Future of Agriculture and Food Security in Sri Lanka

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Policy Change and Climate Change

- Both are unpredictable
- Both are human-induced
- Both have had and will have detrimental impacts on agriculture
Food Security – The Equation

• World population
  9.5 billion (2050)
  8.5 billion (2030)
  7.4 billion (2016)

• About 90% of the population growth will be observed in developing countries

• 50% increase in food production by 2030
• 80-100% increase in food production by 2050
Food Security – The Equation

• But only about additional 10% of current arable, non-protected land will be available (445 Mha) (Lambin, 2011)
• The competition will be stiff
• Water availability and access are key constraints to poverty reduction and food security

Increasing Demand for Food with Limited Land and Water Reserves
• 17 Sustainable Development Goals (SDGs) be integrated to the follow-up of MDGs (after 2015 deadline).

• The SDG Goal 2:

End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Global temperature has increased by 0.85 °C (range 0.65 to 1.06 °C)
• The SDG 13:

Take urgent action to combat climate change and its impacts
Two Goals of Our Time – to achieve sustainable development

- Achieving Food Security
- Avoiding Dangerous Climate Change
Sri Lanka: Granary of the East

Rice Imports 1837-1900 (t/year)

Source: Director General/Agriculture
Population vs Rice Production

• **2015**
  - Population: 20.7 million people
  - Excess rice production
  - Use of high yielding varieties
  - Use of new technologies
  - Use of agrochemicals
  - Life Expectancy: 76 years

• **1940s**
  - Population: 6 million people
  - 60% of rice requirement imported
  - Use of traditional varieties
  - No agrochemicals used
  - Use of traditional technology
  - Life expectancy: 46 years

Contributory Factors

- Improved research & extension services
- Improved health services
- Improved education services
- Improved food & nutrition status
- Increased adoption of modern technology

Source: Central Bank Annual Reports
Department of Agriculture
Percentage Distribution of Rice Varieties from 1950

- **Traditional Varieties**
- **Old Improved Varieties**
- **New Improved Varieties**

YEAR: 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30
Rice cultivated extent & production

![Graph showing cultivated extent and production over years]
Evolution of Rice Varieties

- New Improved Varieties
- 20% extent (Bg 300)
- Popular Samba variety - Bg 360 Keeri Samba
- 2nd highest popular Samba - Bg 358
- Resistance to Pests (Bg 357)
Rice Imports

Source: Director General of Agriculture
Sri Lanka is ranked 65th from among 113 countries.

- India – 75
- Pakistan – 78
- Nepal – 82
- Bangladesh – 95
Climate Change - Global Warming

- Overall, the global annual temperature has increased

  since 1880: at an average rate of 0.07 °C per decade
  since 1970: at an average rate of 0.17 °C per decade
A Glacier in Alaska 1917 - 2005
Hottest years in modern record

16 of the top 17 have occurred since 2000
Land & Ocean Temperature Percentiles Jan–Dec 2016
NOAA’s National Centers for Environmental Information
Data Source: GHCN–M version 3.3.0 & ERSST version 4.0.0
Climate change in Sri Lanka

- Slow & continuous rise of ambient temperature (0.01 – 0.03 °C per year)
- Frequent occurrence of extreme weather events
  - Droughts & floods: increased
  - High intensity rains – Land slides: increased
  - Tornado type winds: increased
  - Intense lightning strikes: increased
  - Total number of dry days: increased
  - Warm days: increased
  - Number of cold nights/comfort nights: decreased

Impacts of Climate Change on Agriculture

- Climate of the country has undergone a drastic change
  - No rains when it is needed (drought)
  - More rains when it is not needed (floods)
- Increasing temperature – direct and indirect impacts
Predicted Temperature change over Sri Lanka by PRECIS RCM in combination with ECHAM4 GCM for B2 Scenario

Predicted Annual average Temperature change in 2020's
Annual Average Temperature Change (°C)

- 0.7-0.8
- 0.8-0.9
- 0.9-1.0
- 1.0-1.2
- 1.2-1.3

Predicted Annual average Temperature change in 2050's
Annual Average Temperature Change (°C)

- 1.4-1.6
- 1.6-1.8
- 1.8-2.0
- 2.0-2.2
- 2.2-2.3

Predicted Annual average Temperature change in 2080's
Annual Average Temperature Change (°C)

- 2.2-2.3
- 2.3-2.5
- 2.5-2.75
- 2.75-2.9
- 2.96-3.10

Projected Precipitation Changes over Sri Lanka by PRECIS RCM in combination with ECHAM4 GCM for B2 Scenario

Annual Average precipitation change in 2020’s
Annual Rainfall Change (%)
- 1-12
- 12-26
- 26-40
- 40-54
- 54-68

Annual Average Precipitation change in 2050’s
Annual Rainfall Change (%)
- -10.5-1.0
- 1.0-7.6
- 7.6-16.5
- 16.5-25.7
- 25.7-34.8

Annual Average Precipitation Change in 2080’s
Annual Rainfall Change (%)
- -28 -- -10.5
- -10.5-2.8
- 2.8-16.2
- 16.2-29
- 29-42

• Wetter rainy seasons and drier dry seasons

• Serious implications for food production
  (reduce agriculture productivity by 10-50% in next three decades)

(APAARI, 2012)
2016 – Worst drought in 40 years

- First inter-monsoon (March-April) – failed
- South-west monsoon (May-September) – failed
- Second Inter-monsoon (October-November) – failed
- North-east Monsoon (December-February) – delayed (failed?)

