**Sixth Regional 3R Forum in Asia and the Pacific**

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**Background Paper on**

# Circular Economic Utilization of Agriculture and Biomass Waste – A Potential Opportunity for Asia and the Pacific

**Parallel Roundtable-3**

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# Introduction

* Biomass resources are potentially the world's largest sustainable source of fuel and chemicals
* Land and resource competition between fuel crop and food crop
* Globally, 1 billion tonnes of agricultural waste is produced yearly
* 17 trillion dollars biomass economy
* Fast emerging biomass trades: woodchips, sawdust and pallets
* PR China is the biggest biomass producer in Asia Pacific with annual generation of 587 million tonnes

# The objectives of this paper are:

* The generation and utilization of biomass waste and its economic opportunities
* An overview on Agricultural and Biomass Management in Asia and the Pacific
* Composition Context: Component and Composition of Agricultural waste in Asia and Pacific regions
* Role of 3R in balancing environmental conservation and economic growth through the effective use of agriculture and biomass waste
* A brief analysis on various case studies and model cases on economic utilization of agriculture and biomass waste management, including how various legislative framework, standards, laws and regulations, etc. have contributed in promoting 3Rs in agriculture and biomass waste utilization
* Effective utilization of agriculture and biomass waste in the context of climate change mitigation
* The Way Forward: How circular economic utilization of agriculture and biomass waste can make significant contribution in post-2015 development context

# * Asia and Pacific country's agriculture and biomass waste generation (1)

* Virgin wood, energy crop, agriculture residues, food waste and industrial waste

* The composition and component of biomass generated varies from country to country.

* Food waste composition ranged between 20% and 70% of total MSW composition

* The agriculture sector has contributed 0.7 to 30% of total GDP

# Asia and Pacific country's agriculture and biomass waste generation (2)

- Agriculture sector contributed > 10% to total GDP:
  - Afghanistan, Bangladesh, Bhutan, PR China, Fiji, Indonesia, India, Cambodia, Sri Lanka, Mongolia, Nepal, Pakistan, The Philippines Thailand Tuvalu, Vietnam, and Vanuatu
- Brunei Darussalam, Hong Kong SAR of China, and Singapore have < 1% of GDP contribution from agricultural sector
- Expanding agricultural production resulted in increased quantities of biomass wastes
- Potential of using agricultural wastes remains largely untapped
- Paddy rice, wheat, coconut, sugarcane, banana, cattle, maize, and livestock

# * Table 1: Agriculture GDP (% of total GDP) (World Bank Statistics)

| Country Name | Agriculture GDP (% of total GDP), 2013 | Country Name | Agriculture GDP (% of total GDP), 2013 |
|---|---|---|---|
| Afghanistan | 23.97 | New Caledonia | NA |
| American Samoa | NA | Nepal | 35.10 |
| Australia | 2.45 | New Zealand | NA |
| Bangladesh | 16.28 | Northern Mariana Islands | NA |
| Brunei Darussalam | 0.73 | Pakistan | 25.11 |
| Bhutan | 17.08 | The Philippines | 11.23 |
| PR China | 10.01 | Palau | 5.33 |
| Fiji | 12.22 | Papua New Guinea | NA |
| Micronesia, Fed. Sts. | NA | Korea, Dem. Rep. | NA |
| Guam | NA | French Polynesia | NA |
| Hong Kong SAR, China | 0.06 | Singapore | 0.03 |
| Indonesia | 14.43 | Solomon Islands | NA |
| India | 17.95 | Thailand | 11.98 |
| Japan | NA | Timor-Leste | NA |
| Cambodia | 33.52 | Tonga | NA |
| Kiribati | NA | Tuvalu | 22.16 |
| Korea, Rep. | 2.34 | Vietnam | 18.38 |
| Sri Lanka | 10.76 | Vanuatu | 27.98 |
| Macao SAR, China | NA | Samoa | NA |
| Maldives | NA | | |
| Malaysia | 9.31 | | |
| Marshall Islands | NA | | |
| Mongolia | 16.47 | | |

