rice wine, vinegar, rice noodles, and more products (The Phnom Penh Post 2020). What is lacking is the technology, investment, and collaboration in the local MSMEs. To create growth opportunities for poor farmers to sustain their incomes, MSMEs, the agriculture sector, and government policies need to promote public-private partnership or private-private collaborations (between local and international investors).

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**IMPACTS OF CLIMATE CHANGE
ON LOCAL LIVELIHOODS AND
FOOD SECURITY IN THE TONLE
SAP LAKE AREA**

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Introduction

In the twenty-first century, climate change is known as one of the most significant development challenges in the world, and it's present threat is exacerbating the existing global problems (Morecroft and Cowan 2010). Climate change is affecting people's daily lives and the environment. Extreme weather-related events such as floods, droughts, storms, and heatwaves, which are a consequence of climate change, cause considerable damage to human society (Thomas 2017). Over the last four decades, those disasters have increased enormously affecting human health, agriculture, people's livelihoods, and food security (Wuobbles 2018).

Like other countries globally, the impacts of climate change in Cambodia have become more visible in the last few decades. They have affected people's lives, particularly rural people who rely on agriculture and natural resources for livelihoods and food security. For example, in the Tonle Sap Lake area, agriculture and fisheries are essential for rural communities. The Tonle Sap Lake is the biggest freshwater lake in Southeast Asia and is rich in fishery resources. It is also a highly fertile area for rice production supporting nearly two million people (Halgræve et al. 2013; Johnstone et al. 2013; Kunnmu et al. 2014). However, in recent decades, climate change and human activities in the Tonle Sap Lake and the Mekong River have caused significant changes to the lake and its ecosystems (Uk et al. 2018), affecting local communities' livelihoods and threatening their food security.

This article is based on my research conducted in 2019 in two villages (farming and fishing villages) in the Tonle Sap Lake area, where local communities are highly dependent on rice and fisheries as their main sources of livelihoods and food security. Semi-structured interviews and participant observation were used as the primary methods for data collection. Although the research was conducted two years ago, the data is still relevant to the current situation. The article examines how climate change has affected local livelihoods and food security, specifically rice farming and fishing in the Tonle Sap Lake area. It suggests suitable interventions from the government and development practitioners to help local communities to become more resilient to climate shocks so that they can secure their livelihoods and food security and prevent future hazards.

Local Perception of Climate Change

Climate change manifests in different forms, such as high temperatures, storms, floods, and droughts. People perceive it in many ways. According to the data from the interviews, most participants in the area reported that the weather in their communities had changed. In general, the responses to the question about climate reflected negative perceptions. Most of the respondents said that the weather in their area had become more irregular since 2016 or 2017 when the weather became warmer and the two main seasons (dry season and wet season) in Cambodia became abnormal. Most local communities noticed that the delay and shortage of rainfall in the wet season had worsened the droughts. The people expressed their growing concerns over prolonged droughts and increasing temperatures, since they have severely affected their lives, livelihoods, and food security. The villagers believed that changing precipitation patterns, prolonged droughts, and high temperatures resulted from climate change in recent years.

Impact of Climate Change on Local Livelihoods and Food Security

Impact of climate change on rice farming

Rice farming is the communities' main source of livelihoods in the Tonle Sap Lake area, especially in the farming village where people are engaged more in rice farming and depend less on fishing for livelihoods. However, prolonged droughts have been felt to have a huge negative impact on rice farming in the area. All the research participants in the farming village reported that severe drought in 2019 caused severe water scarcity for rice farming, failing rice growth. The local villagers expressed that they were facing an unusual lack of water that all the natural and human-made ponds and reservoirs they used to store water for their rice farming were completely dry. Many farmers in this village used the IR66 rice variety, introduced by the Provincial Department of Agriculture, Forests, and Fisheries, for their farming. This rice variety is known as drought-tolerant and able to cope with abnormal rainfall. However, the farmers reported the severe water scarcity in their rice fields and the increasing high temperature had delayed the rice growth, affecting rice productivity. They described that their rice yields were reduced from three tons per hectare in previous years to less than one ton per hectare in 2019 when the research was conducted.

As mentioned by the farmers, water scarcity and pest increase, resulting from prolonged and severe droughts and increasing temperatures, had caused damage to their rice farming. As one farmer said,

Because of drought and high temperature, we don't have enough water, and it makes rice fail to grow. I pumped water into the rice field, but it dried out because the weather was too hot. Another impact of the drought is increasing pests in the rice field. I tried to use pesticides, but it didn't work because there were too many pests. The more pesticides I used, the more pests increased. And rice productivity is lower than before.²

The prolonged drought and increasing high temperature not only impacted farmers' rice productivity but also reduced the times of rice farming per year. Normally, farmers in the village do rice farming twice a year. The farmers start to do the first round of rice farming in April when the water in the Tonle Sap floodplains has receded. Then, they harvest their rice crops in August when they prepare the soil for the second round of rice farming. However, since the drought was too severe in 2019, the farmers could do rice farming only once per year.

Impact of climate change on fishing activities

In the Tonle Sap Lake, fishing is an essential livelihood option for local communities living in floating/fishing villages and the second most important livelihood option in farming villages in the Tonle Sap Lake floodplains. The households in the area heavily rely on fishing activities as their primary source of income and food security. However, climate change, especially droughts and high temperature, have affected local communities' fishing activities in recent years. According to the research participants, prolonged and severe droughts have caused the lake and its tributaries to become very shallow and muddy, while high temperatures caused water to become warm. The participants described that the shallow lake and tributaries made it difficult for fishers to use their boats for fishing, and the mud destroyed their fish traps as they got stuck and could not be pulled off. The participants also observed that the prolonged drought and high temperature caused water scarcity, resulting in less fish population in the lake and its tributaries.

