



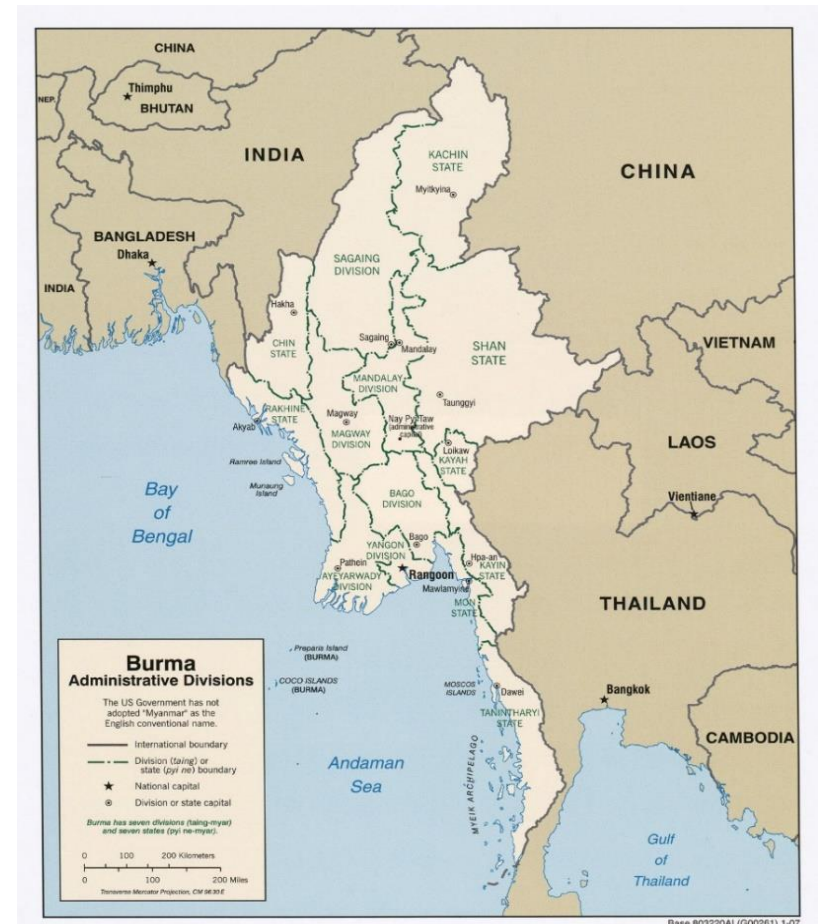
Grassroots Innovations for ASEAN

National Innovation Foundation - India

Myanmar

Economy – Overview

- Natural Resources: Teak, jade, gems, copper, tin, tungsten, iron, petroleum
- Crops: Rice, maize, sugarcane, sesame, groundnut, sunflower, beans, pulses, jute, betel nut (areca nut), rubber, coffee, cotton, millet, potato, cashew nut, coconut
- Industries: Textiles/cotton weaving, fisheries, edible oil, mill (rice, edible oil, cotton, sugar)



Grassroots Innovations for Myanmar

Sandalwood Paste Making Machine

- Suitable to make paste from bark of Thanakha trees applied on face as cosmetic
- Similar to sandalwood
- Distinctive feature of the culture of Myanmar, applied to the face and arms of women and girls, men and boys.^[1]
- Stone slab and water used to make paste

Bamboo Splint & Incense Stick making machine

- Bamboo forests third largest in the world
- Bamboo production 63.2 million sticks
- Undervalued as a potential sector, little revenue obtained
- Concentration in Bago Region, Rakhine State, Thanintharyi Region.^[2]

Arecanut Processing Innovations

- Third largest betel nut producing country (130 kilo tonnes; 5.5% global area).^[3]
- Produced in two varieties: white and red
- Suggested Innovations: Arecanut Dehusker, Arecanut peeling machine, Multi Tree Climber

Fish Dryer & Cooking cum Drying Stove

- Expenditure (%) for dried fish ranges from 1.75 – 1.95% of total household expenditure for food.^[4]
- Access to dried as well as fresh fish is important and might be assumed to be an essential component to their vegetarian habits.^[5]
- Currently sundried

Sugar Cane Processing Innovations

- As of 2016 a total of 10,437,058 tonnes of Sugarcane was produced in Myanmar.^[6]
- Suggested Innovations: Sugars Cane Chipper and Sugarcane Bud Planter

[1] Streissguth, Thomas (2007). [Myanmar in Pictures](#). Twenty-First Century

[2] BIF Burma: Bamboo Market Analysis (Feb 2016)

[3] Areca Nut Market: Global Industry Analysis 2012 - 2016 and Opportunity Assessment; 2017 – 2027

[4] Trade and consumption of dried fish in Myanmar: Abdel Rahman El Gamal - Fish Consulting Group -

<http://fishconsult.org/?p=13018>

[5] MYANMAR - Mission report on inland aquaculture and fisheries – Food and Agricultural Organization of the United Nations

[6] Sugarcane Production in Myanmar – United Nations Food and Agriculture

Grassroots Innovations for Myanmar

Groundnut Processing

- Important oilseed and food crop that is labour intensive
- Grown over 0.7 million hectares
- 70% of produce is processed for oil; 20% as seed; 10% direct consumption
- Suggested Innovations: Groundnut digger, Ground nut harvester

Biomass Gasifier

- Construction Minister Win Khaing focused on completing several smaller projects rather than large dams to tackle chronic power shortages.^[2]

Rice Processing

- Myanmar was once Asia's largest exporter of rice, and rice remains the country's most crucial agricultural commodity.
- Around 2.6 million tons of rice husk is generated annually.^[3]
- Suggested Innovations: Rice Grain Sorting Machine, Paddy Husk Stove