# * Asia and Pacific country's agriculture and biomass waste generation (3)

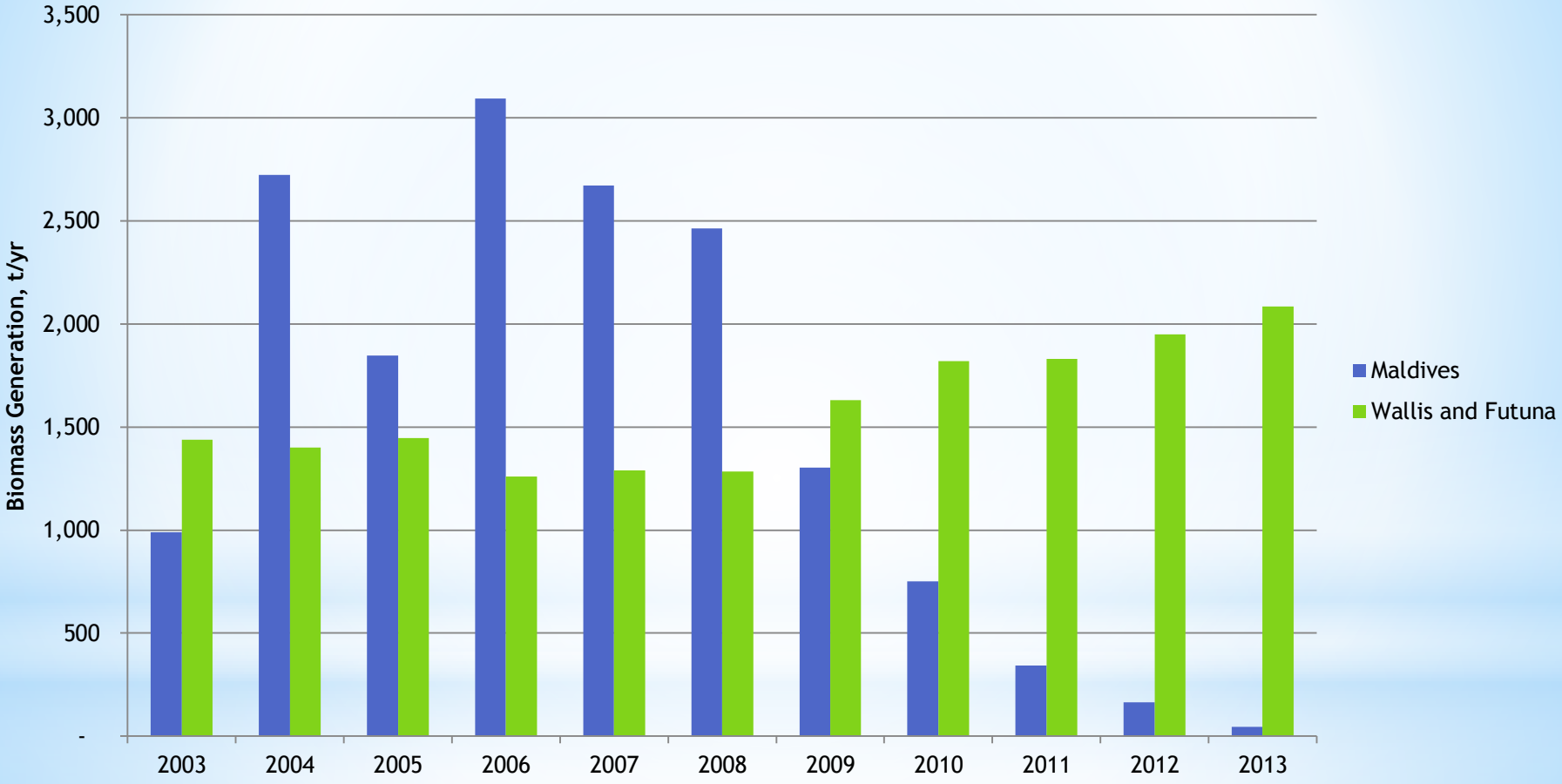


Figure 1: Banana Biomass Generation in Maldives and Wallis and Futuna

# * Asia and Pacific country's agriculture and biomass waste generation (4)

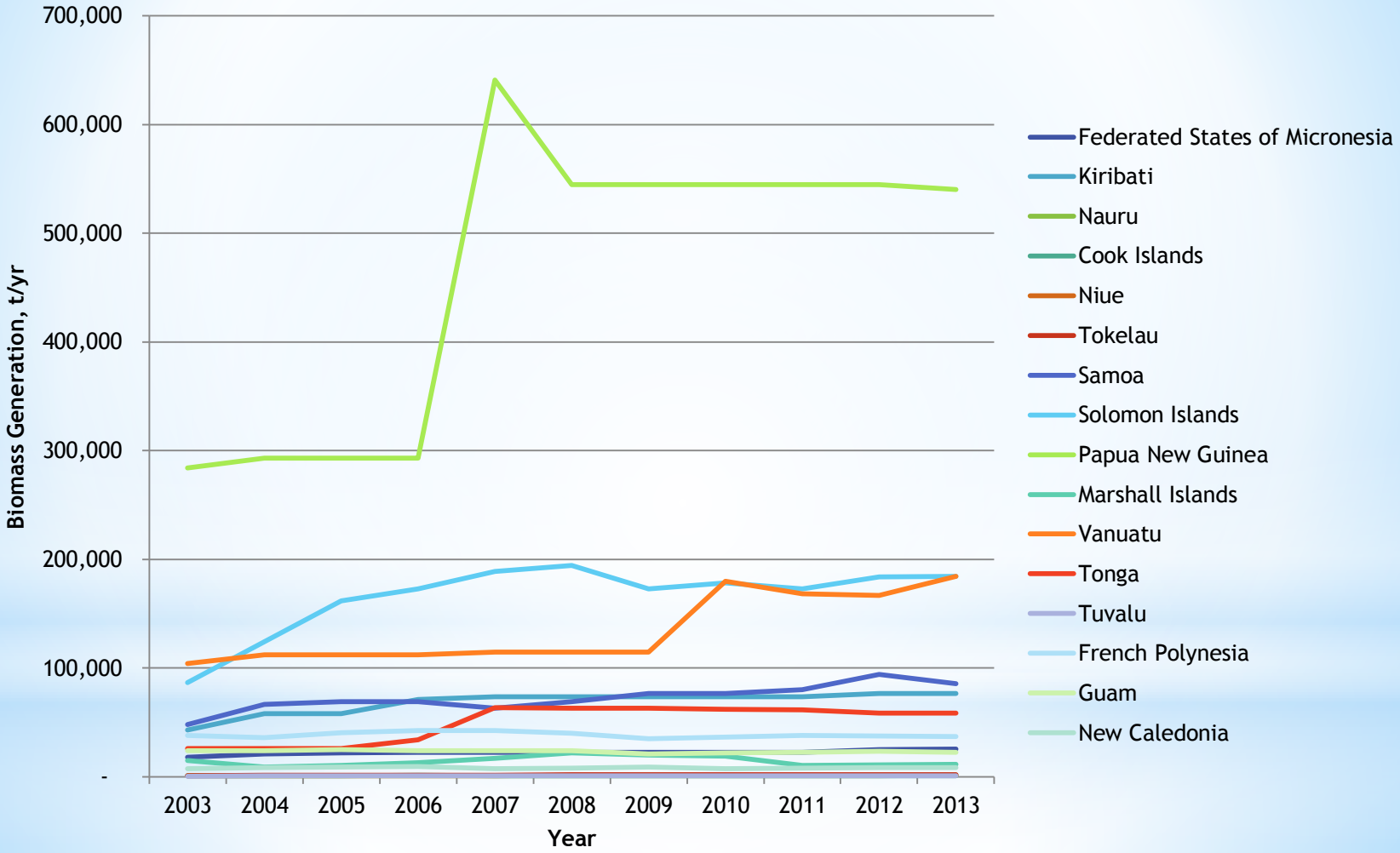


Figure 2: Coconut Biomass Generation in Federated States of Federated States of Micronesia, Kiribati, Nauru, Cook