The fishers observed that the situation had happened for a few years already. They mentioned the fish had become less abundant when the water level in the lake and tributaries had become gradually lower since 2015 during the dry season. They added that they could catch enough fish for sale and household consumption in previous years when there was enough water during the dry season. However, since the water level was too low, and all the tributaries, ponds, and the lake were too shallow, they could not catch as many fish as before. One fisher described that he could catch up to 10kg of fish per night in the dry season in the past. But in 2019, he could catch only 1 to 3kg, or sometimes less than 1kg of fish per night. Another informant talked about comparing fish caught between the present day and the past. He mentioned that he could earn more in the past by catching fish with just one piece of fishing equipment, a cylindrical fish trap. He said:

Before 2015, when there was enough water in the canals and streams, I could earn from catching fish approximately KHR500,000 within three days, and I used only one cylindrical fish trap. But from 2018 until now, I could earn only about KHR300,000 within three to four days although I used more cylindrical fish traps.³

Discussion and Analysis

This study suggests that climate change has been a critical issue for the local communities in the Tonle Sap Lake area. It has had significant negative impacts on local livelihoods, specifically rice farming and fishing activities. Changing precipitation patterns, increasing temperatures, and prolonged droughts have caused low rice productivity although farmers used a dry-season rice variety that is believed to be drought tolerant. Likewise, fishing, the primary source of livelihoods in the two communities, was severely affected by prolonged droughts and high temperatures.

Given that the severe drought and increasing temperatures affected livelihood activities, the local communities' food security has been threatened, and their income has decreased. Local adaptation practices appear to be the only option for the Tonle Sap Lake communities to respond to climate change, but these practices are doubtful in terms of sustainability. Most local communities rely on other income sources such as on-farm activities, wage labour, and non-agricultural activities to maintain their food security. However, the COVID-19 pandemic has disrupted all those income activities. As a result, poor and vulnerable households have faced reduced incomes, affecting their livelihoods and food security.

In this regard, appropriate interventions from the government and development practitioners are essential to help local communities boost resilience against climate change, improve livelihood recovery, and prevent such disasters in the future. For example, the government should link the national food security plans with disaster preparedness and response in hazardous regions, such as the Tonle Sap Lake area, where millions of rural people are vulnerable to climate change. Furthermore, local-level planning should be integrated with sub-national and national plans, and local policies should be coherent with national policies to ensure the climate change strategies and action plans are practically undertaken. Moreover, coordination between the government and development practitioners is crucial to deliver capacity building and awareness-raising on climate change to local communities so that they can cope with the impacts of climate change, achieve food security, and reap the benefits.

Conclusion

Climate change has increasingly become one of the most significant risks facing humanity in the twenty-first century. Rural communities in a developing country like Cambodia are most vulnerable to climate change. Changing precipitation patterns, increasing temperatures, and prolonged droughts, specifically in the Tonle Sap Lake region, have severely affected local livelihoods and threatened their food security. The COVID-19 pandemic has also put more pressure on local communities since their additional income activities were disrupted. Therefore, appropriate interventions from the government and development practitioners are essential in helping local communities become more resilient to climate shocks, improve livelihood recovery, and prevent future disasters.

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**FOOD SECURITY IN VIETNAM:
SIGNIFICANT ACHIEVEMENTS,
BUT CHALLENGES REMAIN**

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Introduction

After more than 30 years of renovation, Vietnam has achieved significant success in ensuring food security. However, food security is always a great concern of the government. In 2009, the Government issued Resolution No. 63/NQ-CP regulating the national food security to terminate food shortages and hunger by 2012 and increase food production by 2.5 times by 2020. In 2020, the government reviewed the implementation of the policy over ten years to develop a strategy for food security until 2030. Although there have been positive results, Vietnam is still facing challenges in food security and nutrition.

Vietnam's Food Security Policies and Achievements

For more than three decades, Vietnam has always considered rice self-sufficiency a core element in ensuring national food security. In 1998, the Politburo noted that the country's number one goal is to ensure food security in all circumstances and use all economic and administrative measures to ensure a stable rice land area. The government's rice reserves must be sufficient for national food security, disaster recovery, security and defence goals (Ho et al. 2012). The government's policies in 2000 continued to consider rice as a staple food to guarantee national food security and food reserves. To achieve this goal, sustainable rice land has been constantly prioritised in various important documents by the Party Central Committee (2007), the Politburo (2009), and the Ministry of Agriculture and Rural Development (2012). The Politburo's Conclusion No.81-KL/TW in 2020 maintained the need for 3.5 million ha of rice land with an annual output of a minimum of 35 million tons to ensure national food security by 2030 (Central Committee 2020).