Multi Tree Climber

- Coconuts - production quantity of Myanmar increased from 41,747 tonnes in 1967 to 531,730 tonnes in 2016 growing at an average annual rate of 6.08 % .^[4]
- Myanmar to set up new 2000 acres coconut plantation zone in Mon State.^[4]

Mechanical Jute Ribboner

- Myanmar produced 500 tonnes of jute in 2014/15.
- There is a decreasing trend in production of jute in Myanmar from 9.6 thousand tonnes to 0.5 thousand tonnes in 2014-15.^[5]

[1] Status of ground nut production and consumption in South east Asia by P S Reddy

[2] Big dams can wait, Myanmar overhauls energy strategy Simon Lewis, Shoon Naing - Reuters

[3] Rice Husk – A Useful By-Product For Rice Growing Countries – Myanmar Insider

[4] "Burma (Myanmar) - Agriculture". Encyclopedia of the Nations, "Myanmar Agriculture Rice Beans Kenaf

[5] Statistical Bulletin 2016 - Jute and hard fibres - Food and Agriculture Organization of the United Nations

Myanmar

Additional Notes

- A biomass gasification power plant which uses rice husks to generate electricity was opened by the Myanmar Agribusiness Public Corporation (MAPCO) in Nay Pyi Taw, said the company's chairman, U Chit Khine.^[1]
- Myanmar Rice Federation said companies involved in the rice husk-to-fuel conversion business, would be eligible to apply for small and medium enterprise (SME) loans to fund expansion. Workshops will also be conducted to train businesses on technique and know-how on converting rice husks to bio mass fuels.^[2]



Thanaka wood (*Hesperethusa crenulata*) for sale
Image: [Thanaka](#) by [Serinde](#) (Public Domain)

[1] Rice husk power plant opens in Myanmar - Htoo Thant 28 Mar 2017 – Myanmar Times

[2] Myanmar aims to increase exports of rice husk-to- biomass products – Myanmar Times

Thailand

Economy – Overview

- Natural Resources: Gypsum, natural gas, rubber, tungsten
- Crops: Rice, corn, cassava, coconut, sugarcane, coffee, dairy, soybeans, mushroom, tapioca, tropical fruits such as durian, mangosteen, rambutan, longan, salak, and langsat
- Industries: Automobiles and automotive parts, financial services, electrical appliances, tourism, agricultural processing, beverages



Kingdom of Thailand

Source: Map No. 3853 Rev. 2 UNITED NATIONS July 2009

Grassroots Innovations for Thailand

Multi Tree Climber

- 206k hectares of coconut palm plantations
- Cooking: coconut milk/oil
- Direct consumption: coconut juice/shoot/flesh
- Spiritual beliefs: Thai funeral
- Main coconut variety: aromatic coconut; exported as fresh fruit/processed juice to US, Canada, Aus, Singapore etc
- Trees dwarf in nature.^[1]

Silk Reeling Devices

- Authentic Thai silk is hand woven.^[2]
- Silk farms focused in northern Thailand (epicentre: Khorat)
- Local consumption relatively low for traditional Thai silk
- Niche market for high-end, cultural products, successfully sidestepping direct competition from emerging low-cost producers
- Modern silk production uses mechanized reels although there is still great demand for hand-reeled silk threads

Sugar Cane Bud Chipper

- Thailand remains a major sugar producer and is the world's second-largest exporter.^[3]
- Sugarcane is cultivated in about 8% of the total agricultural land.
- The majority of sugarcane farms are small and medium farms, 52% and 31%, respectively with an annual production capacity from about 1,000 to 2,000 MT.

Rain Water Syringe System

- In Thailand soil salinity had significant effect on rice yield.^[4]
- Inland salt-affected soils in Thailand is about 1.841 million ha.
- Remediation of salt-affected soils is through leaching and drainage, land levelling, deep ploughing, surface mulching, use of organic amendments, selection of salt tolerant species or varieties and integrated management practices.^[5]

Arecanut Processing

- 7th largest producer of Areca nut.^[6]
- Maak/Arecanut chewing in big cities like Bangkok and Chiang Mai has almost completely vanished. Although in rural provinces, betel chewing is still popular amongst elders.^[7]
- Suggested Innovations: Arecanut Dehusker, Arecanut peeling machine, Multi Tree Climber

[1] Thailand's banana, coconut, mango and papaya industries: a country report, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University, Thailand

[2] Modernizing tradition – the Thai silk industry, Fiscal Policy Research Institute, Bangkok

[3] White paper Thai sugarcane sector & sustainability - Phengkhouane Manivong Emmanuelle Bourgois - FairAgora Asia Co Ltd

[4] Yield of rice under water and soil salinity risks in farmers' fields in northeast Thailand - C.Clermont-Dauphin^aN.Suwannang^bO.Grünberger^cC.Hammecker^dJ.L.Maeght

[5] Salt-affected Soils and Management in Thailand - Somsri Arunin and Pirach Pongwichian

[6] Betel-quid and Areca-nut Chewing and Some Areca-nut-derived Nitrosamines

[7] Which Country Produces the Most Areca Nuts in the World? - Anna Sergeeva – Index Box

Grassroots Innovations for Thailand

Multi-purpose Food Processing Machine

- 1.9 million households are engaged in fruit production and fruit growers represent 30% of the total farm households in the country.
- Up to 57 different fruit species are commercially produced in Thailand
- Tropical fruits such as durian, mangosteen, rambutan, longan, salak, and langsat.^[1]

Fruit Nipper

- 2-3 of the 6 major economic food crops including mango, rambutan, mangosteen and 2 of 6 minor fruit crops have harvesting similar to that of mango harvesting
- Six major economic fruit crops in Thailand cover around 0.9 million hectares of land area and produce 4.45 million tons of fruit annually.
- Six minor economic fruit crops cover an area of around 0.2 million hectares and produce 1.74 million tons of fruit annually.^[1]

Tractor Operated Orchard Sprayer

- Fruit production in Thailand covers a total area of 1.31 million hectares and an average production of 7.5 million tons and a total annual value of US\$2,823 million. ^[1]
- Applicable to Dragon Fruit orchards, orange orchards, etc.