Islands, Niue, Tokelau, Samoa, Solomon Islands, Papua New Guinea, Marshall Islands, Vanuatu, Tonga, Tuvalu, French Polynesia, Guam, and New Caledonia

# * Asia and Pacific country's agriculture and biomass waste generation (5)

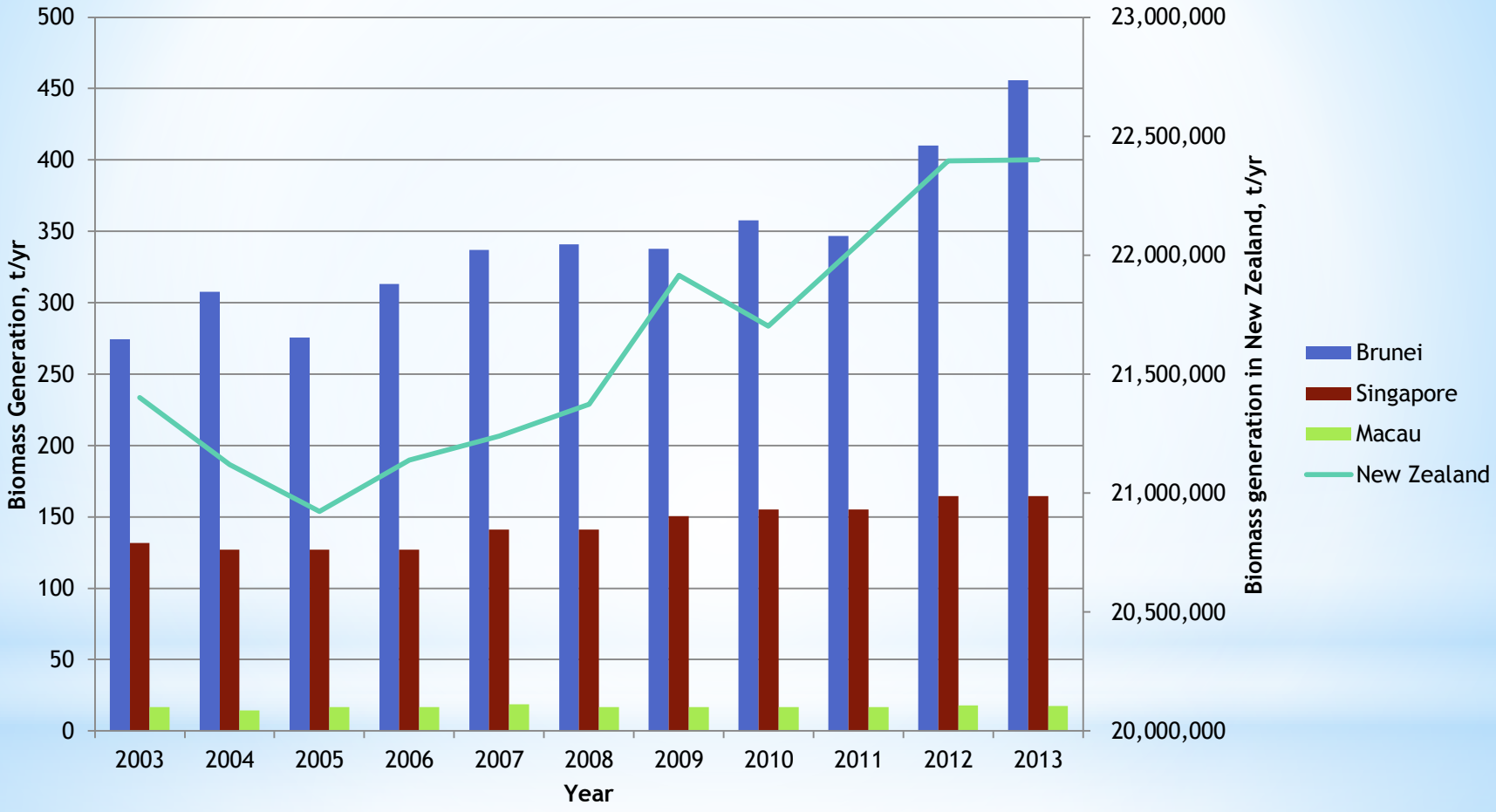


Figure 3: Livestock Biomass Generation in Brunei (Broiler Chicken), Singapore (Layer Chicken), Macau (Broiler Chicken), and New Zealand (Cattle)