After more than ten years (2009–2019) of implementing the Government's Resolution No.63/NQ-CP on National Food Security until 2020, Vietnam has gained important achievements, notably firmly ensuring national food security in all circumstances, contributing to socio-economic stability and development, especially under the contexts of economic crises and the COVID-19 pandemic, and participating in the global food supply chains. Rice production increased from 39.17 million tons to 43.45 million tons. The average food per capita rose from 497 kg per person per year to over 525 kg per person per year, putting Vietnam among the top food production countries (Government 2021). Vietnam's proportion of the undernourished population decreased by 79% between 2014–2016 compared with the 1990–1992 period. This reduction rate is the fastest in the region along with Thailand and Myanmar (FAO 2016). The calorie supply per capita, measured by the amount of food available for consumption in Vietnam, has increased from 1,925 kilocalories per person per day in the year 2010 to 2,023 kilocalories per person per day in the year 2020 (Ministry of Health 2021).

Challenges Remain

Unequal access to food and nutrition

Although Vietnam is a large rice exporter, many of its people still face food shortages and malnutrition. The General Statistics Office found that in 2016 around 6 per cent of all Vietnamese families or 1.4 million households were living under the poverty line. Among them, more than 251,000 families are in extreme poverty and have to suffer hunger daily (VnExpress 2016). Seasonal hunger caused by lack of production resources, market fluctuations, natural disasters, and diseases mainly exist in the remote and mountainous areas. Statistics of the Committee for Ethnic Minority Affairs show that

from 2016 to 2018, the government supplied more than 120,000 tons of hunger-relief rice from the national reserves to support ethnic minorities on the occasion of Lunar New Year or in between-crop periods (Phuong and Tran 2020). From the 1990s to 2020, the proportion of stunted children under the age of five decreased from 37 per cent to 19.5 per cent (Ho et al. 2012), but there are disparities between regions. According to the 2019–2020 Nutrition Census results, this rate in rural and mountainous areas is still high (Ministry of Health 2021). In rural areas, unbalanced nutrition, lack of clean water supply, lack of nutrition education at school or home, disease, and parasites risks are the factors affecting nutritional status rather than quantitative lack of food. The malnutrition rate in rice-growing areas such as the Mekong Delta was higher than that in the diversified farming areas such as the Red River Delta (NIN 2015).

Climate change and natural disasters

Vietnam is one of the most vulnerable countries to the effects of climate change and extreme weather events such as sea-level rise and increased frequency of natural disasters like typhoons, floods, and droughts. If the sea level rises by 100 cm and there are no solutions, about 16.8 per cent of the Red River Delta area and 38.9 per cent of the Mekong Delta area are at risk of being flooded, leading to a loss of agricultural land and irrigation water for agriculture (Thuy Chi 2021). In addition, natural disasters are among the most severe shocks to households and smallholders. The frequency of natural hazards varies between regions. The poor in rural and urban areas are disproportionately affected. They are also incapable of anticipating, absorbing, recovering, and adapting to crises and disasters quickly, efficiently, and sustainably. When faced with disasters, the adoption of livelihood-based response strategies reflects the limited economic capacity of households, which affects their ability to access food and daily consumption. During the 2016 drought, 70 per cent of households in affected areas had to sell assets to cover basic needs. Animals, food stocks, and other assets were reported to be the most common assets sold for cash (Dao and Pham 2020, 6). Weakness in resilience triggers a downward spiral effect. Household livelihoods and national development gains that have taken years to build are compromised or, at times, shattered.

Unsustainable agricultural production

The permanent emphasis on ensuring national food security and other goals requires an increase in the total volume of agricultural production. Intensive cultivation, increases in total yield and yield per crop, using fertilisers, pesticides, and agrochemicals become mandatory. This has become even more pressing under the effects of climate change and extreme weather events and in the context of lacking technological breakthroughs. In recent decades, the consumption of fertilisers and pesticides in Vietnam has increased dramatically due to crop intensification (Nguyen 2017, 21; WB 2019, 45). With fertiliser used at 297 kg per ha, Vietnam has the highest fertiliser use compared to other ASEAN countries (Nguyen 2020). The increasing use of fertiliser and agrochemicals corresponding to crop intensification endanger consumers' health and environmental quality. Many pesticides classified as endocrine-disrupting chemicals can interfere with the actions of hormones and might cause metabolic syndrome (Dang et al. 2017, 5). Only about 45–50 per cent of fertiliser is effectively used while the rest runs off into streams and rivers, causing soil and water pollution and inherently affecting future crop safety concerns, which are two important inputs of agricultural production (Nguyen 2017, 28–29; WB 2019, 45). Maintaining such unsustainable agricultural production methods threatens food safety and the quality of agricultural production resources for long-term food security.

COVID-19

Despite witnessing the damaging impacts of COVID-19 on the world economy, many Vietnamese agricultural experts still affirm that the pandemic has little effect on the country's food security and rice export (Nguyen 2021). However, the reality shows that COVID-19 has, directly and indirectly, threatened the food security among some segments of the Vietnamese population. The implementation of pandemic-controlling measures such as social distancing has affected the livelihoods and jobs of many people. COVID-19 has disrupted the global supply chains, pushing up the prices of input materials such as fertilizer and animal feeds while negatively affecting exports and consumption of agricultural products, forestry, and fisheries. In the opposite direction, the output of agricultural products and food has been limited. In addition, many provinces have been implementing social distancing, leading to an increase in transportation costs and transportation time. This, on the one hand, affects the supply and prices of food. On the other hand, it negatively affects farmers' income and people working in the agricultural and food sectors.