Milking Machine – Milk Master

- Raw milk production capacity of 2800 tons a day (2015)
- 40 % of milk production goes to school milk program and remaining to commercial dairy sector.
- Despite increase in production demand exceed available local supply.^[2]

[1] Fruit production, marketing and research and development system in Thailand - Lop Phavaphutanon - Kasetsart University

[2] Dairy Production and Trade in Thailand – Dang Xuan Phi – Center for Applied Economic Research - Kasetsart University

Grassroots Innovations for Thailand

Bullet Santi

- The average farm size in Thailand is 3.6 ha/farm, and mostly private farms with small land holding.
- Most Thai farmers own small and inexpensive machines such as power tiller, water pump, and chemical sprayer.
- Less than 10% of Thai farmers possess four-wheel tractor and power thresher.^[1]

Fish Dryer/Cooking cum Dryer

- Of total fish taken for human consumption 76% were processed (chilling, freezing, canning, smoked, dried and/or salted, and/or converted into shrimp paste or fish sauce)
- In general dried fish is in high demand and is consumed by 18 percent of the population.^[2]
- Arecanuts also sun dried before consumption

System for small capacity marine Engines

- In 2006 there were 12 552 registered fishing vessels of which - trawlers 41 percent, stick-held falling nets 25 percent, gillnetters 14 percent, purse seiners 11 percent, and others 9 percent. ^[2]

Incense Stick Making Machine

- In Thailand, bamboo is one of the most socioeconomically important species.
- Many uses include food, household construction, supporting poles, baskets, handicraft making, firewood and paper pulping, etc.^[3]

[1] Thai Market for Agricultural Machinery – December 2015 - A Study Commissioned by the Embassy of India, Bangkok

[2] Fishery and Aquaculture Country Profiles - The Kingdom of Thailand - Food and Agriculture Organization of the United Nations

[3] Bamboo research and development in Thailand - Rungnapar Pattanavibool - Scientist, Royal Forest Department, Bangkok, Thailand.

Thailand

Additional Notes

- Thailand has been raising and training pigtailed macaques to pick coconuts for around 400 years.^[1]
- In 2016, Thailand produced 712 metric tons of silk which was the highest among all ASEAN countries.^[2]
- Silk Industry provides employment for 20,000 weaving families in Thailand.^[3]



A person weaving silk at a loom, Ban Tha Sawang, Surin Province, Thailand

Image by [JJ Harrison](#) / [CC-BY-SA-3.0](#)

[1] What's Funny About The Business Of Monkeys Picking Coconuts? - [Eliza Barclay](#) - The Salt

[2] Data derived from: Global Silk Industry .Statistics International Sericultural Commission 2016. <http://inserco.org/en/statistics>

[3] Ukav, İsmail. (2018). Mulberry Production Economy in District of Adiyaman. Asian Journal of Agricultural Extension, Economics & Sociology. 23. 1-10. 10.9734/AJAEES/2018/39462.

Indonesia

Economy – Overview

- Natural Resources: Petroleum, natural gas, coal, nickel, tin, bauxite, gold, lead [1]
- Crops: Rice, spices (pepper, cloves, cinnamon, nutmeg, vanilla), rubber, coconut, tea, coffee, cassava, coconut, tropical fruits
- Industries: Palm oil, fisheries, forest products, textiles, agri-inputs, machinery, software



Republic of Indonesia

Source: Map No. 4110 Rev. 4 UNITED NATIONS January 2004

Grassroots Innovations for Indonesia

Multipurpose Food Processing Machine

- The highest number of fruit and vegetable industries was categorized as pulping of fruit & vegetables.^[1]
- Fruit processing sector is dominated by small local industries which are showing strong growth.^[2]
- Study on Social Enterprise Concept in Sustaining Fruit-Based- Processing Agro-Industry highlighted several advantages.^[3]

Nutmeg Desheller

- At 36 thousand tons, Indonesia is the second largest producer of Nutmegs.^[4]
- Indonesia supplies 75% of global nutmeg demand^[5]
- Essential oil, nutmeg butter, etc are major value added products.

Tractor Operated Orchard Sprayer

- The government of Indonesia included 5 national priority commodity-based fruits including banana, mango, citrus, mangosteen and durian.^[1]
- Applicable to Dragon Fruit orchards, mango orchards, malang apple orchards, etc.

Spice Processing

- Major Spices production is pepper, cinnamon, nutmeg, cardamom, cloves.
- Indonesian spices are sold in raw form hence generates lesser revenue from the commodity although its production volume is higher.^[5]
- Suggested Innovations: Multi purpose dryer, Multi purpose drying machine, cooking cum drying machine

[1] Overview of fruit production, marketing, and research and development system in Indonesia - Mohamed Iqbal Rafani

[2] Business opportunities in fruit sector – East Java : Stefani Amanda - Harmani Food Valley Ambassador

[3] Social Enterprise Concept in Sustaining Fruit-Based- Processing Agro-Industry Development in Indonesia (Study Case: Fruits Up Social Business) Koko Iwan Agus Kurniawan, Dwi Purnomo, and Anas Bunyamin Department of Agroindustrial Technology, Padjadjaran University

[4] Which Country Produces the Most Nutmeg, Mace and Cardamoms in the World? - Anna Sergeeva – Index Box

[5] Indonesia's Spice, Seasoning and Condiment Sectors: Limited by Poor Supply Chains – Global Business Guide Indonesia

Grassroots Innovations for Indonesia

Silk Reeling Devices

- Indonesia silk sector has been somewhat stagnant for the past decade
- Dominated by small producers using traditional methods of production.
- Opportunities in this sector lay in technology and investment. Cost of the technology has deterred investors in the past.^[1]
- Suggested Innovations: Portable Muga and Eri Reeling Machine, Solar multi muga reeling cum spinning machine, Reeling cum Spinning Machine

Multi Tree Climber

- Among the major countries of the world coconut production, Indonesia occupied the first rank.^[2]
- Indonesia has the biggest coconut area in the world but contribution is at 27%.^[3]
- Labour shortages have affected production.