# * Asia and Pacific country's agriculture and biomass waste generation (6)

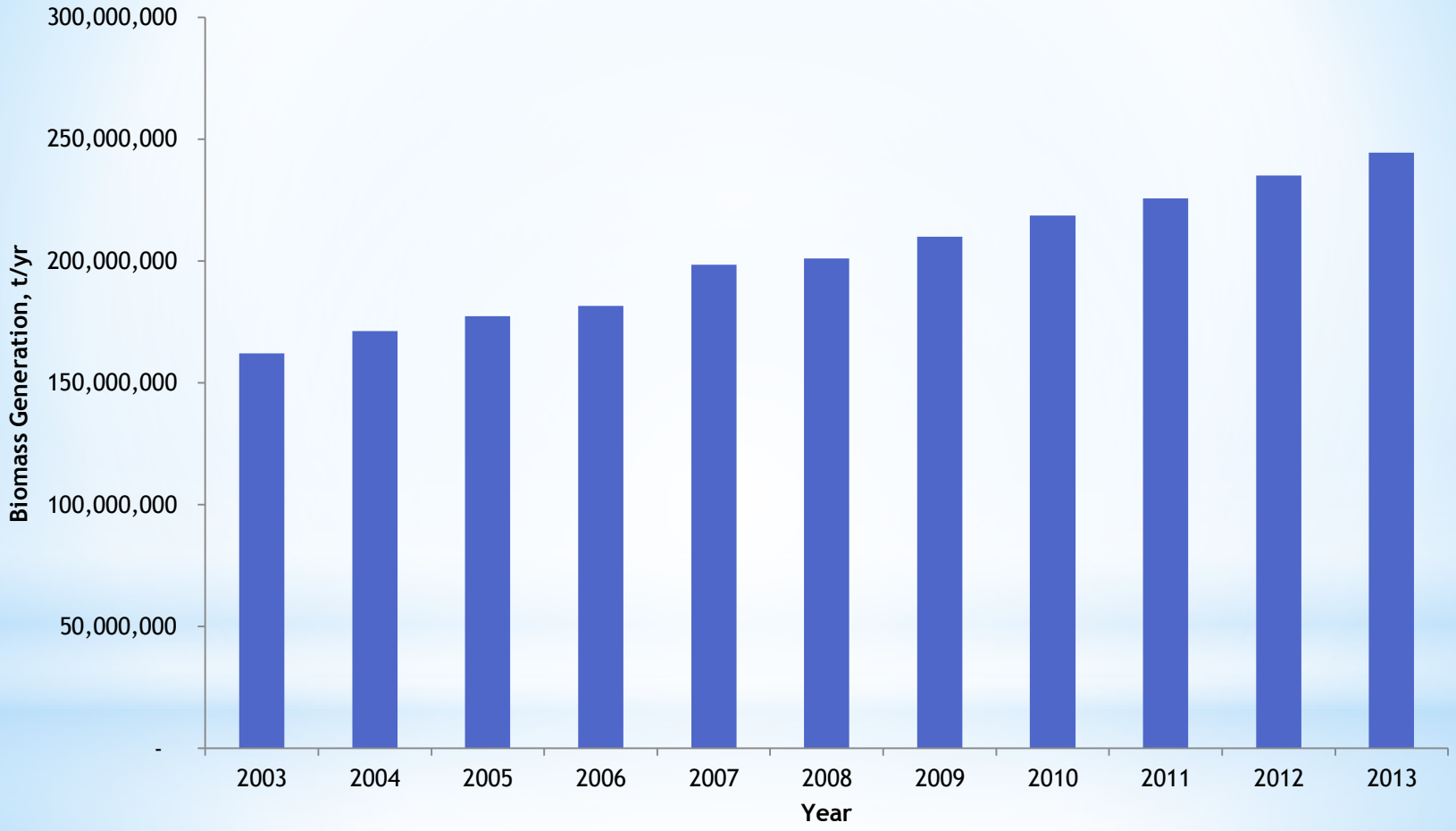


Figure 4: Maize Biomass Generation in PR China

# * Asia and Pacific country's agriculture and biomass waste generation (7)

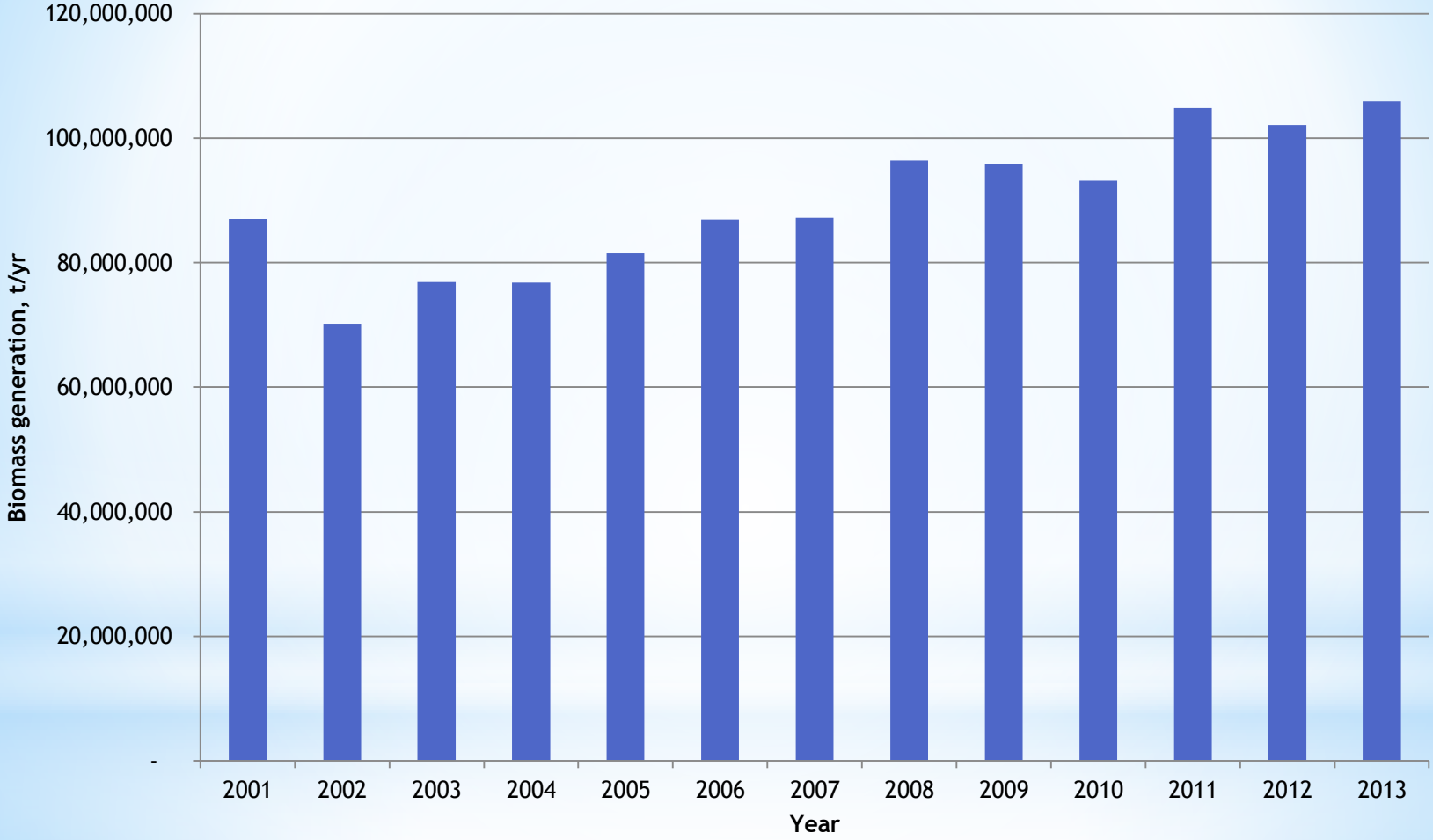


Figure 5: Oil Palm Biomass Generation in Malaysia

# * Asia and Pacific country's agriculture and biomass waste generation (8)

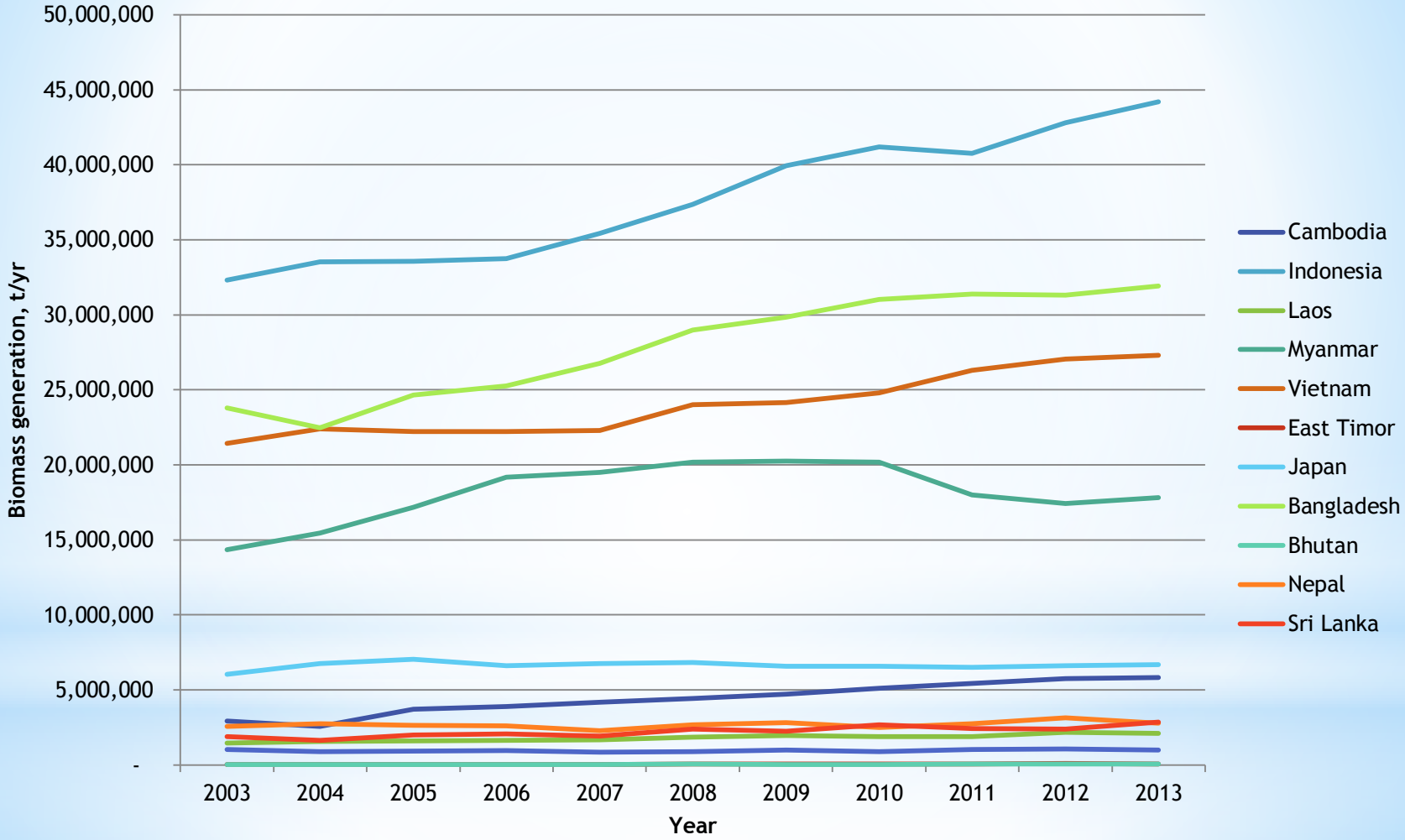


Figure 6: Paddy Rice Biomass Generation in Cambodia, Indonesia, Laos, Myanmar, Vietnam, East Timor, Japan, Bangladesh, Bhutan, Nepal and Sri Lanka