Conclusion

In recent years, many solutions have been implemented to ensure food security and realize the goals of hunger eradication and poverty reduction. The Resolution on ensuring national food security to 2030 of the Government of Vietnam also represents some changes in the perception of food security compared to the 2009 Resolution. However, to improve the solutions' effectiveness, some adaptations are needed. Firstly, it is necessary to promote the change in crops land use from rice into cash crops that can be more adaptive to climate change, which will help increase farmers' incomes. Secondly, according to the Global Food Security Index (GFSI), Vietnam, despite exporting rice in large quantity, ranks only 63 in 2020 globally because of the low sustainability of its natural resources for food production. Therefore, it is necessary to reduce agricultural intensification to ensure sustainable production and food security. Furthermore, to ensure food safety, it is necessary to promote organic and ecological agriculture, reduce the use of chemical inputs, and set a specific timeline for applying quality standards. Last, it is necessary to promote the application of science and technology in agricultural production to improve the effectiveness and, at the same time, reduce the impact of climate change and adverse phenomena.

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**HYDROPOWER AND ITS IMPACTS
ON LIVELIHOODS AND FOOD
SECURITY IN THE MEKONG
DELTA**

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Introduction

Hydropower development in the Mekong mainstream has attracted much attention from the regional and international communities in both positive and negative aspects. Those large-scale development projects promote economic growth. However, they also create risks, seriously affecting the Mekong River Basin's ecosystem, livelihoods, food security, and stability. Controversies around dam construction have arisen due to some disagreements between upstream and downstream nations. Located at the end of the Mekong River, Vietnam is considered the most vulnerable nation from the negative impacts from upstream countries' dam construction activities (Retner 2003). Its food security is threatened due to the river's diminishing sediments/nutrients flux.

Hydropower Development and Impacts

The construction and operation of hydropower dams might lead to the profound alteration in the river's ecosystem and watershed (Liu et al. 2012). Many proposed and completed dams show evidence of their impacts on people's livelihoods and on inland and fish resources (Kuenzer et al. 2012). Studies related to the Mekong River basin show that hydropower projects "can be particularly harmful to fish, by trapping nutrient-rich sediments, flattening out the flood pulse and blocking the migration routes of migratory fish". In addition, there are multifaceted social impacts, including displacement, insufficient compensation, effects on rural economies (such as the decline of agricultural productivity), and cultural changes (Kattelus et al. 2015, 118). Those impacts, as mentioned above, could threaten approximately 60 million people settling in the Lower Mekong River Basin, who mostly bond with the river for a living.

Moreover, water transfer projects and hydroelectric projects upstream could increase the risk of water shortage in downstream states, which might cause a longer time of saltwater intrusion in the Mekong Delta in the dry season (Trinh 2012). According to ICEM (2010), the upstream dam construction will cause Vietnam's economic loss. The adverse impacts on Vietnam may include: (i) significant loss in freshwater and marine capture fisheries and aquaculture—likely to affect livelihoods of fisherfolk in the delta, especially poor communities; and (ii) loss of sediments and associated nutrients causing significant adverse economic effects on deltaic sedimentation, fisheries (Mekong and marine), and agriculture (decrease in sediment load for the delta from 26 million tons/year at present to 7 million tons/year. Marine, freshwater, and aquaculture fisheries are all affected with an estimated loss of at least 500 million to 1 billion USD per year).

Based on the strategic environmental assessment of ICEM, some significant impacts on flows, sediment load, fisheries, agriculture, and social effects are inevitable. Among them, the impact on flows and sediment load appears to be the most severe, which may adversely affect the country's food security, especially rice production.

Sediments play a crucial role in the river's overall health and are necessary to nourish paddy and agricultural fields in Vietnam's Mekong delta. The Mekong River's healthy ecosystem enhances stability by ensuring food security in all the Lower Mekong countries and agricultural sustainability in Cambodia and Vietnam.

Impacts on Livelihoods and Food Security

Existing research showed that both sides of the Mekong River lost 54% of its total crop area, making up a cost of up to 25.1 million USD per year, along with the loss of land areas used for mainstream reservoirs and transmission lines. 24 million USD per year is the estimated cost, generated from the decreasing of nutrient/sediment load, to maintain the productivity of wetland agriculture. Researchers also pointed out that the Lower Mekong River mainstream's hydropower projects had attributed 33% of the total impacts (ICEM 2010). Undoubtedly, changes in the ecosystem in the Mekong region (both terrestrial and underwater) will affect food security for millions of people living along the river due to a loss of subsistence agriculture and waterfront garden, not to mention the decline in fish population (ICEM 2010). Another study by Kuenzer (2012) presents an amount of sediment loss due to upstream dams in China, with an annual sediment concentration decreasing 50% as a result of the construction of the Manwan and Dachaoshan hydropower dams. In a joint report in 2017 by UNESCO and Stockholm Environment Research Institute (SEI), researchers found that only 70% of the flow of sediments/nutrients in the Mekong River remained (due to the building of the dams in the Lancang River or Mekong River's upstream in China) (Fawthrop 2018).

Sediment shortage could create landslides on the river banks and Mekong Delta's coast. Vietnamese farmers have closely monitored the changes in their delta region, and they are worried because the delta region is shrinking and sinking. Besides, saltwater is intruding on the region's freshwater essential for irrigation. According to Nguyen Huu Thien (2014), fertilizer cannot replace sediment in enriching the quality of the farmland, thus affecting long-term food security. He said, "it is necessary to reduce the current triple rice cultivation per year for export because it has been depleting the nutrient in the soil raised by previous sediments volume." The reduction in sediment flux will primarily affect agriculture in the Mekong Delta, especially in rice production. It may have an impact on Vietnam's rice food security, which will also affect global food security. The shortage of rice reserves will lead to an insufficiency of domestic food and a sharp drop in rice export volume. FAO considers Vietnam one of the critical elements in the world market in stabilising the food market, especially rice. Since most nations have recently established policies to increase rice stocks and import volume each quarter, the decrease in rice production in Vietnam will skew the balance of supply and demand, resulting in unstable food price and food insecurity.