Sugar Cane Bud Chipper

- Many issues in sugar industry, ranging from aging factories, reduced sugarcane fields, farm inefficiency and low productivity
- Sugar industry plays an important role in the country's economy. with production ranging from 2.5 to 2.7 million tonnes per year, the economic value of the national sugar industry is estimated at 25 trillion IDR.^[4]
- Suggested Innovations: Sugars Cane Chipper and Sugarcane Bud Planter

Arecanut Processing

- 4th Largest producer of Arecanut
- The Asia Pacific is the largest market of areca nuts in the world, with more than 90% of the global market share.^[5]
- Suggested Innovations: Arecanut Dehusker, Arecanut peeling machine, Multi Tree Climber

[1] Indonesia's Budding Silk Industry - Global Business Guide – Indonesia

[2] Growth Trends in Area, Production and Productivity of Coconut in Major Growing Countries - J. Nehru Naik

[3] End-to-end coconut harvesting robot - Teguh Satrio Wibowo ; Indra Adji Sulistijono ; Anhar Risnumawan

[4] Indonesia's Sugar Industry Overview: Still a Long Way from Self-Sufficiency

[5] Areca Nut Market: Global Industry Analysis 2012 - 2016 and Opportunity Assessment; 2017 - 2027

Grassroots Innovations for Indonesia

System for small capacity marine Engines

- An average of 86 percent of the whole fleet is motorized majority has an inboard motor
- Significant number of vessels that have outboard engines in the 5 to 30 Gross Tonnage capacity.^[1]
- In 2014, the number of fishing vessels in Indonesia amounted to approximately 652 thousand vessels.^[2]

Pepper Thresher

- Problems in Indonesian pepper production include low competitiveness and productivity, poor infrastructure.^[3]
- Indonesian pepper is still competitive - Lampung black pepper and Munthok white pepper are known in international markets.^[3]

Milking Machine – Milk Master

- Small scale and poor equipment of local dairy farms led to low degree of efficiency and inferior milk quality by international comparison.
- Domestic milk consumption is rising at a rapid rate of 8% per year, according to AIPS(Milk Processing Industry Association)
- Indonesia's dairy farmers deliver around 1,800 tonnes of milk a day (AIPS), which satisfies less than a fifth of national demand.^[4]

Fruit Nipper

- The government of Indonesia included 5 national priority commodity-based fruits including banana, mango, citrus, mangosteen and durian.^[5]
- Applicable for mangosteen and mangoes

[1] The fishing fleet in Aceh Province, Indonesia - David Lymer, Simon Funge-Smith and Dominique Greboval

[2] Number of fishing vessels in Indonesia from 2005 to 2014 – Statista

[3] Sudjarmoko, Bedy & Wahyudi, Agus & Ermiati, Ermiati & Hasibuan, Abdul. (2016). Strategy for developing Indonesian pepper export based on trade performance index and analytic hierarchy process. Buletin Penelitian Tanaman Rempah dan Obat. 26. 63. 10.21082/bullitro.v26n1.2015.63-76.

[4] Indonesia's Dairy Industry Needs to Scale Up to Meet Local Demand - Global Business Guide Indonesia - 2015

[5] Overview of fruit production, marketing, and research and development system in Indonesia - Mohamed Iqbal Rafani

Indonesia

Additional Notes

- Subak – it is a cooperative water management system of canals and weirs that dates back to the 9th century.
- Located in Bali, it consists of five rice terraces and their water temples that cover 19,500 ha.^[1]
- The *subak* reflects the philosophical concept of *Tri Hita Karana*, a philosophy born of the cultural exchange between Indonesia and India over the past 2,000 years and has shaped the landscape of Bali.
- The *subak* system of democratic and egalitarian farming practices has enabled the Balinese to become the most prolific rice growers in the archipelago despite the challenge of supporting a dense population.



[Rice Terraces at Tegalalang, Gianyar](#) / [CC BY-SA 3.0](#)

[1] [Cultural Landscape of Bali Province: the Subak System as a Manifestation of the Tri Hita Karana Philosophy](#) - UNESCO World Heritage

Cambodia

Economy – Overview

- Natural Resources: Limestone, quarry, gems, forestry
- Crops: Rice, maize, cassava, sweet potatoes, groundnuts, soybeans, sesame seeds, dry beans, and rubber, sugarcane, sea salt, durian, Kampot Black Pepper, coconut
- Industries: Textiles, handicrafts, tourism



Kingdom of Cambodia

Source: Map No. 3860 Rev. 4 UNITED NATIONS January 2004

Grassroots Innovations for Cambodia

Multi Tree Climber

- Coconuts are cultivated in the Southern coastal provinces with a total of 16,935 hectares.
- Most coconuts produced by smallholder farmers are sold for coconut water
- Each household usually has 10-30 coconut palms on their plot of land.^[1]

Pepper Thresher & Dryer

- Kampot pepper obtained the World Trade Organization's Geographical Indication (GI) status in 2010.^[2]
- Despite international demand, annual export volume is still relatively small, i.e. 58 tonnes was produced on 25 hectares for the year 2014.^[3]

Incense Stick Making Machine

- More than 500.000 T of standing bamboo suitable for industrial processing is available in Varin district of Siem Reap province.
- Experts evaluated business potential of existing bamboo resources in Cambodia
- They have identified the following bamboo products- sticks, plywood, lamination & edible shoots.^[4]

Herbal Toys

- Ancient art of lacquer work nearly faded into oblivion
- Revival is still in its infancy, but 100 lacquer artists have been trained
- Some artists are "beginning to experiment with different techniques and styles."^[5]

[1] BUILDING CAMBODIA'S NASCENT COCONUT INDUSTRY -November 28, 2017 - Global Institute For Tomorrow (GIFT)

[2] "How the World's Best Pepper is Grown in Kampot, Cambodia"

[3] "Kampot pepper defying drought fears". The Phnom Penh Post.