# * Asia and Pacific country's agriculture and biomass waste generation (9)

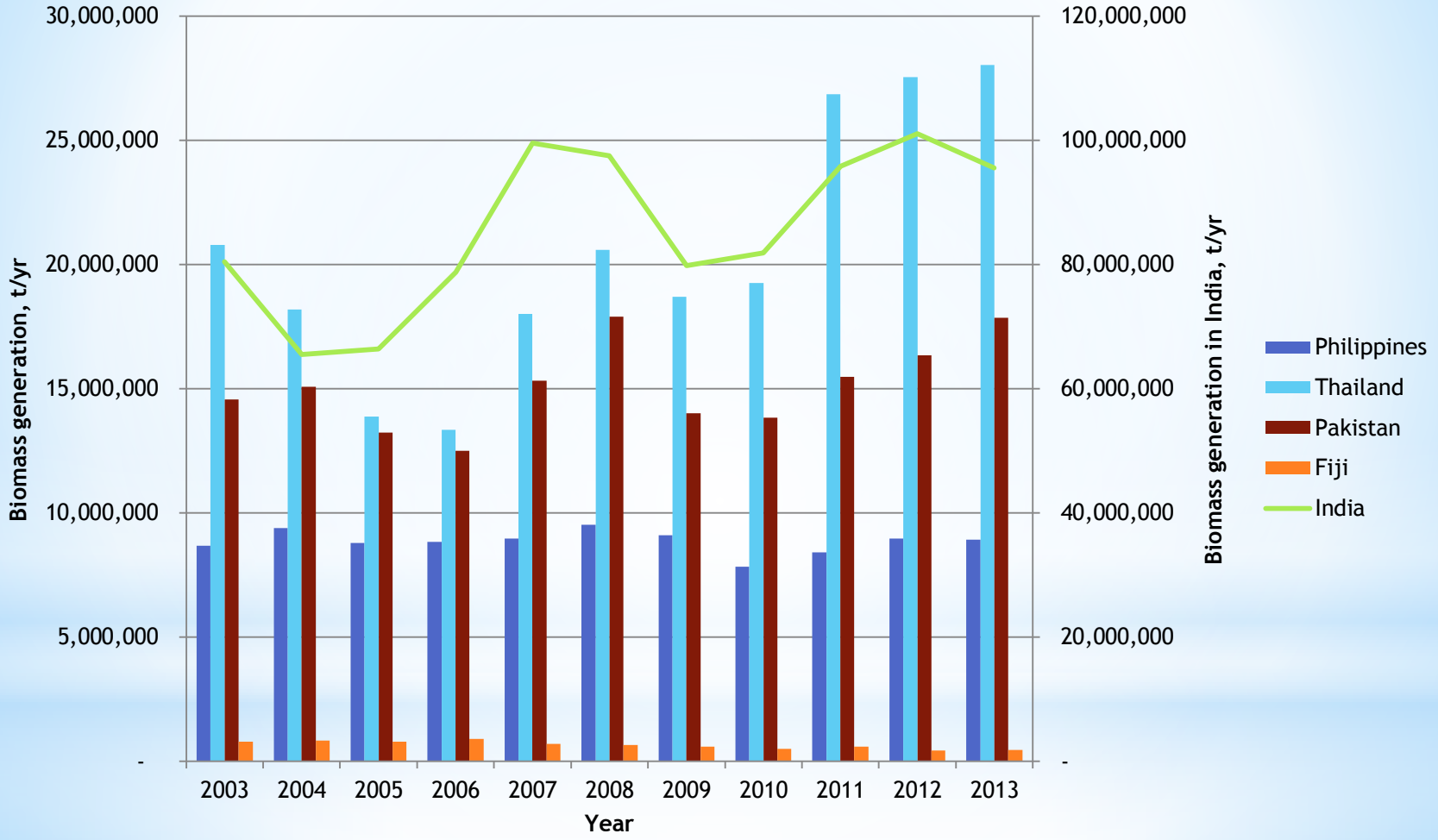


Figure 7: Sugarcane Biomass Generation in The Philippines, Thailand, India, Pakistan and Fiji

# * Asia and Pacific country's agriculture and biomass waste generation (10)

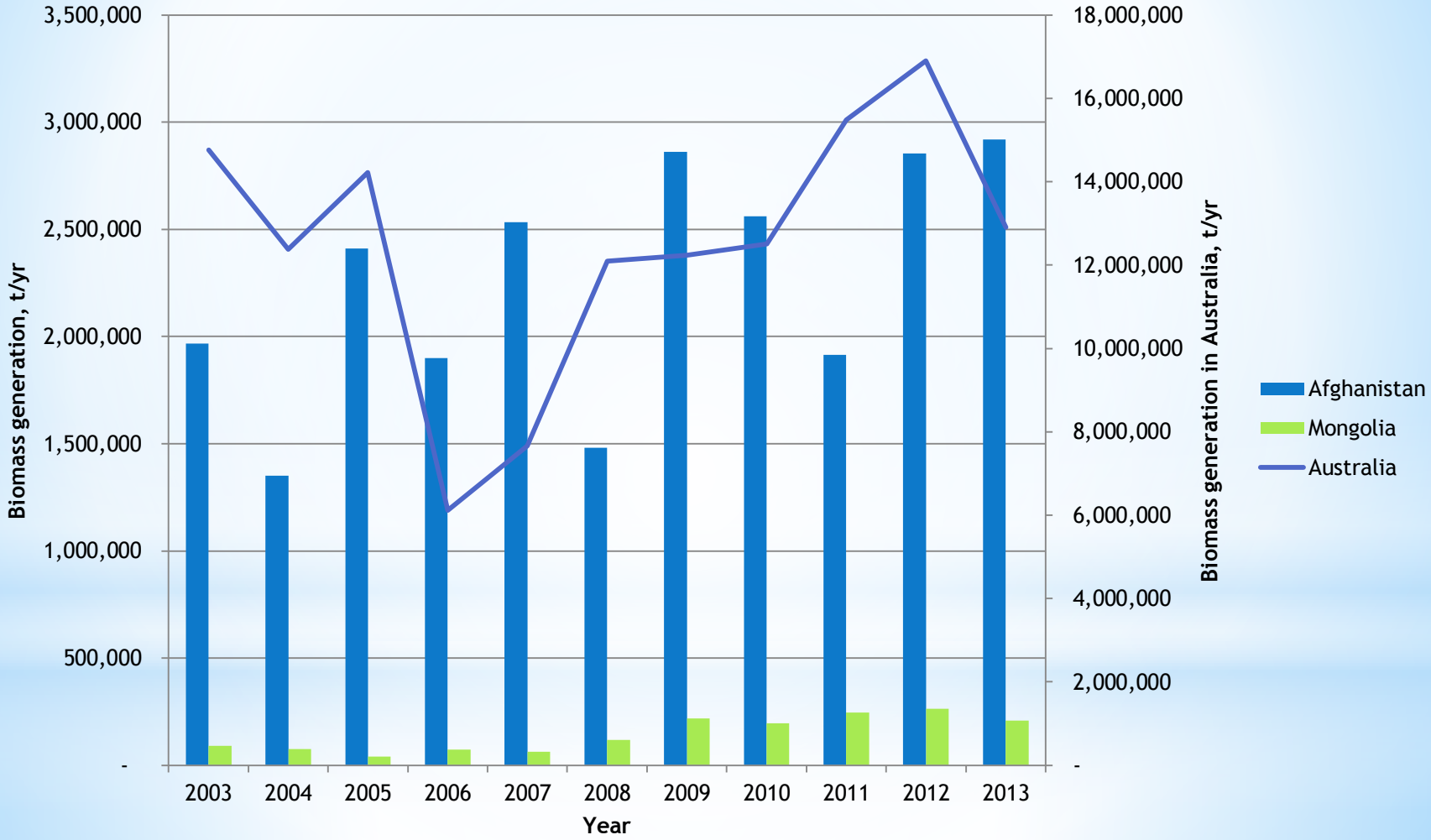


Figure 8: Wheat Biomass Generation in Australia, Afghanistan, and Mongolia

# * Monetary value generated from biomass utilization

* Briquette market is used as a benchmark:
  (1) Universally accepted
  (2) A number of export-oriented producers and buyers available
  (3)Appropriate technology for indigenous production and rural areas of developing countries

* It is estimated, potential generation of 153 million tonnes of briquette (valued at USD 23 billion) in 2013.

* Estimation based on one type of major agri-produce

* The briquette market has low financial return among the biomass product; therefore, the economic value of biomass will increase for ethanol, compost, pellets and fibers.

**Table 2:** Estimated monetary value generated from biomass briquette production

| | Biomass Source | Biomass Generation 2013, tonnes [a] | Briquette Production 2013, tonnes [b] | Monetary value of biomass generated, USD [c] |
|---|---|---|---|---|
| Maldives | Banana waste | 46 | 11 | 1,575 |
| Wallis and Futuna | Banana waste | 2,086 | 474 | 71,100 |
| PR China | Maize waste | 244,386,028 | 55,542,279 | 8,331,341,863 |
| Federated States of Micronesia | Coconut waste | 25,650 | 5,830 | 874,432 |
| Kiribati | Coconut waste | 76,500 | 17,386 | 2,607,955 |
| Nauru | Coconut waste | 1,215 | 276 | 41,420 |
| Cook Islands | Coconut waste | 833 | 189 | 28,381 |
| Niue | Coconut waste | 1,440 | 327 | 49,091 |
| Tokelau | Coconut waste | 1,935 | 440 | 65,966 |
| Samoa | Coconut waste | 85,500 | 19,432 | 2,914,773 |
| Solomon Islands | Coconut waste | 184,500 | 41,932 | 6,289,773 |
| Papua New Guinea | Coconut waste | 540,000 | 122,727 | 18,409,091 |
| Marshall Islands | Coconut waste | 11,250 | 2,557 | 383,523 |
| Vanuatu | Coconut waste | 184,500 | 41,932 | 6,289,773 |
| Tonga | Coconut waste | 58,500 | 13,295 | 1,994,318 |
| Tuvalu | Coconut waste | 990 | 225 | 33,750 |
| French Polynesia | Coconut waste | 36,900 | 8,386 | 1,257,955 |
| Guam | Coconut waste | 22,500 | 5,114 | 767,045 |
| New Caledonia | Coconut waste | 8,550 | 1,943 | 291,477 |
| Brunei | Livestock waste | 456 | 104 | 15,545 |
| Singapore | Livestock waste | 165 | 37 | 5,608 |
| Macau | Livestock waste | 18 | 4 | 597 |
| New Zealand | Livestock waste | 22,400,668 | 5,091,061 | 763,659,150 |
| Malaysia | Oil palm waste | 96,215,331 | 21,867,121 | 3,280,068,102 |
| Cambodia | Paddy rice | 5,821,800 | 1,323,136 | 198,470,455 |
| Indonesia | Paddy rice | 44,193,420 | 10,043,959 | 1,506,593,849 |
| Laos | Paddy rice | 2,117,300 | 481,205 | 72,180,682 |
| Myanmar | Paddy rice | 17,835,540 | 4,053,532 | 608,029,773 |
| Vietnam | Paddy rice | 27,304,361 | 6,205,536 | 930,830,474 |
| East Timor | Paddy rice | 53,940 | 12,259 | 1,838,864 |

