
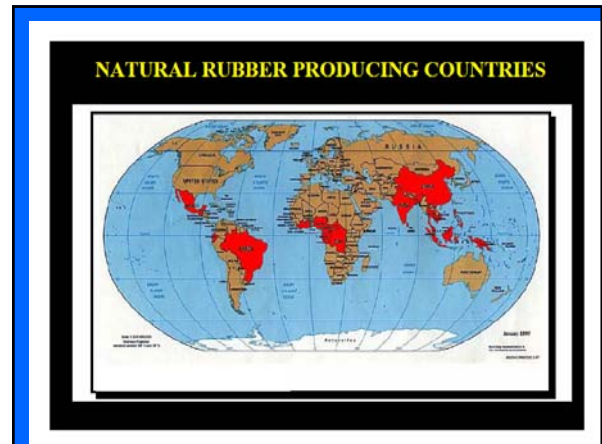


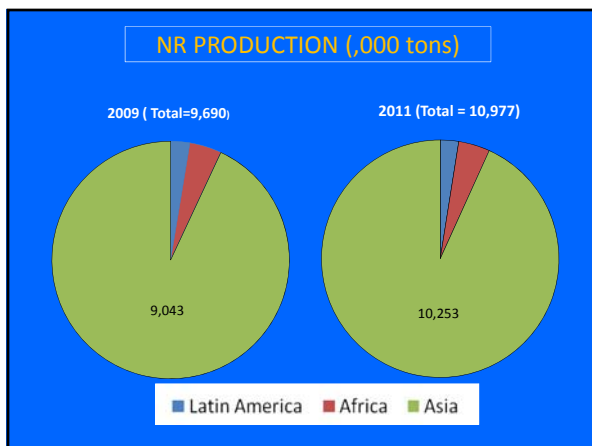
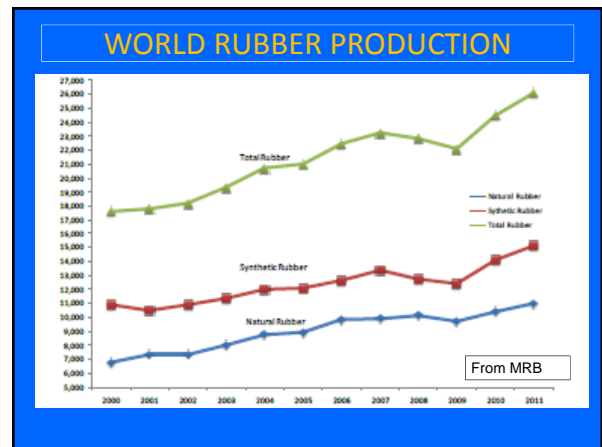
The economic importance of rubber and South American leaf blight (SALB)

The Uses of Rubber Tree



Source: Dr Masahuling



NR PRODUCTION IN ANRPC

COUNTRIES	2009	2010	2011*
Thailand	3,160	3,250	3,350
Indonesia	2,440	2,740	2,950
Malaysia	857	939	975
India	820	851	899
Vietnam	711	755	780
China	643	665	675
Sri Lanka	136	153	159
Philippines	97.7	98.8	107.3
Cambodia	34.5	42.2	63.3
TOTAL	8,900	9,490	9,950

* - estimates: Source - ANRPC

NR CONSUMPTION (,000 tons)

AREA	2009	2011
North America	790	1,165
Latin America	488	585
EU-27	830	1,223
Other Europe	177	250
Africa	094	089
Asia	6,984	7,610
TOTAL	9,330	10,920

Source IRSG

SR PRODUCTION AND CONSUMPTION
(,000 tons)