[4] Bamboo industry development in Cambodia - Angkor Handicraft Association

[5] Visiting Arts (2005), "Lacquerware"

Grassroots Innovations for Cambodia

Textile Innovations

- Opportunities in semi commercial machinery for weaving.^[1]
- Garment production is Cambodia's largest industry, which accounts for 26.2 percent of the country's Gross Domestic Product.^[2]
- Suggested: Electric loom for making bandages, Double shuttle loom, Design Making by Weft Insertion

Rice Cultivation Innovations

- Although only 8 per cent of the rice is irrigated, the rice production has increased steadily and made Cambodia not only self-sufficient in rice, but even an important exporter.^[3]
- Suggested Innovations: Rice Grain Sorting Machine, Paddy Husk Stove

Sanitary Napkin Making Machine

- Textile sector employs 335,400 workers, of which 91% are female.^[4]

Fruit Nipper

- Fruits such as mango, pineapple, jackfruit, durian, rambutan and banana are major food crops.^[3]
- Small export market (e.g. bananas to China, Mango to China and Korea) but production needs to intensify.^[1]

Multi Purpose Food Processing

- Opportunities lie in production of Cambodian - made drinks – from fruit juice for SME, large formal enterprises and boutique producers.
- Opportunities for development of locally – processed foods in supermarkets such as jams and dried fruits.^[1]

[1] AGRICULTURE AND AGRO – PROCESSING SECTOR IN CAMBODIA: BDLINK (CAMBODIA) CO.,LTD

[2] Unions and Employers Deeply Divided Over Cambodia's Trade Union Law. Voacambodia.com (15 June 2016)..

[3] FAO in Cambodia

[4] "Cambodia's textile industry grew 32%". Inside Investor. Retrieved 11 July 2013.

Grassroots Innovations for Cambodia

Rural Egg Incubator

- Poultry production has steadily increased by 57 percent from 2011 to 2015, thanks to improved farming methods.
- Overall Commercial production of increased from 5.9 to 7.7 million birds a 29 percent increase, between 2014 and 2015.^[1]

Sugarcane Processing

- Production is in increasing, although very few sugar mills in the country.
- Sugar cane export was 0.236 million tons in 2013.^[1]
- Though Cambodia sugar cane - production quantity fluctuated in recent years, it tended to increase ending at 610,878 tonnes in 2016.^[2]

Milking Machine

- A total of 533 milking machines were ordered between 2013 and 2015 from 4 countries of which 531 were ordered in 2014.^[1]

Ground Nut Digger

- Though Cambodia groundnuts, with shell - production quantity fluctuated substantially in recent years, it tended to increase through 1967 - 2016 period ending at 28,571 tonnes in 2016.^[2]

[1] AGRICULTURE AND AGRO – PROCESSING SECTOR IN CAMBODIA: BDLINK (CAMBODIA) CO.,LTD

[2] Production Statistics - Crops, Crops Processed – Knoema - Cambodia

Cambodia

Additional Notes

- Currently only 10% of Cambodia's agricultural goods are processed. Expanding the agro-processing sector is a priority in the 2015 Industrial Development Policy (IDP).^[1]
- As the first Cambodian product, Kampot pepper obtained the World Trade Organization's Geographical Indication (GI) status in 2010, tying the quality of the product to its origin.^[2]



Painting a Vase, Artisans D'Angkor, Cambodia by [Marc A. Garrett](#) /CC-BY-SA-2.0

[1] Agriculture and agro-processing sector in Cambodia – BDLINK (CAMBODIA) CO.,LTD.

[2] "How the World's Best Pepper is Grown in Kampot, Cambodia". Serious Eats.

Philippines

Economy – Overview

- Natural Resources: Nickel, White iron, copper
- Crops: Rice, rubber, corn, sugar, coconuts, pineapple, banana, abaca
- Industries: Electronic Components, Manufactured goods, aerospace, shipbuilding, textiles



Map of Philippines
Source: Public Domain

Grassroots Innovations for Philippines

Multi Tree Climber

- Among the major countries of the world coconut production, Philippines occupied the first rank.^[1]
- It is estimated that around one quarter of total farm land in the Philippines is dedicated to coconut production.

Sugar Cane Bud Chipper and Planter

- Sugar industry provides direct employment to 700,000 sugarcane workers spread across 19 sugar producing provinces
- The sugar industry funds its own research, development and extension programs through the Philippine Sugar Research Institute Foundation, Inc. (PHILSURIN) to develop high yielding cane varieties.^[2]

Multi Purpose Food Processing

- Philippines is also the world's largest producer of pineapples, producing 2,458,420 million metric tons in 2013
- Major fruit crops include banana, pineapple, mangoes, papaya, calamondin.^[3]

Rice Cultivation Innovations

- Rice production in the country of Philippines is important to the food supply in the country and economy.
- The Philippines is the 9th largest rice producer in the world, accounting for 2.8% of global rice production.^[4]
- In 2017, the total paddy rice output met 93% of the country's annual requirement.^[5]
- Suggested Innovations: Rice Grain Sorting Machine, Paddy Husk Stove

[1] Growth Trends in Area, Production and Productivity of Coconut in Major Growing Countries - J. Nehru Naik

[2] Master Plan For the Philippine Sugar Industry. Sugar Master Plan Foundation, Inc. 2010

[3] "Food and Agricultural commodities production / Commodities by country", The Philippine Fruit Industry:

An Overview - Arlan James Rodeo

[4] "2009 Crop Production Statistics". FAO Stat

[5] "Philippines to Import Rice Through 2020 Despite Rising Output - Minister"