Policy Recommendations

In conclusion, the dam construction in the Mekong River's upstream severely affects Vietnam's food security in general and rice food security in particular because it causes a decline in sediment flux in the Mekong River.

A priority work of the governments of the Mekong River Basin is to "institutionalize participatory mechanisms [and] informal decision-making and provide public access to information on project development" (Yeophantong 2013). The accessibility and exploitation of the Mekong River's water resources are common interests of all basin countries. Thus, the solutions that Vietnam can implement should follow the region's rules and norms.

Firstly, in maintaining and enhancing cooperation via the Mekong River Commission (MRC), Vietnam should pay more attention on promoting international cooperation based on legal principles in water management of international river basins and promoting the principles to establish them as a national system for water resource exploitation. Moreover, the country needs to invest in enhancing the management ability of the MRC Vietnam in terms of policy consultation and project supervision. Hence, it can contribute to strengthening the effectiveness of the regional institution—the MRC.

Secondly, manage effectively the use of international river water resources within Vietnam's territory in both quantity and quality. A practical method that should be considered is to conduct a more comprehensive study on the impact of hydroelectric dams in upstream countries and the LMR mainstream, along with the consequences resulting from climate change and the rise of sea level, on the Mekong Delta. The study might serve as a concrete evidence supporting Vietnam's claim for the Mekong Delta's healthy condition.

Thirdly, build a consensus in orienting development model of the Mekong River Basin. The most suitable development model might be lessening emission and energy consumption, not to mention intelligent and efficient use of energy resources. Besides, in fostering the cooperation model among the four members of the MRC, there should be more bilateral and multilateral cooperation programmes and initiatives in the Greater Mekong Sub-region.

Fourthly, encourage the participation and synchronous coordination of social organisations and NGOs in raising the awareness about the impact of dam construction upstream. Organisations working on the environment can also support people in the affected areas to minimise the impacts on their livelihoods.

Lastly, foster cooperation with the countries in the same vulnerable group to find effective and sustainable solutions. Moreover, the Vietnamese government needs to coordinate with all national sectors to find an alternative method of ensuring food security.

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THE DUAL IMPACTS OF THE COVID-19 PANDEMIC AND CLIMATE CHANGE ON FOOD SECURITY IN THE MEKONG DELTA IN VIETNAM

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The Mekong Delta is now facing complex, unprecedented challenges. The two most critical issues are the impact of climate change and the COVID-19 pandemic. Those problems could exacerbate the risk of food insecurity in the Mekong Delta region in particular and in Vietnam in general.

Dual Impacts of Climate Change and COVID-19 on Food Security

Climate change is a major concern for food security in the Mekong Delta due to saltwater intrusion damaging rice, vegetables, and fruit trees. According to the General Department of Meteorology and Hydrology statistics of the Ministry of Natural Resources and Environment, winter-spring rice crop area decreased by about 30,000 hectares in the 2020–2021 period due to the impact of drought and saline intrusion. Tien Giang province saw a reduced area of 6,000 hectares; Tra Vinh province decreased 2,000 hectares; and Vinh Long province reduced 5,000 hectares due to cropland conversion policy. Kien Giang reduced 5,000 hectares; Soc Trang decreased 8,000 hectares; and Dong Thap reduced 4,000 hectares due to sowing of late summer-autumn crops (Vietnam Meteorological and Hydrological Administration 2021). Therefore, the amount of rice to be supplied to the market every year will significantly reduce, causing concerns about food security.

In addition, climate change also changes the living conditions of many species. As a result, the risk of the disappearance of some useful species will increase. At the same time, the probability of the emergence of more robust growth of pests also becomes unpredictable. According to the National Key Laboratory of River and Coastal Engineering of the Vietnam Academy for Water Resources (2021), the brown planthopper infestation, yellow dwarf virus, and leaf curl disease in the Mekong Delta have increasingly become complicated in the last two years. Consequently, it is severely affecting the ability of intensive cultivation and multi-cropping and reducing rice yield.

At the same time, climate change has caused the changes in the intensity and duration of sunshine and water and increased CO2 emissions and temperature. These factors will affect the dry-matter production of the plant and the quality of the harvested products. As a result, the productivity and quality of crops in the Mekong Delta also change according to the unpredictable developments of climate change.

In general, climate change can affect the rice cultivation season, change the structure of the growing season, and change the planning of agricultural regions, including clusters, irrigation techniques, pest and disease situation, productivity, and rice production, all of which create an existential risk to food security.

For the pandemic, the Mekong Delta is relatively less affected by COVID-19 compared to other regions. The reason is that the area is not well developed in terms of industry and tourism. However, the pandemic has affected the region's agricultural sector, causing long-term impacts.

Specifically, the disruption of export activities due to the pandemic could create a short-term increase in prices of rice and essential agricultural products in the country, which could affect the purchasing price and workers' livelihoods. In the long term, if exports still face disruptions, people will face financial difficulty in producing new crops. As a result, the supply chains will be disrupted, threatening Vietnam's food security.