Year	Production	Consumption
2009	12,385	12,248
2011	15,090	14,961

INCREASING NR CONSUMPTION IN ASIA

REGION	Consumption (%)		COUNTRIES	Consumption (%)	
	1960	2010		1960	2010
North America	25.1	8.8	China	5.3	37.3
Latin America	5.3	5.0	Japan	8.1	7.2
Europe	47.9	10.9	India	2.2	9.9
Asia	18.7	74.1	Malaysia	0.3	4.9
Africa	1.2	1.0	Korea	0.4	3.3
Oceania	-	0.1	Thailand	0.4	4.0
Middle East	-	0.6	Indonesia	0.9	4.3
World	100 (2.080 mil t)	100 (10.195 mil t)	Other Asian	1.5	2.2
			Total	18.7	74.1

Source ANRPC

RUBBER PLANTED AREA (,000 ha)

YEAR	INDONESIA	THAILAND	MALAYSIA	INDIA	VIETNAM
2000	3,372*	1,882	1,431	563	412
2003	3,290	2,019	1,326	576	441
2006	3,346	2,294	1,264	615	522
2009	3,435	2,756	1,237	680	674

Source - MRB

MALYSIAN PLANTED AREA AND
PRODUCTION

PLANTED AREA (,000 ha)				PRODUCTION (,000 tonnes)			
Year	Small-holding	Estate	Total	Year	Small-holding	Estate	Total
2000	1,307	124	1,431	2000	800	128	928
2003	1,247	79	1,326	2003	909	76	986
2006	1,209	54	1,264	2006	1,215	68	1,284
2009	1,174	60	1,237	2009	801	56	857

Source: MRB

MALYSIAN RUBBER DOWNSTREAM INDUSTRY

Rubber Products Manufacturing

Year	Manufacturers (no.)	Employment	Output (RM mil)	Export (RM mil)
2000	319	63,125	7,089	5,512
2003	344	60,975	8,149	6,312
2006	369	60,956	11,368	9,334
2009	348	56,476	11,673	10,588

NR Contribution to National export (RM mil)

Year	NR	Products	Other rubber	Rubber Wood	Total
2000	2.57	5.51	0.09	5.10	13.27
2003	3.58	6.31	0.24	5.37	15.50
2006	8.23	9.33	1.57	7.68	26.81
2009	10.59	10.59	2.84	7.11	25.00

IMPORTANCE OF RUBBER TO SMALLHOLDERS

- Malaysia
 - 264,894 smallholders (2009).
- Indonesia
 - Foreign exchange earned in 2009 was US\$ 3.2 billion;
 - Source of income for 10 million people;
 - Smallholding area is 2.9 million ha out of 3.4 million ha of rubber land.
- Cambodia
 - Rubber area of 181,000 ha and 45% are smallholding.

South American leaf blight (SALB)

- The most serious disease of rubber
- Destructive, spreads rapidly, difficult and expensive to control
- Infects only rubber plants (*H. brasiliensis*, *H. benthamiana*, *H. guianensis*, *H. spruceana*, *H. camporum*).

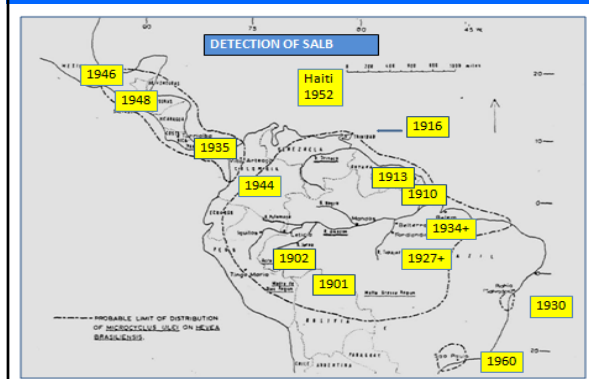
Past Destruction By SALB

SURINAM	1911 - 40,000 Tree Planted 1918 - Plantation Destroyed
PANAMA	1935 - Good year plantation starter 1941 - Plantation destroyed
BRASIL	1927 - 3,200 ha planted at Fordlandia 1993 - Plantation abandoned 1936 - 6,478 ha planted at Belterra 1943 - Plantation abandoned 1967 to 1986 - 150,000 ha planted under (PROBOR) 1986 - PROBOR Terminated, 100,000 ha infected with SALB

