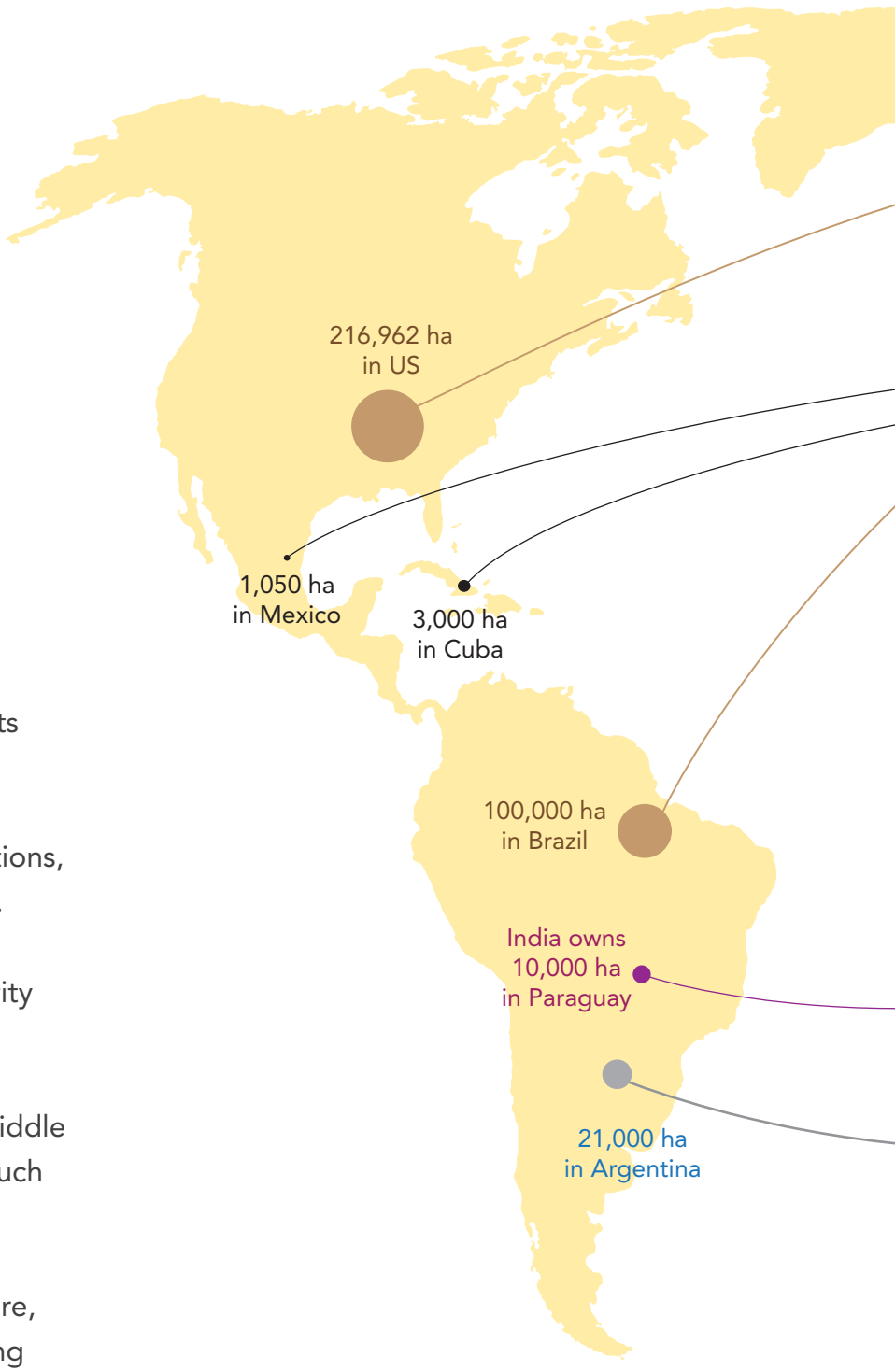
TAY JUHANA FOUNDATION

TJF Agrifood Booklet Series 3

Suboptimal Land

A

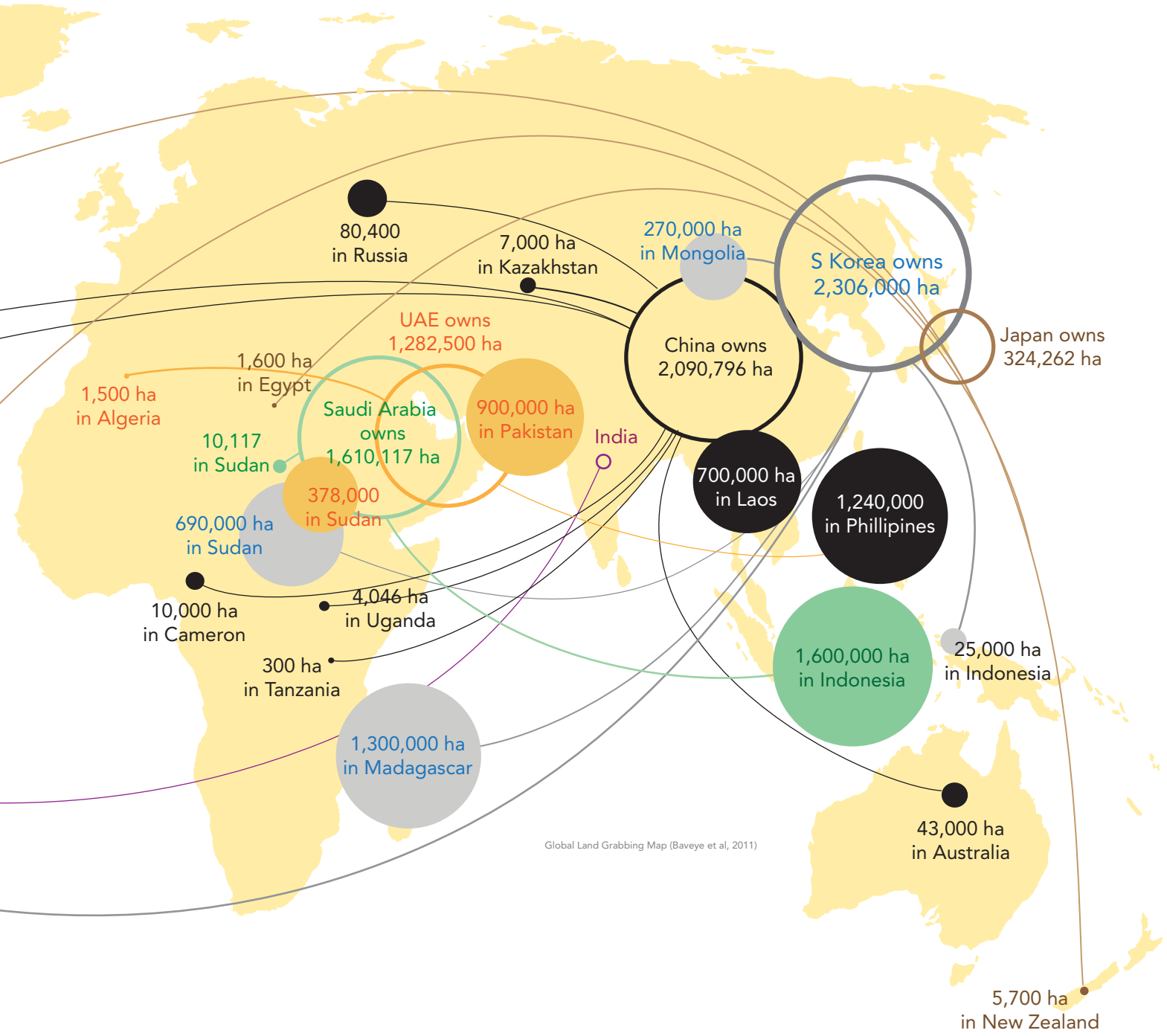
Suboptimal Land in Context



Globally, securing food resources is increasingly important in the midst of unprecedented global threats including climate change, pandemic, food crisis, water scarcity, supply chain disruptions, and decreasing arable lands. Following these challenges, concerns about food insecurity became prominent among countries with deficits of agricultural capacity[1]. The middle and high income countries such as the United Arab Emirates (UAE), Singapore, European Union (EU) Nations, Singapore, and China have been securing the food supply through land-acquisition and trading schemes that frequently take place in developing countries, including in Indonesia[2]. This phenomenon is also called land-grabbing.