Philippines

Additional Notes

- Top 5 export gainers in Philippines economy were Machinery and Transport Equipment, Electronic equipment and parts, metal components, wiring sets and electronic products.^[1]



[Sugarcane plantations Bacolod Philippines](#) by [Paolobon140](#) (Public Domain)

[1] Highlights of the Philippine Export and Import Statistics : July 2017 – Philippines Statistics Authority

Malaysia

Economy – Overview

- Natural resources: Natural rubber, palm oil, timber
- Crops: Cocoa, pepper, pineapple, tobacco, durian, banana, coconut, rice
- Industries: Fishing, medical tourism
- Exports: Palm oil, liquefied natural gas, petroleum, manufactures of metal, rubber, wood and wood products



Map of Malaysia
Source: Public Domain

Grassroots Innovations for Malaysia

Solar Mosquito Destroyer

- Tropical country, mosquitoes prevalent
- Dengue occurs nationally, outbreaks in urban and suburban settings
- Occasional spraying and fogging by government
- Health ministry conducting trials for introducing genetically modified mosquitoes.^[1]

Multi purpose fish Dryer

- Important sub-sector; source of employment, foreign exchange and protein supply for the rural population
- Fish constitutes a major portion of national animal protein intake
- Average annual fish consumption in Malaysia: above 40 kg per capita.^[2]
- Smoking an ancient method of flavouring, cooking and preserving food
- Significant markets for smoked fish include Malaysia and Singapore

System for small capacity marine engines

- According to a study^[3], it has been found that Malay fishermen are inclined towards accepting technology as they possess knowledge about it. Safety and saving time are two important driving forces behind the gradual inclination happening.
- Govt trying to incentivize through tax exemptions on imports and sales on fishing machinery

Portable energy efficient wood stove

- Firewood frequently available at no cost and is clearly the dominant fuel
- Usage of coconut shell fuel for preparing certain foods such as barbecue, and many other native dishes are suited to cooking over a fire
- Many rural households contain several different types of stoves which can be used simultaneously

[1] Eong Ooi E. Gubler DJ. Dengue and Dengue Hemorrhagic Fever. In: Guerrant, R; Walker D; Weller P, eds. Tropical Infectious Diseases. 3rded. New York: Saunders Elsevier; 2011: 504-510.

[2] Teh, Evelyn (June 2012). Fisheries in Malaysia: Can resources match demand? Maritime Institute of Malaysia. No. 10/2012.

[3] Raidah Mazuki1 & Norsida Man (July 2014). Acceptance of Technology among Malaysian Fishermen. Asian Social Science; Vol. 10, No. 16; ISSN 1911-2017.

Malaysia

Additional Notes

- Building its own innovation ecosystem: National Innovation Agency (AIM) of Malaysia; Malaysia Innovation Hub (MyInnoHub); Malaysian Global Innovation & Creativity Centre (MaGIC)
- Malaysia is responsible for one third of the world's rubber export.
- Rice: Even with this high production, Malaysia still only produces eighty percent of what it needs to support itself and imports the rest from Thailand and Vietnam.
- Agriculture made up 8.1% of GDP in 2017, down from 11.5% in 2011.^[1]
- Planning required to achieve selective mechanization and popularization of machinery among the farmers.
- Climate ideal for exotic produce; 90% humidity level. Drought or hurricane rare.
- Majority poultry/broiler operators are in the matured age and focus on small and medium scale of production.
- Efforts to harness solar and wind renewable energy.

[1] "Positive growth prospects for Malaysia's agriculture sector". Oxford Business Group. May 2017.

Singapore

Economy – Overview

- Crops: Fruits (durian, rambutan, mangosteen), mushroom, eggs, vegetables, poultry, pork, flowers (orchids), fishes (ornamental fish)
- Industries: Tourism, medical sciences, logistics, banking and finance, chemicals, construction



Map of Republic of Singapore
Source: Public Domain

Grassroots Innovations for Singapore

Compost maker for mushroom cultivation

- The fresh mushroom market in Singapore is expected to grow at an annual compound rate of 3% over the next four years to reach just over US\$101 million in 2020.^[1]
- This would mean by 2020 the market is forecast to include 39% button mushrooms, 33% Shiitake and 20% Oyster mushrooms.

Fish Dryer

- Aquaculture production will need to more than double again between now and 2050 to meet the food demands of the growing population
- Singaporeans consume 54,000 tonnes of fish each year, 92% of which is imported.^[2]
- AVA has been engaging local fish farmers on how to employ innovative fish farming methods to boost supply
- Significant markets for smoked fish include Singapore

Egg incubator

- Singapore's egg supply comes from hen farms locally as well as in Malaysia
- Per capita consumption of hen eggs in 2016 was 308 pieces.^[3]
- Due to AVA's efforts and strategies to ensure a steady food supply, local farms now provide 26% of the eggs consumed in Singapore

Orchard Sprayer

- Over the last two to three years, more than 80 plots with fruits, herbs and vegetables have sprung up not only in private and public housing estates, but also in eateries, malls, schools and offices as urban farming
- Fruits produced include durians, mangosteens and rambutans

[1] Edible Mushroom Cultivation for Food Security and Rural Development in Southeast Asia. Asian Institute of Technology, April 2014.

[2] Modern fish farming for a secure food supply. Singapore Economic Development Board, November 2016.

[3] 10 year Per Capita Consumption Trend. Agri-Food and Veterinary Authority of Singapore (AVA), December 2017.

Singapore

Additional Notes

- Scarce in agriculture, only 7% food grown locally; rest imported from Malaysia, Thailand, Philippines.^[1]
- Agriculture responsible for less than 0.5% of the GDP, as of 2010.
- Agricultural production not enough to deliver to the needs of the country's people, and as such, about 90% food comes from overseas imports, making food safety an issue of high note. ^[1]
- 153 orchid farms
- 500 species of ornamental fish produced; top exporter
- Public-private partnerships to set up agro-technology parks and vertical farms by Agri-Food & Veterinary Authority (AVA).

