Observations on Climate Smart Agriculture (CSA) in Indonesia

The Global Context

With the world's population estimated to reach 9.8 billion by 2050 – a 2 billion increase over the next 30 years – the current food production systems face an enormous challenge, made even more daunting by climate change. Experts say agriculture sector must increase its output by 50 percent in the next 30 years – while halving its carbon footprint.[1]

The challenge is not just food production and its more even distribution globally, but also to address obesity and malnutrition. It is estimated that in 2020, 39% of adults in the world were overweight; and one-in-five children and adolescents, globally, were overweight. Globally, 13% of adults aged 18 years and older were obese in 2016. Obesity is defined as having a body-mass index equal to or greater than 30.[2] Globally, share of undernourished population has fallen from 13.4 percent in 2001 to 8.8 percent in 2017, but the share still can be reduced further.[3]
Addressing the above challenges do require greater prevalence of CSA or what in some emerging countries is called Climate Resilient Agriculture (CRA), which gives less stress on emission reductions, but primarily focuses on increasing yields and improving resilience to shocks and stresses from climate change.

Climate-smart agriculture (CSA) may be defined as “…an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible.”[4] Figure 1 shows the three components of CSA graphically.

**Figure 1: Components of CSA**

![Components of CSA](https://cdn.agclassroom.org/media/uploads/lp703/climate_smart_ag.jpg)

Food security and climate change can be addressed together by transforming agriculture and adopting practices that are climate-smart. Farmers are under the greatest threat from climate change, but they also play a major role in addressing it. Climate-smart farming techniques can increase agricultural productivity and incomes, make rural communities more resilient to climate change and where possible, mitigate climate change.[5]

It is in the above context that the rest of the column discusses opportunities for CSA and CRA in Indonesia.

**Indonesia: Its Importance to the Global economy**

The world’s largest archipelago, with over 17000 islands, Indonesia, with a population of 276 million in 2020, is the fourth most populated country globally. Employing 32% of the total labor force, agriculture is the second largest employment sector in Indonesia. Though agriculture’s share of total employment has dropped steadily, from 44% in 2005 to 30% in 2019, the sector still employs a large number of Indonesia’s citizens—its 117 million rural residents in particular.[6]

Indonesia’s gross domestic product (GDP) per capita in nominal terms at current exchange rates has grown steadily since 2000, more than doubling from US $2,144 to US $4,136 in 2019. Its economy is the 15th largest economy in the world by nominal GDP (USD 1.15 trillion), and the 7th largest in terms of GDP (PPP) (3.50 trillion).[7]
The share of GDP in agriculture in Indonesia has been declining, from 24.2 percent of GDP in 1986 to 13.7 percent of GDP in 2020. Correspondingly the share of services sector has increased, which is typical of the structural economic transformation associated with becoming a middle-income country. The share of manufacturing in Indonesia's GDP in 2020 was 20.0 percent. Gross value at current prices of agricultural production in Indonesia peaked at USD 146 billion in 2012, declining to USD 111 billion in 2018. This makes Indonesia one of the largest agricultural country in absolute USD terms.

Between 2013 and 2019, Indonesia's agricultural land decreased to 7.46 million hectares from 7.75 million hectares, according to data collected by the Agrarian and Spatial Planning Ministry, BPS (Biro Pusat Statistics) and other government institutions. According to BPS, the country lost 5.1 million farmers between 2003 and 2013, with their numbers falling to 26 million. This trend is expected to continue in the next few years. Challenges, such as increasing production costs, changes in weather and pest attacks, have also pushed farmers to change professions, with land-owners either converting land to other uses or selling it.

In its COVID-19 response, Rp 1.85 trillion (USD 130 million) from the Agriculture Ministry's Rp 14.06 trillion (about USD 1000 million) budgets for 2020 has been reallocated for seed assistance, labor-intensive programs, stabilization of food stocks and prices as well as food distribution and transportation.