The Mekong Delta will have to make a difficult decision between how much of agricultural products to export and how much to reserve. The situation of the COVID-19 pandemic is still complicated and unpredictable, causing many countries to buy more agricultural products to ensure food security. In the long run, the higher demand would lead to a higher equilibrium price and stimulate the export activities of businesses. However, too much export will lead to the risk of food shortages if there are bad scenarios of COVID-19 disrupting the supply sources. The problem would cause Vietnam to face many policy confusions when calculating the appropriate export-reserve ratio.

Possible Solutions

The COVID-19 pandemic and climate change present both risks and opportunities for different regions and community groups. However, the drawbacks outweigh the benefits. It is difficult for the Mekong Delta to develop effective solutions to address the dual impacts of COVID-19 and climate change. A possible solution is to adapt to them, learn to live with them, and take advantage of new opportunities arising from the two issues.

First, take advantage of the problem of saline intrusion to build saltwater and brackish water aquaculture systems. The idea will help expand the region's aquaculture and seafood processing clusters, which will improve the capacity for supplying domestic markets and export. In addition, the Mekong Delta must invest in researching more drought-tolerant and salt-tolerant rice varieties while still ensuring rice quality.

Second, establish supporting policies for the fisheries sector relying on saltwater as an equal priority as those on rice and fruits relying on freshwater. It will help balance the structure of modern agriculture, more adapting to climate change and saltwater intrusion.

Third, develop ecotourism models but still ensure safety during COVID-19 for mangrove areas. It will help make the most of the natural landscape in its new condition and create jobs for local communities. In addition, the initiative might help people have more financial resources to diversify their food needs, reduce dependence on traditional food, and reduce pressure on the region's food security.

Fourth, renovate the activities of the Vietnam Food Association (VFA). Currently, the VFA mainly represents state-owned export enterprises (through G2G centralised contracts). The VFA needs to promote the linkage of other stakeholders such as private enterprises and rice farmers to increase the size and efficiency of the market for rice and essential agricultural products. Then, the VFA will regulate the market, ensure uninterrupted exports, and calculate a reasonable reserve ratio to recommend policies to harmonise the interests of businesses and farmers with food security within the country. Thus, it might ensure food security for Vietnam in all scenarios of COVID-19 while still being able to export rice to contribute to international food security.

Finally, form a novel regional linkage mechanism. This mechanism will connect provinces in the Mekong Delta to assign labour according to the strengths of each region and unify a development policy based on the situation of COVID-19 and climate change. Therefore, it can remove the locality in the current provincial policy and share resources with each other. The idea can be the most crucial solution because it will determine the success of other solutions.

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FOOD INSECURITY IN LAO PDR DURING THE COVID-19 PANDEMIC

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Introduction

Lao People's Democratic Republic (PDR) is one of the six countries through which the Mekong River flows, and it is located in the Greater Mekong Subregion, also known as mainland Southeast Asia. Its connectivity with the rest of the world is improved by the engineering marvel of constructing the railway line to China. Still, the country remains relatively isolated from its neighbours because of the low infrastructure, particularly transportation infrastructure, the difficult geographical terrain, and the relatively low population density.

The overall population was estimated at 7.2 million people in 2020. Agriculture remains a central part of the Laotian economy and absorbs the majority of the country's workforce. The agriculture sector mostly involves smallholder farming, which is vulnerable to natural disasters such as floods or droughts and global climate change. Some farmers are changing from subsistence to market-based forms of agriculture, which poses new challenges to people unfamiliar with the competitive nature of capitalism that would result in winners and losers.

Labour migration has become an important means of earning cash income, especially among younger people. Therefore, an unknown number of Lao workers have crossed the borders for work, primarily to Thailand, where there are relatively higher paid jobs available in the agriculture and service sectors, and the language is similar that mutual comprehension is possible.

COVID-19

At the time of writing this article, Lao PDR has 41,829 cases of COVID-19 with 70 deaths (WFP 2021). The number has increased rapidly since July 2021, and the infected cases have kept rising at exponential rates. Border closure in neighbouring countries such as Viet Nam and Thailand means that infections have been kept under control for a significant period, but this is an unsustainable strategy in the absence of a vaccinated population. 44.7% of the population has so far received at least one dose of vaccine, and 38.2% or 2,780,000 people are fully vaccinated (Our World in Data 2021). The most commonly used vaccines are Chinese ones donated by the Chinese government or the People's Liberation Army. At the same time, Russian Sputnik V doses are also present, and some doses of the AstraZeneca vaccine have been received through the global COVAX facility (The Star 2020).

Similar to other countries, Lao people suffered from an economic and health crisis, as businesses were shut down and mobility between farms and markets was restricted to prevent infections. Lao society suffers from extensive poverty and inequality, and these problems have been exacerbated due to the pandemic crisis. Poverty is correlated with ethnicity, which is correlated with locations, making its distribution uneven. Negative impacts more likely affect families with children, which may lead to vulnerability to child labour, child marriage, sexual exploitation, and the perpetuation of multi-generation poverty (UNICEF 2021). The government is also concerned about the implications this situation may cause on politics and society.

These effects come at a time of existing economic insecurity resulting from a prolonged drought in the country's north in 2019 and severe flooding in the south. As a result, rice paddy yields were under the target, while the demands for rice imports were very high. At the same time, the outbreaks of African Swine Fever has added to the concerns about food insecurity (Reliefweb 2020).