[1] Agriculture in Singapore, Nations's Encyclopedia

Vietnam

Economy – Overview

- Natural resources: Coal, timber
- Crops: Pepper, rice, coffee, cashews
- Industries: Food processing, wood, garments and textiles, footwear, vehicle, rice, coffee, seafood, fishing, vegetable, tourism



Map of Socialist Republic of Viet Nam
Source: UNOCHA. September 2013.

Grassroots Innovations for Vietnam

Pepper Thresher

- Largest pepper producer (producing 163,000 tons which is 34.5% of world's production) and exporter
- 51k ha area under pepper production
- High productivity (3.2 tons per ha).^[1]
- In 2013, Vietnam exported 130,000 tonnes of pepper worth US\$850 million
- Vietnam model – exclusive monocrop with high density planting using concrete poles to support pepper vines

Multi Purpose Fish Dryer

- Vietnam's seafood industry is one of the world's largest, and exported \$8.3bn of its products worldwide in 2017.^[2]
- Vietnam's most important seafood products include shrimp, pangasius, tuna and marine fish
- Average annual consumption of seafood by the domestic market has reached 27kg per capita
- Total seafood consumption by the domestic market was forecast to reach 940,000 tonnes for 2020
- Total fisheries output amounts to 6.5-7 million tonnes

Rice related innovations

- One of the largest exporters of rice in the world
- Although rice production prevalent throughout Vietnam, yields and growing periods vary substantially
- Average yield for paddy is 4.3 tonnes per hectare currently
- Higher production of the Mekong and Red River Deltas underline their importance in rice production for surpluses and food security within Vietnam
- Agricultural mechanization focused mainly on soil preparation for annual crops, upland crops, threshing, and rice transportation and milling. For sowing, caring, and harvesting, mechanization level is low.^[3]

Textile related innovations

- Cotton ginning, spinning, weaving, knitting, dyeing and finishing, garments
- Most common raw materials for the textile industry: cotton fabric, polyester, silk
- Industry consists of three sub-sectors:
 1. Up-stream (fiber production)
 2. Mid-stream (fabric production and dyeing)
 3. Down-stream (garment manufacturing)
- Most of the enterprises are SMEs with low investment capital mobilization and limited ability of innovating technology and equipment.^[4]

[1] Pepper Crop Report 2017. NEDSPICE, ESA Conference (01 June 2017), France.

[2] Vietnam's Fisheries and Aquaculture Development's Policy. Author: Philippe Lebailly, Vietnam National University of Agriculture. Review Article Volume 5 Issue 4 - December 2017.

[3] Mechanization of agricultural production in Vietnam. Vietnam Institute of Agricultural Engineering and Post Harvest Technology, Ministry of Agriculture and Rural Development, Vietnam, September 2015.

[4] African Cotton & Textile Industries Federation (ACTIF) Report on Vietnam Textile and Garment Industry. July 2010.

Vietnam

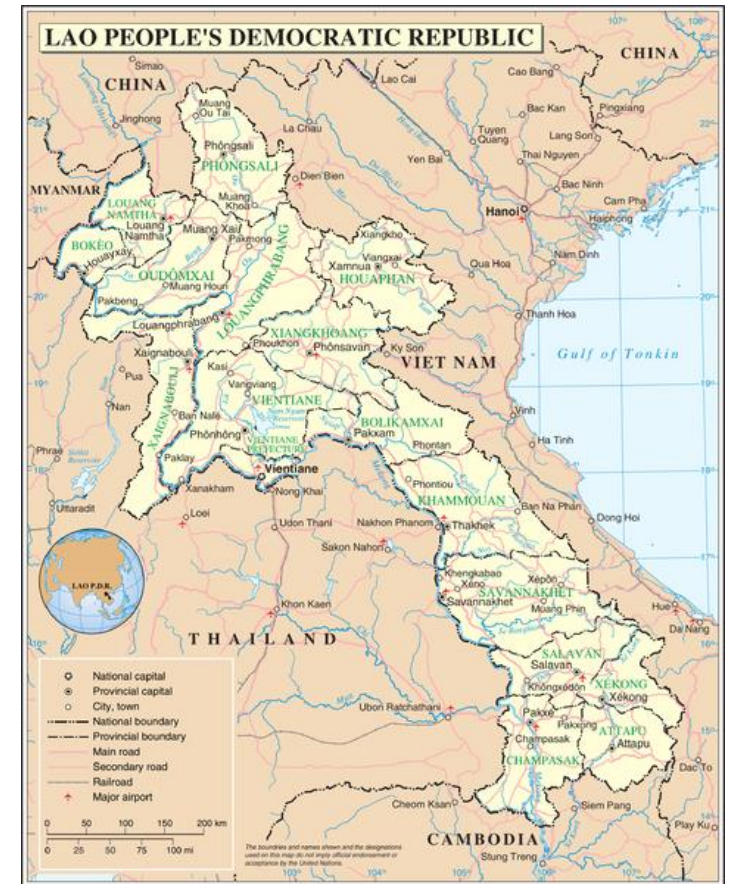
Additional Notes

- Agriculture accounts for almost 20% of GDP and Vietnam has a growing middle class with an increasingly westernized eating pattern.
- Agriculture's contribution to the national GDP is expected to decline by 0.5% annually, due to decreasing employment in the primary agricultural sector.
- At the same time the agro-industry's share is expected to grow to USD 51 billion by 2020 and remains a significant market for outside players.
- Vietnam aims to become a producer and exporter of high standard food products to improve its export of value-added products.
- Small-scale production and the flow through traditional or informal markets still dominates in most of the country's agricultural value chains.