In Indonesia, climate-change induced drought is likely to increase the frequency and severity of wildfires, and larger tropical cyclones are likely to cause significant damage and flooding. Forest and peatland degradation is also linked with increased floods, landslide, and forest fires. Climate Smart Agriculture measures that protect the natural environment can help mitigate these impacts, while those that increase adaptive capacity can build the resilience of vulnerable communities.

It is reported that fewer young people are pursuing farming as a profession compared with previous generations. Only 23 percent of the country's 14.2 million people aged between 15 and 24 worked in the agriculture, forestry and fishery sectors in 2019, data from the National Labor Force Survey suggests. There is a mismatch between the share of GDP in agriculture (13.7 percent in 2020) and share of labor employed in the sector (32 percent in 2019); and age structure of the workforce in agriculture has bias toward elder workers which would need to be replaced. Hence, it is very crucial for Indonesia to take steps which can boost the productivity of agriculture sector both in terms of production and labor getting attracted to the sector to meet the rapidly increasing food demand; and to improve profitability and income generation of farmers.

Reforming Production Systems: Key for Food Security in Indonesia

Table 1 provides data on land use of different crops and yield in Indonesia as compared to the Southeast Asian region. The data suggest that Rice cultivation (15 percent) occupies the largest share of harvested area, followed by raising of pigs (13 percent), and palm oil (8 percent). The three together account for 36 percent of the harvested area. As smallholdings are widely prevalent in these and other crops, pursuing CSA would require reforming their agricultural practices as well, a challenging task.

Table 1 suggests that Indonesia’s yield per hectare is considerably higher than the yield in Southeast Asia in Rice, Palm Oil, and Maize. But the yields are considerably below those in Southeast Asia in Rubber, Cocoa, Coffee, Pig, Sheep, Goat, and Chicken, suggesting a need to improve productivity. There are however large variations in the yield of different crops among various islands. The above may provide opportunities for changing the crop-mix in different islands to help achieve goals of CSA.

Table 1: Area Under Crops and Yield in Indonesia (Data Around 2016)
<table>
<thead>
<tr>
<th>Crop/ Livestock</th>
<th>Land Use (% of Harvested Area)</th>
<th>Indonesia (yield)</th>
<th>South (yield)</th>
<th>East Asia (yield)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Palm</td>
<td>8%</td>
<td>17082</td>
<td>14889</td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>5%</td>
<td>5198</td>
<td>4083</td>
<td></td>
</tr>
<tr>
<td>Rubber</td>
<td>4%</td>
<td>926</td>
<td>17642</td>
<td></td>
</tr>
<tr>
<td>Coconut</td>
<td>3%</td>
<td>5754</td>
<td>5766</td>
<td></td>
</tr>
<tr>
<td>Cocoa</td>
<td>2%</td>
<td>378</td>
<td>802</td>
<td></td>
</tr>
<tr>
<td>Coffee</td>
<td>1%</td>
<td>535</td>
<td>1236</td>
<td></td>
</tr>
<tr>
<td>Pig</td>
<td>13%</td>
<td>22</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>Goat</td>
<td>6%</td>
<td>10</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td>4%</td>
<td>9</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Chicken</td>
<td>2%</td>
<td>849</td>
<td>1305</td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td>2%</td>
<td>270</td>
<td>216</td>
<td></td>
</tr>
</tbody>
</table>

Yields (Crops: t/ha; Livestock: kg/an)

**Indonesia: International Trade in Agriculture**

Indonesia’s profile of international trade in agriculture goods has the following characteristics:

The data are from 2019 and are estimated from World Trade Organization – Trade Profiles 2020[16]

1. Indonesia’s total trade in goods and services was USD 408.4 billion (USD 338.2 billion in goods, USD 70.2 billion in services), Services thus account for only 17.2 percent of its total trade.

2. Indonesia exhibited a negligible deficit of USD 3.2 billion in goods, and a deficit of USD 8.4 billion in services. Its external trade balance can therefore be regarded as healthy.

3. Agriculture sector accounted for 25.5 percent of Indonesia's exports (USD 42.7 billion), and 13.1 percent of its imports (USD 22.4 billion), representing a healthy surplus of USD 20.3 billion. This puts Indonesia among the major agriculture trading nations. As a comparison, in 2019, India's agricultural export according to the WTO were USD 38.9 billion, and imports 26.7 billion, representing a surplus of USD 12.2 billion.