**Table 2:** Estimated monetary value generated from biomass briquette production (Continued)

| | Biomass Source | Biomass Generation 2013, tonnes [a] | Briquette Production 2013, tonnes [b] | Monetary value of biomass generated, USD [c] |
|---|---|---|---|---|
| Japan | Paddy rice | 6,669,960 | 1,515,900 | 227,385,000 |
| Bangladesh | Paddy rice | 31,930,000 | 7,256,818 | 1,088,522,727 |
| Bhutan | Paddy rice | 48,813 | 11,094 | 1,664,066 |
| Nepal | Paddy rice | 2,792,792 | 634,725 | 95,208,813 |
| Sri Lanka | Paddy rice | 2,864,853 | 651,103 | 97,665,430 |
| The Philippines | Sugar cane | 8,924,720 | 2,028,345 | 304,251,818 |
| Thailand | Sugar cane | 28,026,880 | 6,369,745 | 955,461,818 |
| India | Sugar cane | 95,536,000 | 21,712,727 | 3,256,909,091 |
| Pakistan | Sugar cane | 17,849,972 | 4,056,812 | 608,521,773 |
| Fiji | Sugar cane | 448,000 | 101,818 | 15,272,727 |
| Australia | Wheat | 12,913,400 | 2,934,864 | 440,229,560 |
| Afghanistan | Wheat | 2,920,618 | 663,777 | 99,566,515 |
| Mongolia | Wheat | 208,134 | 47,303 | 7,095,482 |
| Grand Total | | **673,694,540** | **153,112,395** | **22,966,859,307** |

**a: FAOSTAT**

**b: Compaction ratio assumed to be 4.4**

**c: Briquette assumed to sell at USD100**

# * Economics of Biomass Utilization/ Business opportunity (1)

* Increase interest of utilizing of biomass for power generation as an alternative to fossil fuels

* Generally, there are two types of biomass utilization:
  i. energy utilization
  ii. material utilization

* In Asia Pacific region biomass is often used as
  i. Fuel, e.g. firewood, bio-diesel, bio-kerosene, and ethanol
  ii. Raw material , e.g. pulp and paper, lumber, furniture, fodder, fertilizer, fiber, feedstock and construction industries.