Lao PDR

Economy – Overview

- Crops: Rice, sweet potatoes, fruit, corn, coffee, sugarcane, tobacco, cotton, cabbage, peanuts, garlic, chilli, opium, soybeans, mung beans, cardamom
- Industries: Agricultural processing, livestock, fishing (for lowland dwellers)
- Exports: Textile, coffee, cabbage, eucalyptus



Lao People's Democratic Republic
Source: Map No. 3959 Rev. 2 UNITED NATIONS January 2004

Grassroots Innovations for Lao PDR

Sweet Potato Digger

- Common crop after rice and maize
- Traditionally used as human food when rice not sufficient, also commonly used as feed for farm livestock, especially pigs
- Due to the low level of agricultural technology and awareness present, areas used well below their full potential
- 80% of the rural population are still subsistence farmers.^[1]

Milking machine

- Country had no dairy farms; and the whole concept of milking buffaloes was unknown. Was dependent on imported milk
- Cross breeding of Murrah and Swamp buffaloes on the rise for fresh milk production. First cross breeding happened in 2017
- Farmers unaware of how to milk a buffalo.^[2]

Cardamom Dryer

- Drying occurs in the village on the ground or on a tarpaulin in the sun, or the product is smoked on a metal sheet or on a bamboo platform. Takes 15 days of sun-drying to achieve satisfactory dryness. If smoke drying, it takes 5 to 7 days for 50 kg of seed capsules.^[3]
- Need to eliminate constraints in the cultivation process by introducing driers to help improve product quality and reduce the work involved in the drying period.

Garlic Peeling Machine

- Traditionally processed food includes deep-fried garlic
- Processed by local, small-scale manufacturers
- Processed and preserved without any refrigeration system, using traditional fermentation techniques
- Garlic a conventional and essential part of Laos cuisine. Used as a spice, cooking ingredient, fermenting, marination, grilling, in dips and toppings, or consumed raw in salads.

[1] Food and Agriculture Organization of the United Nations (FAO), FAO in Laos. Laos at a glance, 2018.

[2] laosbuffalodairy.com

[3] Cardamom (*Amomum spp.*) in Lao PDR : the hazardous future of an agroforest system product (*Book*). Author: Aubertin Catherine, originally published in 2004.

Lao PDR

Additional Notes

- Less than 4% of the total area under agriculture, employing an estimated 85% of the population and producing 40% of GDP.
- Rice accounted for about 80% of cultivated land while only 5% of it marketed. 90% of total rice area is non-irrigated, relying on monsoon rainfall for its growth. Monoculture system despite govt efforts to encourage crop diversification. Current goal to sustain self sufficiency. Larger farmers often have their own threshers.
- Lowlands more productive than uplands, owing to infra, technology, fertilizers, market network. Subsistence agriculture in uplands (buffalo as draught power); shift towards market based production and modernisation.
- Coffee: The only crop produced for export in substantial quantities. Cultivated on Bolovens Plateau of mainly two types: Robusta (Regular & Typical Laos sweet drink) and Arabica (Espresso).
- Industries: Most industry is still done on the village level - weaving, blacksmithing, carpentry, boat making. Some villages specialize in pottery, charcoal or tobacco production.

Brunei Darussalam

Economy – Overview

- Natural resources: Crude oil, natural gas (high dependency)
- Crops: Bananas, sweet potatoes, cassava, coconuts, pineapples, and vegetables.
- Industries: Fishing, aquaculture



Map of Negara Brunei Darussalam
Source: Public Domain

Grassroots Innovations for Brunei Darussalam

Fish Dryer

- One of the largest contributors of the country's revenue
- Coastal location on the island of Borneo makes it an ideal location for commercial and subsistence fishing
- Annual catch fluctuates which has caused them to import
- Coral reefs burdened with overfishing
- Increase in imports of dried fish, due to absence of fish drying factories.^[1]
- Fish drying currently an underdeveloped cottage industry
- Fish drying carried out on a small scale at homes for daily consumption, with excess being sold at the local food market

Multi purpose food processing machine

- Valued at B\$ 110.48 million, the agrifood processing industry represents the second largest contributor to the agriculture sector, with main commodity being crop based processing.^[2]
- Seeking higher levels of foreign investment as it bids to diversify its food processing sector
- Weaknesses of the local processing due to lack of machinery needs to be addressed

Poultry related Innovations

- Livestock industry is Brunei's largest contributor to agricultural sector, valued at B\$ 197.15 million.^[3]
- Main commodity: eggs, broiler, beef
- In 2015, broiler contributed B\$ 106.80 million, which makes up for 54% of the livestock industry and 29% of the agriculture sector.^[3]
- The broiler industry target for 2020 is B\$ 289.29 million.^[3]
- Seeking investors to invest, develop, operate and produce poultry meat and eggs
- Suggested Innovations: Egg Incubator, Poultry Raking Machine

[1] Brunei – History, Islam, Society and Contemporary Issues. Edited by Ooi Keat Gin. Published December 2015.

[2] Investment Opportunities in Brunei Darussalam's Agriculture and Agrifood Sector. Report by Department of Agriculture and Agrifood, Ministry of Primary Resources and Tourism, Brunei Darussalam. Published January 2017.

Brunei Darussalam

Additional Notes

- Small market, lack of infrastructure and low transport accessibility.
- Agriculture accounts for 5% of GDP and employs some 2% of the work force (lacks manpower).^[1]
- Rice production is low (only about 1,000 tons per year), and Brunei imports more than 80% of its requirements.^[1]
- Nearly self-sufficient in vegetables, poultry and egg production.
- To help its agribusiness sector scale-up and make the most of growth opportunities, Brunei is keen to attract investment in innovation, agriculture production, advanced food processing and its halal industry.

[1] Agriculture and Agrifood Statistics 2016. Published by Department of Agriculture and Agrifood, Ministry of Primary Resources and Tourism, Negara Brunei Darussalam.



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