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Climate Crisis: A Persistent Threat to Food Security

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Introduction

Impacts from the climate crisis, such as changing rainfall patterns, more frequent droughts and flooding, and the geographical spread and redistribution of pests and diseases are threatening food production around the world[1].

While we manage the risks posed by COVID-19 for food security, several other risks are already endangering food production globally such as the worst locust invasion in East Africa and Yemen in decades[2], and African swine fever outbreaks in China[3].

[1] FAO (2020)
[2] UN (2020) & Schacht (2020)
[3] Patton (2020)

Closer to home, prolonged drought in some parts of Southeast Asia saw water in the Mekong drop to their lowest level in a century[4]. Because of the drought and other factors including changing riverbed depth, seawater intrusion in deltaic regions are getting more severe, making matters worse[5].

Five paddy growing provinces in Vietnam have declared a state of emergency. As of March, a total of 33,000 hectares of rice fields in Vietnam's Mekong delta region were damaged. Vietnam's government estimates that 362,000 hectares of rice and 136,000 hectares of fruit trees in the region will be affected by the drought and increased salinity this year[6].

According to the Foreign Agricultural Service (FAS) of the U.S. Department of Agriculture, off-season rice yields in Thailand are expected to drop by 40 per cent from the year before. Most off-season rice is meant for export. Coupled with the COVID-19 crisis, the Kasikorn Research Centre estimates a decline in rice exports from Thailand, one of the largest rice exporters in the world, of between 12.9 and 18.1 per cent this year[7].

Meanwhile, the Meteorology, Climatology and Geophysics Agency (BMKG) of Indonesia anticipates that more than 30 per cent of the country, including agricultural areas in parts of Bali, Java, Sumatra and Sulawesi, will experience harsher than usual dry seasons from this month[8]. Already, several provinces in Indonesia are facing food shortages due to COVID-19, with seven facing rice shortages[9].

Climate crisis is borderless

There is evidence of higher rainfall variability, abnormally severe floods, increased durations of extreme rainfall and wind events, and a higher incidence of thunderstorms in Malaysia. The mean sea levels in Malaysian waters have been increasing at an average rate of 3.67 ± 0.15 mm/year, higher than the projected global sea-level rise of 1.7 – 3.1 mm/year[10].

Still fresh in our memory is the unprecedented flood in the northeast of Peninsular Malaysia in 2014/2015. Hundreds of thousands were displaced. It was reported to cost the agriculture sector RM299 million as a result of damage to agriculture produce, infrastructure and assets[11].

[4] Lovgren (2020)
[5] Osborne (2020)
[6] South China Morning Post (2020)
[7] NNA Business News (2020)
[8] The Star (2020)
[9] Dzulfiqar Fathur Rahman (2020)
[10] Tang (2019)
[11] The Star (2015)

Early this year, the worst drought in four decades severely affected paddy planting in the northern region of Peninsular Malaysia, involving at least 100,000 hectares of paddy[12] including three granary areas—Muda Agricultural Development Authority (MADA)[13], Kemubu Agricultural Development Authority (KADA)[14], and Integrated Agricultural development Authority (IADA) Pulau Pinang[15].

Effects of climate crisis, if not managed well, will not only threaten our food security, but also the livelihoods of people depending on agriculture, thus worsening inequalities. According to a study by the Economy and Environment Program for Southeast Asia (EEPSEA)[16], the most vulnerable regions in Malaysia are Kelantan and Sabah[17], two of the poorest states in the country with significant agricultural activities.

Technology for sustainable agriculture

Now that food and agriculture get more attention than before due to the COVID-19 threat, it is high time to carry out much-needed reforms with sustainability considerations foremost. As Malaysia looks to boost the economy post-COVID-19, investments in sustainable technology and infrastructure should be a priority. It is an opportune time for Malaysia to shift towards a more sustainable food agriculture.

The Netherlands is an exemplary country utilising technology to achieve its national commitment to produce "twice as much food using half as many resources" [18]. It is the second-largest food exporter in the world with only 0.4 per cent of the United States' land size.