Food Insecurity

A multi-country survey concerning food insecurity was conducted in Lao PDR, Thailand, Myanmar and Viet Nam in 2016, garnering 1,057 responses, of which 257 were from Lao PDR. It used the Food and Agriculture Organization's (FAO) food insecurity experience scale, asking respondents whether they had experienced aspects of food insecurity with increasing severity within the previous twelve months.

It found that 55.3% of Lao respondents had experienced insecurity at the mildest level (overall 42.75) (being worried about not having enough to eat) and 10.1% at the highest level (overall 9.7%) (going without food for more than a day). There were significant differences between urban and rural settings, with people in the former having expectations that they would select high-quality foods and people in the latter fearing starvation. Rural households also tended to be larger in number, which was another source of vulnerability (Walsh 2016).

The figures for Lao PDR are similar to those from the other countries in the survey and help indicate the extent to which the government has reduced the overall poverty rate. However, many of the people who have been helped out of poverty remain close to the line and are still vulnerable to external shocks. The poverty rate was forecast to rise between 1.4% and 3.1% in 2020 (UNICEF 2021). Affected people respond to economic downturns with a combination of saving and home production (Boost and Meier 2017). Saving, in this context, may mean the sale of assets or the abandonment of investment in education which will have the effect of increasing future risks of poverty. The government has responded with various initiatives, including providing free school meals to more than 900 schools (supported by the WFP) (Times Reporters 2021).

Meanwhile, the WFP and the FAO have combined their resources to help support villagers suffering from food insecurity and diminished income by providing seeds, home gardening kits, items for animal healthcare, and other forms of support (Ibid). Nevertheless, as a food importing country, Lao PDR is always subject to concerns over disarranged supply chains and higher food costs when supply falls behind demand. The government will enforce price controls for essential products when this is deemed necessary, but limited funds and technical capacity mean it remains a short-term solution. As neighbouring Thailand and Viet Nam are beginning to reopen their economies and admit that the COVID-19 virus will just have to be lived with in the future, Lao PDR will likely have little choice but to do the same.

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THE FREE-FLOWING LOWER SONGKHAM'S FOOD SECURITY AND WAY OF LIFE UNDER THREAT

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Introduction

Running over 400 kilometres through Thailand's Upper Northeastern region, the Songkhram River is the Mekong's tributary that contributes around 1.8% of average annual flows to the Mekong River as being discharged at Nakhon Phanom provinces. The Uthen district. As a vast flood plain, approximately 54% of the overall Songkhram Basin, the second-largest basin of the Northeast with the size measured around 6,473 square kilometres or around four million rai, could be classified as "wetlands". As noted by the Ramsar Site Information Service, the most extensive area is concentrated in the lowland floodplains of the lower section of the river.

Unlike other Mekong tributaries in the same region of the Northeast, the Lower Songkhram River of nearly 200 kilometres of length is considered the most pristine and fertile one in the region, as it remains untamed by any water resource development projects. Even the whole Songkhram River that runs over 400 kilometres before discharging into the Mekong River at Chai Burri Village of Tha Uthen district remains largely untamed.

Aside from such a pristine and fertile state, the Lower Songkhram also possesses the uniqueness of the natural river cycle linked extensively to the Mekong River's hydrology. In rainy seasons, the Mekong's overflow usually floods and flows deep into the Lower Songkhram River during the peak flooding period from July to September. According to Ramsar, this so-called backflow is reported to flood up to 80,000 to 96,000 hectares (ha) of the lower section, or around 500,000 to 600,000 rai of the basin. It is reported to travel as far as 300 kilometres inland in some flooding years. Such a rare and unique phenomenon occurs similarly to the Tonle Sap in Cambodia.

This "flood pulse" phenomenon contributes to complex water-based geographical characters, including permanent and temporary surface water sources, artificial and natural wetland habitats, and a range of riverine, floodplain, lacustrine, palustrine, and salt-water wetlands.

According to the "Thai Bar" research (The Locals' Research), at least 28 different sub-ecosystems have been identified in the Bung-Tham forests downstream. These various habitat characteristics and sub-ecosystems nurture freshwater animals and wildlife in the area, especially in the Bung-Tham forests that are predominantly swamp and forest shrubs.

They are sanctuaries, which are fertile breeding, feeding, and spawning grounds for migratory fish and other wild species, which in turn feed the residents. According to the Thai Water Partnership, which helps the locals develop the river health assessment tools, the lower section of the Songkhram River has recorded at least 17 species, including those on the IUCN Red List species such as Giant Catfish and Blancs Striped Featherback, which regularly use the lower basin as their breeding and spawning grounds. The locals thus dub it as the Mekong's womb.

Appreciating the rich biodiversity, villagers from 49 communities living along the lower section and the WWF Thailand last year managed to push for the forests and wetlands along the section sized around 34,400 rai in total to be designated as the country's 15th Ramsar Site and the world's 2420.

Among its great biodiversity in the designated area are 192 fish species, both residents of the Songkhram River itself and migratory ones from the Mekong River. As noted by Ramsar, many of the fish species are found exhibiting special feeding habits to particular niches in the ecosystem, such as an archer fish which ejects water from its mouth to bring down insects off overhanging vegetation (Toxotes chanaresis), and a cyprinid trout-like fish, which catches small fish and insects from the surface of clearwater streams and rivers (Raiarnus guttatus).

However, the changes in the Mekong River have caused the decline in fish population in the Songkhram River, thus affecting the livelihoods and food security of the local communities.