4. Palm Oil constituted about 34 Percent of Indonesia’s agriculture exports. The top five categories of exports, comprising Palm oil and its fractions; Industrial monocarboxylic acids; Coconut (copra), or palm kernel oil; Cigars, cheroots, cigarillos; and Coffee accounted for about half of the agriculture exports. This suggests that CSA actions relating to palm oil would have significant benefits for managing climate change not just in Indonesia, but also globally.

5. In contrast, top five imported agriculture items, centering on wheat, soyabean oil, sugar, and cotton, accounted for little over one third of imports. In spite of having high yield per hectare, (Table 1),^
Indonesia imports rice, whose quantity varies depending on domestic production-consumption trends.

Potential for CSA in Indonesia

The discussion so far suggests that how Indonesia addresses the CSA process is of considerable importance not just to Indonesia but to the global economy, particularly to the emerging countries. It could therefore serve as an instructive case study for other middle-income emerging economies.

The World Economic Forum reports that countless farmers have obtained dramatic increases in production, pest control and other advantages by implementing CSA practices. “I reaped many benefits by adopting CSA practices in my farm such as planted cover crops and weed management, reduced pests and diseases. The soil is not dry in the dry season, and [we experience] only the minimum level of black pod caused by phytophthora during the rainy season," said Dashat Tandibua, a cocoa farmer in Central Sulawesi, Indonesia, who is currently engaged in agroforestry and shade tree management. Tandibua recorded an increase in yield from 550kg/ha in 2018 to 643kg/ha in 2019 attributed to agroforestry, which hinges on growing trees intermixed with crops.[17]

Studies suggest that the biggest gains from CSA in Indonesia are likely to be generated from reforming the palm oil sector. Thus, a world Bank Report notes that-

“Despite the economic benefits of oil palm production, its production is devastating for both local ecosystems and global GHG emissions. Much of the forest being converted for oil palm is peat swamp, which is a carbon sink and thus plays an outsized role in global carbon sequestration...Slash-and-burn and oil palm mono-cropping also have negative effects on local biodiversity, which is of critical concern as Indonesia is home to a significant number of species that are endemic to vulnerable forestland.”[18]

As shown in Table 1, Indonesia is most suitable for palm-oil cultivation with high yield per hectare. Global demand for palm oil is robust due to its competitive price and its suitability in a wide range of products. This increases the imperative of making palm oil cultivation more consistent with CSA can have potential benefits. As Indonesia’s planning agency, Bappenas argues,

“Optimizing the productivity of palm oil plantations is expected to have a positive impact on the economy and reduce the rate of deforestation where forests are converted to oil palm. In addition to increasing the productivity of oil palm, the efforts to certify palm oil sustainability through RSPO (The Roundtable on sustainable Palm Oil) certification will also have a positive impact on sustainable land management efforts.”[19]

Indonesia is strongly urged to more closely adhere to the norms of ethical plantations which grow oil palms in a manner that does not harm the environment. This would be facilitated if the consumers attempt to consume products of those manufacturers of products using palm oil from any country, who have sourced their palm oil from such plantations.

The Roundtable on Sustainable Palm Oil (RSPO) implements long-lasting solutions through credible global standards. When grown according to RSPO standards, oil palm agriculture, the environment, and local communities can co-exist in harmony. RSPO’s standards work to protect primary and secondary forests, ensure wildlife habitats are not harmed and safeguard workers, communities, and indigenous people in oil palm producing regions. RSPO has also built a network of manufacturers who agree to ensure that their products (which use palm oil) are sourced by these standards. By mid-2021, about 20 percent of global palm oil production meets RSPO standards.[20]
The other areas with potential for CSA application are rice and livestock production. Rice is critical to Indonesia's food security, and 87% of poor households purchase additional rice for consumption in order to supplement what they grow. Indonesia is highly efficient producer of rice, with yield per hectare very much above the region's average (Table 1). Livestock production also plays an integral role in Indonesia's agricultural sector. The above two areas thus provide opportunities for CSA in Indonesia, especially in improving practices of smallholders and providing better support systems such as extension services, and local weather services in a timely and practical manner.