# * Economics of Biomass Utilization/ Business opportunity (2)

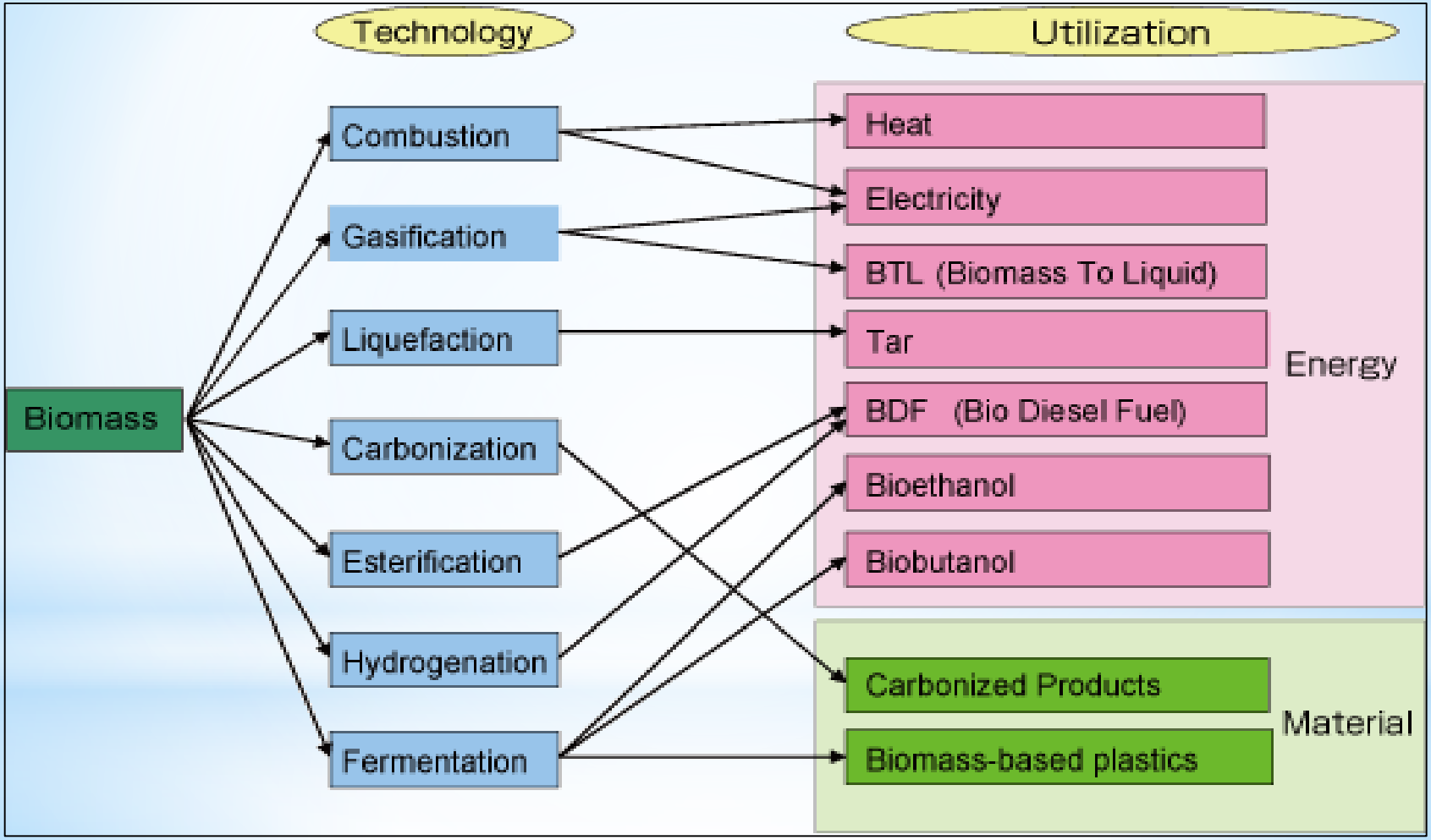


Figure 9: Major biomass utilization

Source: http://www.toyo-eng.com/jp/en/products/environment/baiomass/

# Table 3: Asia Pacific biofuel production from various types of feedstock

| Economy | Feedstock Type | Resource Availability ('000 tonnes) | Ethanol Potential (hm3) | Gasoline Equivalent ('000 tonnes) | Gasoline Consumption ('000 tonnes)* | Share of Gasoline Consumption (%) | Crude Oil Import ('000 tonnes)* | Share of Crude Oil Import (%) |
|---|---|---|---|---|---|---|---|---|
| Australia | crop, forest, and primary mill residues; urban wood waste | 36,700 | 11.0 | 5,299 | 14,520 | 36.5 | 20,070 | 26.4 |
| Brunei | | | | | 196 | | | |
| Canada | crop, forest, and primary mill residues; hog fuel piles | 71,000 | 21.3 | 10,261 | 29,751 | 34.5 | 45,336 | 22.6 |
| Chile | primary mill residues | 3,254 | 0.9 | 434 | 2,081 | 20.8 | 10,219 | 4.2 |
| China | crop, forest, and primary mill residues | 788,000 | 236.0 | 113,689 | 46,097 | 246.6 | 126,817 | 89.6 |
| Hong Kong | | | | | 325 | | 352 | |
| Indonesia | crop residues; sugar cane bagasse; oil-palm, rubber, and coconut residues | 74,000 | 22.2 | 10,695 | 12,942 | 82.6 | 20,829 | 51.3 |
| Japan | crop and forest residues; urban wood waste | 15,000 | 4.5 | 2,168 | 44,391 | 4.9 | 207,266 | 1.0 |
| Korea | crop and forest residues | 13,100 | 3.9 | 1,879 | 6,969 | 27.0 | 113,234 | 1.7 |
| Malaysia | crop residues; sugar cane bagasse; oil-palm and wood-processing residues | 32,392 | 9.7 | 4,673 | 7,756 | 60.2 | 7,885 | 59.3 |
| Mexico | crop, logging, and primary mill residues | 74,500 | 22.4 | 10,767 | 27,704 | 38.9 | | |
| New Zealand | crop, logging, and primary mill residues; horticultural and urban wood waste | 5,500 | 1.7 | 795 | 2,325 | 34.2 | 4,488 | 17.7 |
| PNG | logging, oil-palm, and coconut residues; sugar cane bagasse | N/A | N/A | N/A | N/A | N/A | 435 | N/A |
| Peru | crop, logging, and oil-palm residues; sugar cane bagasse | N/A | N/A | N/A | 771 | N/A | 4,809 | N/A |
| The Philippines | crop, logging, and coconut residues; sugar cane bagasse | 18,000 | 5.4 | 2,601 | 4,111 | 63.3 | 10,681 | 24.4 |
| Russia | crop and forest residues | 100,000 | 30.0 | 14,452 | 26,260 | 55.0 | | |
| Singapore | | | | | 727 | | 54,786 | |
| Chinese Taipei | crop residues | 1,900 | 0.6 | 275 | 7,845 | 3.5 | 54,035 | 0.5 |
| Thailand | crop residues; sugar cane bagasse; oil-palm and coconut residues | 47,800 | 14.3 | 6,889 | 5,280 | 130.5 | 39,815 | 17.3 |
| United States | crop, forest, primary mill, and secondary mill residues; urban wood waste | 324,448 | 97.3 | 46,873 | 373,930 | 12.5 | 538,651 | 8.7 |
| Viet Nam | crop, wood-processing, and coconut residues; sugar cane bagasse | 93,000 | 27.9 | 13,440 | 2,546 | 527.9 | | |
| **APEC Total** | | **1,698,594** | **509.0** | **245,189** | **616,527** | **39.8** | **1,259,708** | **19.5** |

Note: Possible additional resources from dedicated energy crops are not included.

Source: http://www.nrel.gov/docs/fy09osti/43710.pdf

# * Table 4: Asia Pacific Energy Demand

| Regions | Energy Demand (Quadrillion BTUs unless otherwise indicated) 1990 | 2000 | 2010 | 2025 | 2040 | Average Annual Change 2010-2025 | 2025-2040 | 2010-2040 | % Change 2010-2025 | 2025-2040 | 2010-2040 | Share of Total 2010 | 2025 | 2040 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASIA PACIFIC** | | | | | | | | | | | | | | |
| Primary | 90 | 125 | 201 | 289 | 316 | 2.5% | 0.6% | 1.5% | 44% | 10% | 58% | 100% | 100% | 100% |
| Oil | 28 | 43 | 56 | 77 | 88 | 2.2% | 0.9% | 1.5% | 39% | 14% | 58% | 28% | 27% | 28% |
| Gas | 6 | 12 | 22 | 42 | 57 | 4.5% | 2.1% | 3.3% | 94% | 36% | 164% | 11% | 14% | 18% |
| Coal | 32 | 42 | 89 | 118 | 102 | 1.9% | -0.9% | 0.5% | 33% | -13% | 15% | 44% | 41% | 32% |
| Nuclear | 3 | 5 | 6 | 14 | 27 | 5.9% | 4.3% | 5.1% | 136% | 89% | 345% | 3% | 5% | 9% |
| Biomass/Waste | 19 | 21 | 23 | 25 | 23 | 0.7% | -0.5% | 0.1% | 11% | -7% | 3% | 11% | 9% | 7% |
| Hydro | 1 | 2 | 4 | 6 | 8 | 3.5% | 1.5% | 2.5% | 69% | 25% | 110% | 2% | 2% | 2% |
| Other Renewables | 0 | 1 | 2 | 6 | 11 | 7.2% | 3.8% | 5.5% | 184% | 74% | 394% | 1% | 2% | 3% |
| | | | | | | | | | | | | | | |
| **End-Use Demand (including electricity)** | | | | | | | | | | | | | | |
| Total End-Use | 76 | 98 | 151 | 213 | 228 | 2.3% | 0.5% | 1.4% | 41% | 7% | 52% | 100% | 100% | 100% |
| Residential/Commercial | 29 | 33 | 42 | 54 | 58 | 1.7% | 0.5% | 1.1% | 30% | 7% | 39% | 28% | 26% | 26% |
| Transportation | 11 | 18 | 26 | 42 | 53 | 3.1% | 1.6% | 2.4% | 59% | 27% | 102% | 17% | 20% | 23% |
| Industrial | 36 | 47 | 82 | 117 | 117 | 2.3% | 0.0% | 1.2% | 41% | 0% | 42% | 55% | 55% | 51% |
| Memo: Electricity Demand | 7 | 12 | 24 | 43 | 54 | 3.9% | 1.6% | 2.7% | 77% | 27% | 125% | 16% | 20% | 24% |
| | | | | | | | | | | | | | | |
| **Electricity Generation Fuel** | 23 | 41 | 77 | 122 | 146 | 3.2% | 1.2% | 2.2% | 60% | 19% | 90% | 38% | 42% | 46% |
| | | | | | | | | | | | | | | |
| **$CO_2$ Emissions, Billion Tons** | 5.3 | 7.4 | 13.2 | 18.2 | 18.1 | 2.2% | -0.1% | 1.1% | 38% | -1% | 37% | | | |
| | | | | | | | | | | | | | | |

Source: http://www.exxonmobil.com/Corporate/Files/news_pub_eo2013.pdf

# * Economics of Biomass Utilization/ Business opportunity (3)

* Asia Pacific countries are the key supplier of biomass feedstock to Europe and the United States

* PR China, Japan and The Republic of Korea currently leading the region in biomass projects

* New opportunities and investments in biomass are emerging in Southeast Asia

* It is estimated the Southeast Asian biomass and waste-to-power market produced nearly 230 million tonnes of feedstock annually.