- Worst drought in the dry zone since 1973/1974
Sri Lanka Floods, May 2016 (>300 mm in 3 days)  
(96 dead; damage worth USD 570 million)
2016 – Worst drought in 40 years

- Approx. 32% of paddy extent cultivated *Maha* 2016/2017
- <30% capacity of reservoirs filled (until recently)
- 23 districts are affected (>1 million people)
- Price of rice – *on the rise*
- Rice import requirement for 2017 – *would increase*
Hambantota – Ridiyagama wewa in early January 2017
(Source: Sunday Times)

Anuradhapura – Vegetable cultivation in early January 2017
(Source: Sunday Times)
Heavy rains – late January 2017
Vegetable cultivation affected in central
Rainfall in late January 2017

- Ampara district – rice crop saved
- Maize and soybean in the dry zone – mostly saved
- Seed paddy for the next cultivating season? Short age varieties (2.5-3 months old)
- Crop diversification
By 2020 we need 18% more rice

We need an additional quantity of 0.76 million tons of rice in 2020
Adaptation strategies
Crop Production – No regret options

• Aerobic rice – *Kekulam system, SRI*
• Flood tolerant rice – *Maha Maa Wee, Bg455*
• Short duration rice – *Bg250, Bg251 (drought tolerant)*
• Salt tolerant rice – *Pokkali, Bg 310, 269, Bw400*
• Drought/Heat tolerant highland crops
• Timely cultivation – with onset of rains
• Use of residual moisture: *third season crop*
• Seasonal Climate Forecasting
• Effective dissemination of weather information
Adaptation strategies
Crop Production – No regret options

• Crop Diversification with proper land selection based on agro-ecology
• Shared cultivation in minor irrigation schemes – Bethma
• Incorporation of livestock to farming systems
• Micro-irrigation techniques
• Rainwater harvesting
• Improved management practices - Shade trees in Tea, Organic matter integration
• Crop insurance schemes
Cost of Climate Change and Cost of Adaptation in South Asia (ADB, 2014)
Adapting to climate change

- National Climate Change Policy of 2012
- National Adaptation Plan (NAPs) for Climate Change Impacts of Sri Lanka – launched on 18th October 2016
Policy Change - Fertilizer subsidy in Sri Lanka

• National Fertilizer subsidy scheme (N, P, K) – since 1962
• Revised by many governments
• Previous scheme (material)
  adopted during 2005 – Feb 2016 (*Kethata aruna*)
  Urea, TSP, MoP: Rs 350 per 50 kg

• Current scheme – cash
  implemented since 1\textsuperscript{st} March 2016
  Maximum prices set for Urea, TSP and MoP
  (Rs. 2,500 per 50 kg)

• Movement to replace “synthetic fertilizer” with “organic fertilizer”
• Problem: misuse of fertilizer
Policy change – use of Pesticides

• Ban imposed on several pesticides, including all total killer herbicides (suspected as a causative agent of CKDu)

• A “cry” for cost-effective, alternative methods for weed control

• **Problem**: misuse of pesticides (e.g. over-use, poor application technologies)
Fertilizer Consumption in the region
(kg/ha of arable land)

- Bangladesh
- India
- Maldives
- Nepal
- Pakistan
- Sri Lanka
- Vietnam
- Thailand
- Indonesia

Year:
- 2010
- 2011
- 2012
- 2013
Use of Glyphosate for Crops in Sri Lanka (2013/2104)

Crop

- Tea
- Maize+OFC
- Paddy (Wet Zone)
- Paddy (Dry Zone)

Use (Litres)

Source: CropLife, Sri Lanka
Other Fertilizers

• Organic farming – cultivated extent of rice
  2014/2015 and 2015/2016 *Maha*: 0.8%
  2015 *Yala*: 0.1%

Use Traditional varieties (paddy) ?

• Traditional varieties : 1.5 t/ha
• New High Yielding varieties: 4.5 t/ha
Innovations in Agriculture

• Increasing rate of technological change - emergence of platform technologies (ICT, biotechnology and nanotechnology)

• Need to tackle problems that have plagued the Food & Agric. sector
  High cost of production and low profitability
  Lack of value addition
  Weak mechanisms to support commercialization of R&D
  Poor intra- and inter-institutional coordination
  Weak national quality infrastructure
  Rapid changes in national policies (mostly *ad hoc*)
PART I : SECTION (I) — GENERAL

Government Notifications

IMPORT AND EXPORT (CONTROL) ACT, No. 01 OF 1969

REGULATIONS made by the Minister under Section 20 read with Sub- section (3) of Section 4 and Section 14 of the Imports and Export (Control) Act, No. 01 of 1969, as amended by Act, No. 1983 and No. 28 of 1987.