Declining Fish Population

Residents of the Lower Songkhram River have long enjoyed the privileges of living along this lower section of the river. Due to the richness of biodiversity in the area, the residents have developed their unique way of life, largely dependent on the fishery. Over the years, they have sophisticatedly developed their fishing gears to fit the different circumstances and periods as well as fish preservation.

According to the Thai Bar Research conducted by the locals living along the Lower Songkhram River, up to 79 different fishing gears have been identified and recorded out of their routine uses, reflecting the local wisdom in adjusting their knowledge to different circumstances around them.

Saneh Sukcharoen, the head of Pakyam Village, which helped set up the Ramsar Site, said that on some lucky days during the rainy season, the villagers can catch and earn income over Bt 1,000 a day. The Mekong fish, in particular, can bring them income as much as Bt 200-300 per kilogram. However, it is just only this year that the residents of this lower section of the river have started to feel the real pinch.

The study conducted a few years ago entitled, "Fish in the Lower Songkhram River: Catching, Disappearing, and Compensating" by Rajabhat Mahasarakham University and Nakhon Phanom University, already recorded the disappearance of some local fish in the river around ten years back. The research explained this was partly because there had been overfishing while fertile fish nursery grounds had been converted into farmland, resulting in the depletion of biodiversity in the area.

However, it is not like this year that some community leaders like Saneh said they hardly saw migratory fish from the Mekong River. In mid-2020, unusual water fluctuations were already observed, and the changes were recognised, including the river's water level, which decreased earlier in the dry season, according to the Thai Water Partnership.

The organisation noted that when the river ecosystem was affected by the unusual water fluctuations, the migration pattern of fish may also be affected, as well as the degradation of seasonally flooded forest. Following exchanges of information and updates from residents living in other tributaries, Saneh said the residents in the Lower Songkhram River had learned about the dams on the mainstream Mekong that may have affected the flow regime of the river.

Although he has not had solid proof to show, he strongly believes that the dams on the Mekong River have something to do with the drop in water levels in the Mekong River in the rainy season. "They said the dams upstream (China) are storing water extensively, and that's why there is hardly the water left coming into our river," said Saneh. He said the water level of the Mekong River that year had dropped too low to flood into the Songkhram River through their confluence.

The village head said the villagers were also concerned about the construction of new sluice gates planned on the Songkhram River itself. They have learned that a few of them are going ahead and in use upstream now. If more are to come at the Mekong confluence as announced, the river cycle of the Lower Songkhram River will be further disrupted to the point that they can no longer fish and make a living. "What if there are no more natural river flows that lure the fish, and no more fish come in? We are doomed, just like our neighbours in other tributaries," said Saneh.

Food Security Under Threat

The Thai Water Partnership noted that the complexity of local livelihoods adapted to these environments is easily overlooked. For example, rural livelihoods are based on the combined use of a wide range of resources adapted to seasonal changes—communities based in the Songkhram floodplain exhibit a high degree of dependency on wetland resources for their livelihoods.

The lower basin, however, has been under threat like other basins elsewhere. Ramsar noted that the factors that may influence the ecosystems at the site include habitat destruction, over-exploitation, alien species, chemical pollution, infectious diseases, habitat change and global warming. Among these threats, it said, those with the greatest impact were habitat destruction, overexploitation, and habitat change. Other threats, meanwhile, have the potential for minor or unknown impacts.

Species found being under threat already include the critically endangered Baer's pochard (*Aythya baeri*), the endangered sutchi catfish (*Pangasianodon hypophthalmus*), and the vulnerable king cobra (*Ophiophagus hannah*). Suriya Kotraee, a representative of the WWF's working group that pushed for the Ramsar site listing, said that the Lower Songkhram River had increasingly faced various threats in recent years, including the large-scale water resource development projects on the river itself, which have added further complications to the river's flow regime.

Suriya said the villagers had felt the changes in the river section and questioned about the dams on the Mekong, both in Laos and in China. They suspected that the dams were the prime cause for the unusual absence of the Mekong's backflow and flood pulses that year. Besides, they were concerned about the new development projects being pushed for implementation in the area, including the construction of sluice gates at the river's mouth and in the middle part of the river section.

According to the National Water Resources Office, it has developed an integrated water development plan to address the issues it claims to be chronic in the basin, namely floods and droughts. Projects include the construction of large sluice gates planned at the Songkhram River's mouth, the middle of the river, and upstream to help regulate the flows of the Songkhram River itself and the Mekong River. In addition, up to 1,644 structural and non-structural water management projects have been planned both in short-term and long-term periods (20 years) for the Songkhram River Basin. Among the top priorities are the two sluice gates on the Lower Songkhram River.

Meanwhile, on the mainstream Mekong, China has constructed 11 hydropower dams in the Upper Mekong Basin, of which two are large storage dams. According to the Mekong River Commission, another 11 dams, each with a production capacity of over 100 MW, are planned or constructed.

On the Lower Mekong, 11 projects are planned, with seven in Lao PDR, two in Cambodia, and two across the Lao-Thai border. Two of them, Xaiyaburi and Don Sahong have become operational, and four more have been notified to the MRC for Prior Consultation Process, according to the MRC.

Suriya said the basin had faced an increasing challenge, as the combined impacts of various factors would become more complicated. Climate change, he added, would become one of the critical factors in the near future, as its impacts could not easily be differentiated but felt strongly. "The calls for a balance of nature by the villagers would become more and more challenging as much as frustrating," said Suriya.