# * Economics of Biomass Utilization/ Business opportunity (4)

*Challenges in agriculture waste utilization

i. Local and domestic biomass use competing for resource
ii. Seasonal production produces large quantities being available directly after the harvest.
iii. The ownership and access, fraction of agriculture wastes which can be recovered economically
iv. Lack of technology development in certain countries
v. Treatment of waste generated by the plant
vi. Limited policy, incentives and financial support
vii. Biomass program were confined to traditional applications
viii. High transportation cost

# * Economics of Biomass Utilization/ Business opportunity (5)

* Thailand
  - Formulated policies to encourage biomass projects
  - Very Small Power Producers (VSPPs) scheme (2001)

* Malaysia
  - Palm oil industry contributed to RM 90 billion GNI
  - 83 million dry tonnes of biomass (2012)

* Singapore
  - Woody biomass and steam cogeneration plant on Jurong Island (60 tonnes of process steam per hour).

The picture shows the PowerSeraya's Combined Cycle Power CoGeneration Plant in Singapore. (Press picture: PowerSeraya)

Biomass power generation facility using rice husks as fuel in Thailand (Source from MEIDENSHA CORPORATION)

Biomass power generation facility using palm fruits bunch as fuel in Thailand (Source from MEIDENSHA CORPORATION)

Palm oil mills in Malaysia use biomass to power itself in the form of combined Heat and Power usage

# * Economics of Biomass Utilization/ Business opportunity (6)

* Thailand
  - Renewable Portfolio Standard(RPS)
  - Energy Conservation (ENCON) Program (1994)
  - Energy Conservation Promotion Act
  - Energy Conservation Fund
* Malaysia
  - National Renewable Energy Policy and Action Plan (NREPAP)
  - Renewable Energy Act 2011
  - Sustainable Energy Development Authority Act 2011
  - National Biomass Strategy (NBS)

* Singapore
  - Singapore Green Plan 2012
  - Clean Energy Programme Office (CEPO)

# *Case study

## * Table 5: Case Study in Cambodia, Malaysia, India and PR China

| | Cambodia | Malaysia | India | PR China |
|---|---|---|---|---|
| Project name | Rice husk biomass energy | Oil Palm Biomass Energy | Household biogas stove | Efficient utilization of Agriculture Wastes |
| Benefit | - Reduced imports of fossil fuels<br>- Create new employment & business opportunities<br>- Improved rural livelihood<br>- Ensure community energy cooperation & country's energy security | - Improvement of biomass waste management in oil palm mill<br>- Allow oil palm mill to be self-sustain<br>- Reduce production cost of oil palm mill<br>- Promote sustainable development of palm oil industry | - Household monetary savings<br>- Forest conservation benefits<br>- Improved indoor air quality<br>- Improved health benefits | - Reductions in traditional rural energy and chemical fertilizer use<br>- Decline in emissions of $CO_2$, $SO_2$, & $NO_2$<br>- Improved of farm soils quality<br>- Improved indoor air quality<br>Decline in poverty |
| Project challenges | - Lack of technology development<br>- Demonstration plants failed to scale up.<br>- Treatment of waste generated by the plant<br>- Lack of availability of technical expertise and training and awareness programs for plant operators | - Limited incentives available<br>- Slow implementation of 5th Fuel Policy<br>- Current technologies are inefficient and polluting<br>- High initial investment with poor financial support<br>- No record on biomass industry<br>- Limited coordination among the local agencies | - Biomass supply chain/biomass availability<br>- Biomass price increase after commissioning of power project<br>- Lack of mechanization in agriculture sector<br>- Defragmented land holdings<br>- Most farmers are small or marginal<br>- Lack of investment in bio-power sector in states<br>- Transportation cost | - Shortage of credit facilities<br>- Weak institutional and technical expertise<br>- Inadequate service infrastructure<br>- Lack of environmental awareness<br>- Very few incentives |

# * Table 5: Case Study in Cambodia, Malaysia, India and China (Continued)

| | Cambodia | Malaysia | India | PR China |
|---|---|---|---|---|
| Policies | - Renewable Electricity Action Plan (REAP) (2002-2012)<br>- Rural Electrification Strategy (RES)<br>- Wood and Biomass Energy strategy (2012) | - Five-Fuel Policy (2001)<br>- National Renewable Energy Policy<br>- Renewable Energy Act (2011)<br>- Sustainable Energy Development Authority Act (2011)<br>- National Biomass Strategy (NBS) (2011) | -National Biogas and Manure Management Programme (NBMMP)<br>-The National Biomass Policy (1970s)<br>-The Fuel Policy Committee (FPC) (1974)<br>-Working Group on Energy Policy (WGEP) (1979)<br>- The National Programme on Bagasse based Co-generation (1994),<br>-Biomass Policies under the Ninth Plan (1997 to 2002) | - Circular Economy Promotion Law<br>- Cleaner Production Promotion Law<br>- Prevention and Control of Environmental Pollution Caused by Solid Waste (1995)<br>- Waste Electrical and Electronic Equipment (WEEE) Regulation (2011)<br>- The renewable Energy Law (2005) |
| Challenges in the implement ation of policy | - Low awareness of RE<br>- Lack of an integrated approach in energy planning and development<br>- No specialized training program or training facility<br>- Lack of commercial RE related equipment<br>- Low market demand and purchasing power<br>- Weak financial status of government<br>- High tariff of 35% on import of RE equipment | - Policies are not centralized under the energy ministry<br>- Different juridical power between the federal and state government.<br>- Bureaucratic procedures of environmental impact assessments (EIA)<br>- RE stakeholders are less organized | - The policy perspective was too narrow and supply dominated<br>- Biomass program were confined to traditional applications<br>- Market was given little role in energy supply as well as conversion | - Insufficiency specific policy guidance at micro level<br>- Lack of specific operational approach for the single policy<br>- Lack of sustainability in the formulation and implementation of policy<br>- Lack of effective management rules<br>- Insufficiency of execution mechanism |


Cambodia rice husk power generator


The electricity generated from oil palm waste is able to sustain a palm oil mill


10 MW Biomass Power Project, Gadchiroli Distt. (Maharashtra State)


Biomass Gasification Power Plant System in Chongqing, PR China

# * Agriculture and biomass waste utilization and climate change

* Rapid increase in volume and types of waste agricultural biomass
  - intensive agriculture, population growth and improved living standards.

* Improper management of causes environment problems such as
  - rotten waste emits methane and leachate
  - open burning generate $CO_2$ and pollutants
  - water and soil contamination
  - contribute to climate change,

* Effective utilization of agriculture and biomass waste → global mitigation potential of 5,500-6,000 megatons $CO_2e$/yr by 2030

* Agriculture waste is of high value with respect to material and energy recovery

# * The Way Forward (1)

## How circular economic utilization of agriculture and biomass waste can make significant contribution in post-2015 development context

* Concerns on sustainability of biomass production and use

* Crop land expansion of 48 and 80 million ha

* FAO estimates 1.3 billion tonnes of food are wasted yearly

* The utilization of food and biomass waste are able to reduce the global rate of food loss and waste by 50 per cent.

* Barrier to the implementation of 3R in agriculture biomass
  - Lack of biomass specific policy
  - Lack of communicate uncertainty (duration and level of financial support)

# * The Way Forward (2)

## How circular economic utilization of agriculture and biomass waste can make significant contribution in post-2015 development context

* Paradigm shift to green economy and sustainable economy
* Alternative biomass source of energy crop to avoid competition of land and resources with food crop
* Expansion to biomass market trading region.
* Millions of dollars business opportunities
* Government policy intervention is one of the key to successful implementation of 3R agriculture biomass.
* Define paths towards sustainable development based on national circumstances and priorities.

# * The Way Forward (3)

## How circular economic utilization of agriculture and biomass waste can make significant contribution in post-2015 development context

* Will the global shift from current economic patterns to green economy affects the livelihood?

* Is the current national policy frameworks and trade policy strategies ready for green economy?

* What types of policy framework are needed to be developed to take advantage of the rise of new trading opportunities from green economy?

# *Thank you !