Geothermal energy is used on farms, plants are grown hydroponically to use less water, waste carbon dioxide from a local oil refinery is channelled to greenhouses, while driverless tractors and quadcopters provide detailed measures of soil chemistry, water content, nutrients, and plant growth[19]. Since 2009, Dutch poultry and livestock producers have managed to reduce the use of antibiotics by 60 per cent[20].

[12] BERNAMA (2020b)
[13] Yusmizal Dolah Aling (2020)
[14] Hazelen Liana Kamarudin (2020)
[15] BERNAMA ibid.
[16] Economy and Environment Program for Southeast Asia (EEPSEA) was established by the International Development Research Centre (IDRC) in May 1993 to support training and research in environmental and resource economics. EEPSEA is headquartered in the Worldfish Philippine Country Office.
[17] Yusuf and Francisco (2009)
[18] Viviano (2017)
[19] Whiting (2019)
[20] Viviano (2017)

With the help of Hokkaido University and Tohoku University, Myanmar plans to launch its first satellite in 2021 to increase agricultural productivity, prevent and reduce damage from disasters, and monitor environmental pollution[21]. These two Japanese universities also helped develop Filipino microsatellites DIWATA-1 and DIWATA-2. DIWATA-1 is able to detect banana disease outbreaks from space[22].

Companies, such as Benson Hill uses machine learning and big data to help scientists develop more productive and environmentally sustainable crops more quickly than with conventional methods[23]. IBM and many start-ups, such as Ripe and TE-FOOD, enable food chain transparency using blockchain technology to encourage and reward better agricultural practices[24].

Cornell Initiative for Digital Agriculture connects world researchers across disciplines with practitioners to solve agri-food system challenges. Some past research projects include developing an integrated digital solution to optimise irrigation in apple orchards, intelligent lighting systems for greenhouses, and drones to better manage the nitrogen needs of corn and sorghum[25].

Turning to natural solutions may solve many problems in agriculture. Biocontrol approaches, such as introducing exotic natural enemies, conservation and augmentation of endemic natural enemies, releasing genetically-engineered insects to suppress their wild populations, and cropping system manipulation are better alternatives to pesticides. Widespread use of pesticides is not only harmful to the environment, but also to human health.

Strengthen research and development in agriculture

Multi-disciplinary research and development (R&D) and multi-party partnerships are necessary to tackle the formidable challenges of food security exacerbated by the climate crisis, and especially in dealing with the pandemic.

Problems such as deforestation in water catchment areas and marine pollution have not been given enough attention in mainstream discussions of food security. For instance, unsustainable logging activities, both legal and illegal, in the Ulu Muda forest threaten the reservoir's vital role in providing as much as 96 per cent of Kedah's water supply and 80 per cent of Penang's, including the Muda Agricultural Development Authority (MADA) region, the main rice granary of the country[26].

[21] Nitta (2020)
[22] Hokkaido University (2019)
[23] Waltz (2019) & Benson Hill (n.d.)
[24] IBM (n.d.), ripe.io (n.d.) & TE-FOOD (n.d.)
[25] Cornell Initiative for Digital Agriculture (n.d.)
[26] WWF Malaysia (n.d.)

Meanwhile, fish landings per unit effort have been declining since the early 2000s[27], reflecting the dwindling marine fisheries or fish stocks for capture fisheries, due to both over-fishing and ecological destruction.

Unlike say Australia[28], which has a single government research agency covering a broad range of subjects and disciplines, Malaysia has many research agencies under different ministries, with uneven, and even dubious contributions.

Key performance indicators for government-funded R&D has to include effectiveness in solving real problems, not the number of research publications or patents. This should be applicable to grants to universities for agricultural-related research.

In addition, extension services need to be scaled up to ensure mass adoption of sustainable technology and practices. In fact, extension services have to be part of the agricultural R&D effort from conceptualization, and not a post hoc addition.

[27] Shafique F. Sidique and Ashraf Shaharudin (2018 Unpublished work)

[28] Commonwealth Scientific and Industrial Research Organisation (CSIRO) is Australia's national science research agency. Its research areas include astronomy & space, artificial intelligence, farming & food production, environment, health, indigenous engagement, and mining and manufacturing.

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