Today's agricultural production may not be able to meet the future demand for staple food such as rice, soybean, and wheat; especially in climate change conditions. To improve food security, one of the options is to strengthen self-sufficiency in domestic food production. The governments have long been employing a series of programs and regulations to secure the food supply. These include land intensification and extensification, food diversification, increase regional food stock, reform the supply chain system, and enhance agricultural data management.

1. Zhou J, Dellmuth L M, Adams K M, Neset T-S and Uexkull N V. 2020 The geopolitics of food security: Barriers to the sustainable development goal of zero hunger vol November
2. Yang B and He J 2021 Global Land Grabbing: A Critical Review of Case Studies across the World L. 10 324.



These efforts also facing a challenge especially from the alarming rate of agriculture area conversion into infrastructure development that reached 96,500 ha/year. Meanwhile, the national government can only generate new crop lands of 20,000-30,000 ha/year[3]. Furthermore, the country requires an additional 10 million ha of crop lands to achieve food self-sufficiency in 2045[4]. This staggering gap can be narrowed through the sustainable utilization of suboptimal lands.

Suboptimal land agricultural areas

refer to the less-favorable agricultural areas (LFAAs) characterized by resource degradation, constrained agriculture potential, and low productivity of agricultural resources attributable to biophysical constraints such as rugged terrain, extreme weather conditions, poor soil quality, salinization, drought and erratic rainfall, and other factors that present significant constraints for intensive agriculture.

3. Direktorat Jenderal Prasarana dan Sarana Pertanian 2014 Potensi alih fungsi lahan akibat tidak ditetapkan LP2B dalam RTRW kabupaten/kota dan pencetakan sawah baru (Jakarta)
4. Mulyani A and Fahmuddin A 2017 The Need and Availability of Reserved Arable Land Realize Indonesian as the World Food Supplier in 2045 Anal. Kebijak. Pertan. 15 1–17