Ravi Karunanayake,
Minister of Finance.

Ministry of Finance,
Colombo 01,
10th June, 2015.

Special Import Regulations published in the *Gazette Extraordinary* No. 1813/14 dated 05.06.2013 are hereby further amended as follows.

The following items under HS codes 3808.93.90 are included in I, II, III columns of the Schedule IV published in the *Gazette Extraordinary* No. 1813/14 dated 05.06.2013.

Regulations:

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6 - 770
PART I : SECTION (I) — GENERAL

Government Notifications

L. D. B. 5/83

CONTROL OF PESTICIDES ACT, No. 33 OF 1980
Order under Section 11

BY virtue of the powers vested in me by Section 11 of the Control of Pesticides Act, No. 33 of 1980, I, Gamage Anura Wickramasiri Wijesekara, Registrar of Pesticides, do by this Order, in the interest of the public and on the advice of the Pesticides Technical and Advisory Committee, cancel every licence issued in respect of Pesticides containing the active ingredient bearing the Chemical Abstract Service Registry number specified in the Schedule hereto.

Dr. G. A. W. Wijesekara,
Registrar of Pesticides.

Peradeniya,
01st October, 2015.

SCHEDULE

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<td>Glyphosate</td>
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Organic Farming vs Food Security

1 ton of rice per ha

- Nitrogen (N) 21 kg
- Phosphorous (P) 04 kg
- Potassium (K) 24 kg
- Calcium (Ca) 04 kg
- Magnesium (Mg) 04 kg
- Sulfur (S) 01 kg
- Silica (Si) 80 g
- Iron (Fe) 500 g
- Manganese (Mn) 400 g
- Zinc (Zn) 40 g
- Copper (Cu) 12 g
- Boron (B) 16 g
Tea industry is heavily affected due to the absence of an effective total weed killer, drought, high labour wages, sluggish global economy and the absence of a cohesive marketing strategy.
Issues to currently being addressed

• Nutrient use efficiencies (N 30-35%; P 18-20% and K 35-40%)
• Timing of fertilizer depending on the growth stages of the crop – removal of Urea from the basal dressing; addition of a top dressing at the time of panicle initiation
• Nano-fertilizer (slow release of N and P)
• Bio-fertilizer and Bio-pesticides
• Foliar application of N and P
• Precision agriculture – e.g. use of drone technology to detect plants that require fertilizer and spot application of fertilizer, pesticides, etc.
• Climate-resilient varieties (e.g. drought resistant tea - TRI 5000 series)
• Other technologies
Sri Lankan economy - 2016

• First nine months: 4% growth
• Growth of
  Service sector: 5.7%
  Industrial sector: 4.8%
  Agriculture sector: -2.5%
• Expected rice imports in 2017: 250,000 t
• Tea production at -13.4%
  (as of November 2016)
The Future – The Need

- Climate change concerns - in development planning in the agriculture sector (e.g. NAP)
- Climate-resilient varietal development (planting material)
- High quality planting material (e.g. seeds)
- Crop-animal Integrated (climate-resilient) farming systems
- Self-sufficiency in the main staple (traditional + modern technologies), with buffer stocks + planned release
- Cultivating abandoned paddy land – no other land use
- Crop diversification based on agro-ecology
- Further improve land productivity through judicious input use (e.g. organic matter + chemical fertilizer, crop protection)
The Future – The Need

- Prioritize investments on agriculture – local/export markets
- Carefully designed public–private development partnerships (e.g. seeds, improved technology, product traceability)
- Strengthen entrepreneurial capacities (e.g. Young Farmer Forum; Farmer Cooperatives)
- Value added production (e.g. rice varieties for biscuit production - At 306, 308, 309)
- Better coordination in production and market mechanisms (e.g. price control??)
- Increased private and public investments in R&D
- Tap the expert knowledge (science-based) in decision making: NOT non-expert or divine advice (Do not panic)
Thank you
Fertilizer Imports to Sri Lanka – since 2005

• Subsidized fertilizer supplied by two state-owned fertilizer companies (Lak pohora and Colombo Commercial Company Ltd)
  - Paddy – total requirement since 2006
  - Other crops – 10% of the total until 2013
    40% of the total since 2014

• Private sector –
  did not supply subsidized fertilizer to paddy from 2006 to 2016
  supplied fertilizer to the other crops through a quota system imposed by the government
  At present (2016) – provides fertilizer at market prices
Policy Change - Fertilizer subsidy in Sri Lanka

• National Fertilizer subsidy scheme (N, P, K) – since 1962
• Revised by many governments
• Previous scheme (material)
  adopted during 2005 – Feb 2016 (*Kethata aruna*)
  Paddy (<5 ac) – since 2005, Other Crops – since 2011
  Urea, TSP, MoP: Rs 350 per 50 kg

• Current scheme – cash
  implemented since 1st March 2016
  Cash payment (Rs 25,000/ha x 2 seasons a year)
  Maximum prices set for Urea, TSP and MoP
  (Rs. 2,500 per 50 kg)
• Movement to replace “chemical fertilizer” with “organic fertilizer”
• Problem: mis-use of fertilizer