Agri-Tech companies in Indonesia are reshaping the agriculture value chain by attracting greater numbers of young people to the sector, which is essential to ensure food security in the future. Companies like TaniHub Group are using technology to improve the agriculture supply chain through the promotion of sustainable practices, improved operational efficiency and waste reduction.

There are e-Fishery initiatives focused on climate-smart agriculture to increase productivity of fish farming in a sustainable way through the use of internet of things sensors and artificial intelligence. This is still a nascent market and will need to be nurtured. The e-Fishery initiatives would benefit from the creation of public–private partnerships that focus on innovative use of data and platforms. The International Finance Corporation, the private sector arm of the World Bank, is using the group's global reach and knowledge network to identify and invest in companies working on precision farming: companies that develop soil moisture sensors, solar water pumps or rainwater harvesting equipment for efficient irrigation.[21]

**Observations on Funding CSA in Indonesia**

In additional to conventional budgetary resources, Indonesia has taken advantage of other avenues to help finance CSA initiatives. First, in 2010, Indonesia signed a Letter of Intent with Norway in accordance with the UN Reducing Emissions from Deforestation and Forest Degradation (REDD+) Framework. In it, Norway pledged a direct financial contribution of US $1 billion to Indonesia in exchange for verified reductions in forestry emissions. However, Indonesia's forestry emissions continued to rise, the setup of the measurement, reporting, and verification systems were delayed, and, in 2015, a change in government and subsequent administrative restructuring saw Indonesia's REDD+ coordination agency disbanded. “non-payment for non-performance” is an increasingly accepted norm. Indonesia nevertheless maintained dialogue and is now due to access the previously agreed finance. These developments may reassure donors that results-based agreements are a secure means of directly investing in the preservation of globally critical natural resources, causing more donors to crowd into this space.

Second, in 2019, the Ministry of Finance and the Ministry of Environment and Forestry partnered to establish the Public Service Agency for Environment Fund Management (BPLDH). BPLDH is a new type of public service agency, designed to combine public funding, private finance and international donations to finance projects targeting environmental protection and management. Its functioning will significantly impact on the progress of CSA in Indonesia.

Third, with an average of US $1.7 billion in annual lending to Indonesia, the WB funds many projects incorporating CSA, including the Strategic Irrigation Modernization and Urgent Rehabilitation Project (SIMURP). This Project is worth US $578 million and has time frame of 2018 to 2024. SIMURP aims to rehabilitate and modernize 100k ha of gravity upland and tidal gravity lowland irrigation systems.

Fourth, the International Fund for Agricultural Development (IFAD) is currently funding five ongoing projects in Indonesia worth a total of US $1.8 billion, targeting a wide range of CSA components, including integrated farming systems, youth entrepreneurship, rural empowerment, integrated participatory development, irrigation management, and village economic transformation.
Fifth, the Asian Development Bank (ADB) is financing 278 agriculture, natural resources, and rural development-related projects worth US $4.93 billion, or 13% of their total investment in Indonesia through 2018. ADB currently has 13 CSA-related projects active or approved in Indonesia, though exact investment levels are difficult to estimate as many projects are regional.[22]

Concluding Observations

Indonesia as a major agricultural country, as well as the global community, both have a stake in the sustained and competent pursual of CSA in agriculture by Indonesia. It will need to pursue increased productivity, enhance resilience of agriculture sector, especially of smallholders, and reduce emissions, embracing all three components of CSA. This column has argued that reforming the palm oil sector has the largest potential to contribute to the goals of CSA, followed by improving practices in rice cultivation, and in the livestock sector. Better extension services, and more localized weather services suitable for Indonesia’s over 17000 islands will be needed in pursuit of CSA. Newly emerging agri-tech businesses hold promise in increasing productivity and enhancing resilience in the agriculture sector in Indonesia.

References


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