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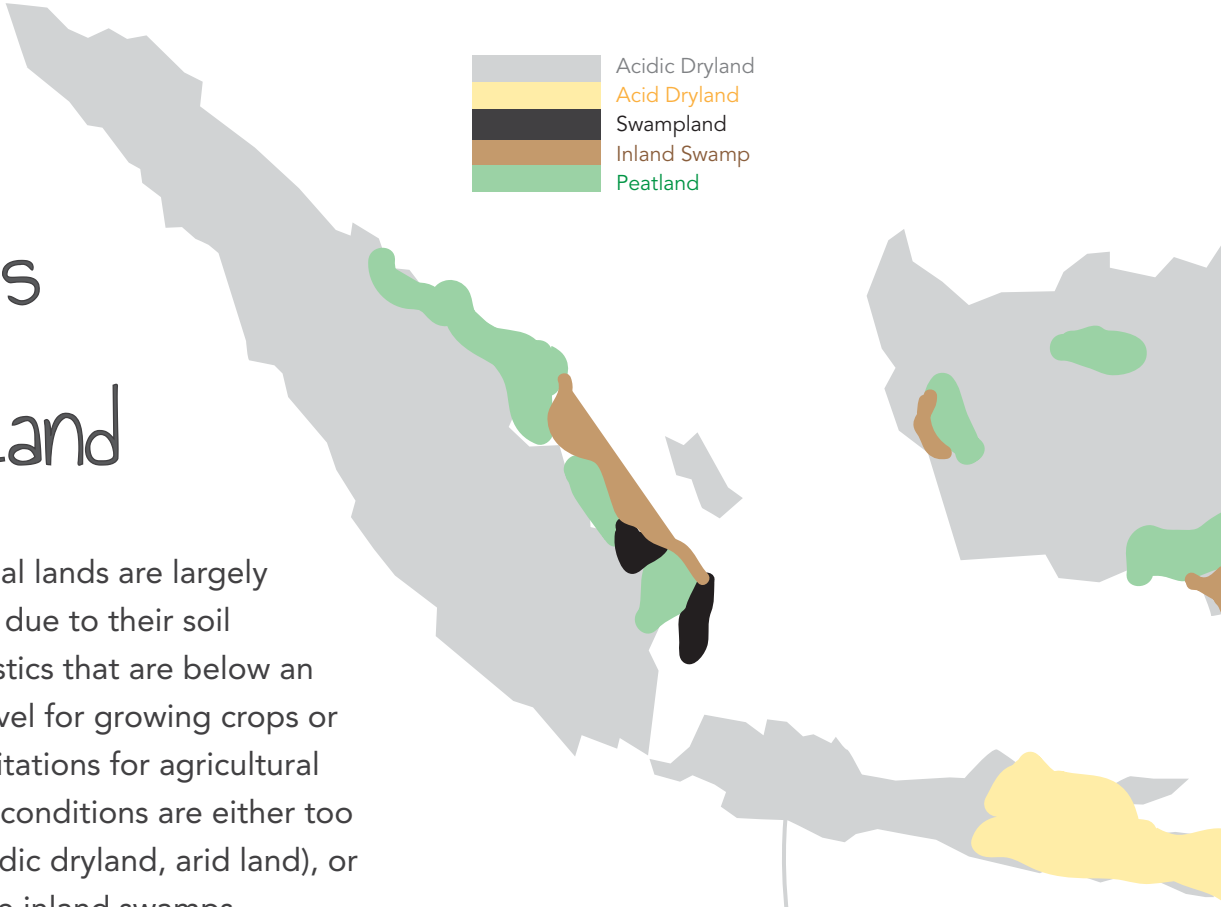
Types of Land



Suboptimal lands are largely neglected due to their soil characteristics that are below an optimal level for growing crops or severe limitations for agricultural use. Their conditions are either too dry (i.e acidic dryland, arid land), or too wet (i.e inland swamps, peatland). Hence, they also known as marginal lands, abandoned lands, or critical lands.

Despite the soil characteristics, it has enormous potential with abundant availability around the world. In Indonesia alone, there are around 29 million ha of suboptimal lands that are compatible for agricultural purposes, while it makes up 15 percent of the current agricultural lands worldwide and 21 percent of the total global land resources[5].

In contrast with popular belief that deemed Indonesia as an agrarian country with abundance of fertile soil, the suboptimal lands are, in fact, heavily dominate the land types in almost every region as it covers 78.2 percent of the land area of Indonesia.

Strategy management to enhance land utilization can use some approaches, such as (1) giving additional fertilizer to enhance the soil nutrient; (2) reducing the negative impact from physical and chemical properties by applying coal ash and humic substances as a soil ameliorant; (3) developing plant varieties those acidic tolerant[6].

Based on its dominant characteristics, there are only two types of suboptimal land: dryland and wetland. Principally, if the land is too dry or too wet, especially under flooded conditions, it would hamper the crops growth. There are five types of suboptimal lands in Indonesia as shown on pictures.

5. Mulyani A, Nursyamsi D and Harnowo D D 2016 Potensi dan Tantangan Pemanfaatan Lahan Suboptimal untuk Tanaman Aneka Kacang dan Umbi Prosiding Seminar Hasil Penelitian Tanaman Aneka Kacang dan Umbi ed A A Rahmianna, D Harnowo, Sholihin, N Nugrahaeni, A Taufiq, Suharsono, E Yusnawan, E Ginting, F Rozi and Hermanto (Malang: Pusat Penelitian dan Pengembangan Tanaman Pangan) pp 16–30
6. Wijanarko, A. & Taufiq, A. (2004). Buletin Palawija: Pengelolaan Kesuburan Lahan Kering Masam Untuk Tanaman Kedelai.

Map source: (Mulyani et al., 2016)

Acidic Dryland

High acidity on the soil appears from the rapid mineral corrosion process. The corrosion process washes out the substances and leaving only its non-essential nutrients within the soil that can be toxic for the plant. This kind of land commonly has a pH of less than 5.5.

Dryland on the Dry Climate

Dryland can be defined as an inundated land with scarce water in a majority time of a year or even during whole year. This type of land formed by a combination of low precipitation, drought, and heat wave, as well as human activities such as land burning, livestock grazing, forest utilizing, and soil cultivation[7].

7. http://www.fao.org/dryland-forestry/background/what-are-drylands/en.

Lowland Swamp

The water supply of lowland swamp (rawa lebak) comes from rainfall that trapped on a land cavity. Based on the land depth, there are three types of swamp: **1. shallow swamp; 2. middle swamp; 3. deep swamp.** Among those types, the shallow swamp has the highest potential to be cultivated into productive agricultural. While it has an extra nutrient layer that is deposited from the upstream flow, the challenge comes from the difficulties of predicting and managing water level and acidity level[8].

Tidal Swampland

Tidal swamp is also known as tidal marshes which can be found along the coastline in middle and high latitudes regions. Some of the swampland contain a saline (salty) water, others are brackish (somewhat salty), and the rest are freshwater.

Peatland

Peatland comes from the accumulation of organic matter that is formed in an anaerobic condition which drives long-process yet partial decomposition. Peatland can be found in high latitudes of the northern hemisphere, coastal environment, and moist tropical areas with wet climate. As peat layer become thicker over time, the level of the undecomposed organic matters will also increase which causes the land to have higher level of acidity and low nutrient availability[9].

8. Syahnur, H. (2015). Peningkatan Produktivitas Padi Lahan Rawa Lebak Melalui Penggunaan Varietas Unggul Padi Rawa. Medan, Indonesia.
9. Craft, C. (2016). Creating and Restoring Wetlands. Indiana, United States of America.
Photograph Tidal Swampland by gianluigi guercia, afp/getty

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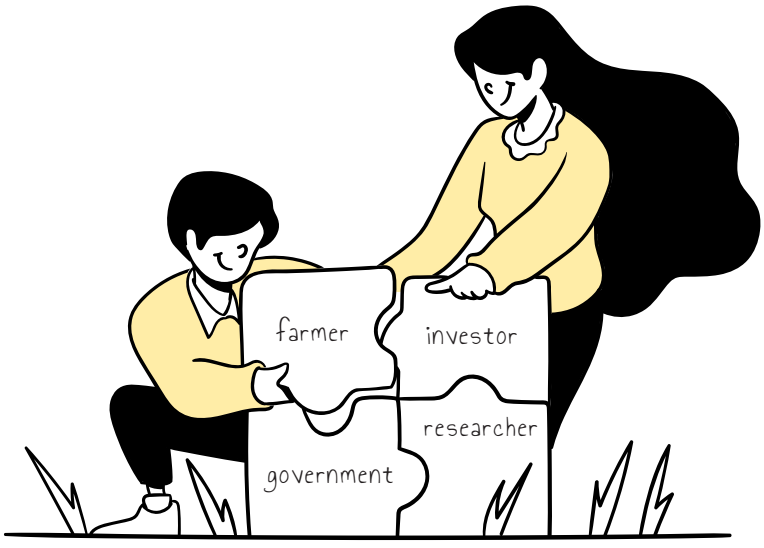
Challenges in Cultivating Suboptimal Lands

There are at least three major factors that hamper the sustainability of agricultural practice on suboptimal lands. Developing feasible funding schemes, fostering partnership among farmers, government and private sectors, and capability in managing the lands should be put in place to gain the optimum benefit of suboptimal lands.

1. Investment

Procurement and application of technology/innovation, especially on a large scale, will require a large initial capital.



2. Stakeholder Coorperation

It is necessary to increase the capacity of farmers on suboptimal land, from capital to practice.

3. Capability

Extensification by converting suboptimal land into productive agricultural land is prone to land degradation if not well managed. Also, a reliable map of land types and zones are not available yet.

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