COSTA RICA

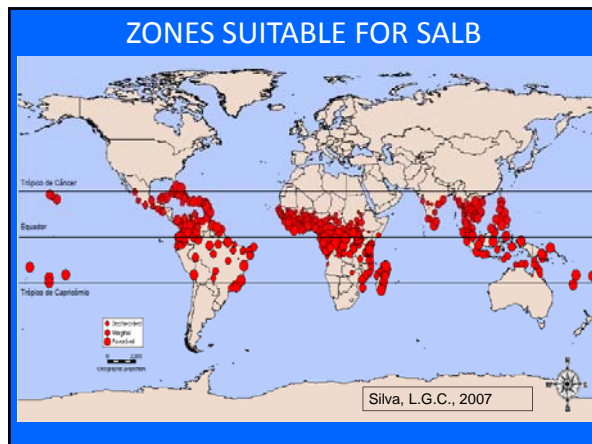
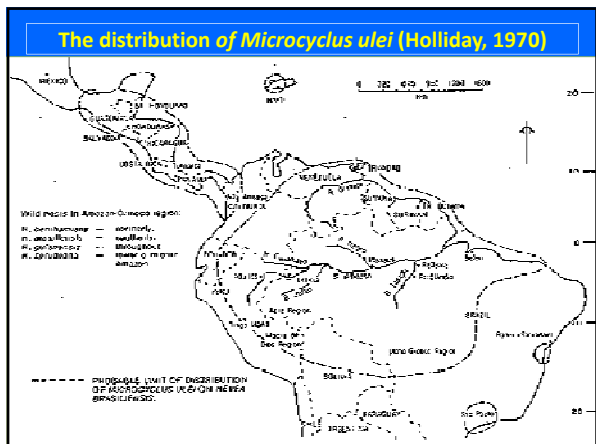
- Goodyear Speedway estate was planted in 1935 and was severely infected by SALB in 1941;
- History indicated that SALB caused a serious problem within 6-7 years of establishment of a plantation

THE SPREAD OF SALB



DISTRIBUTION OF SALB

- Confined to the American tropics and Caribbean islands from Mexico to Brazil
- Present in Brazil, Bolivia, Colombia, Peru, Venezuela, Guyana, Surinam, French Guiana, Trinidad & Tobago, Haiti, Panama, Costa Rica, Nicaragua, Salvador, Honduras, Guatemala, Belize and Mexico
- Asia and Africa are free of SALB



IMPACTS OF SALB ON THE TREE

- Repeated leaf defoliation
- Shoot dieback
- Trees with poor canopy
- Kill the tree

ECONOMIC IMPORTANCE OF SALB

- Reduces tree growth
- Prolongs the immaturity period
- Reduces latex productivity by as much as 70%
 - Productivity of RRIM 600 in Amazon region, Brazil - 11.2 g/t/t and 15.9 g/t/t
 - Productivity of RRIM 600 in Malaysia - more than 60 g/t/t
- Kills the rubber plants and reduce density of stand
- Increases cost of rubber production – extra weeding and disease control

ENVIRONMENTAL EFFECT OF SALB

- Contamination of the environment and farmers by pesticides used for controlling SALB and also the weeds.
- Reduction in carbon sequestration as rubber plants are good in sequestering carbon (72,000 kg/ha at 27 years).

THE THREAT OF SALB TO ASIA AND AFRICA

SALB: HOW SEVERE IT WILL BE IF INTRODUCED INTO SOUTH EAST ASIA

- “It is an open secret in the industry that SALB should it crosses the Pacific could wipe out the supply of natural rubber” – Peter Wade in Fortune.
- “SALB would run through the Asian rubber plantations within five years” - Richard Evan Shultes.
- “It moves like a blow torch through the plantings” - Ernie Emle

SUITABILITY OF SALB IN ASIA

- Suitable climatic conditions
- Abundant susceptible clones
- Contiguous rubber plantings
- Rubber plant is mainly planted in smallholdings

Effect OF Rainfall On Severity On SALB

- High Severity
 - Annual rainfall > 250 cm, well distributed with no long dry season
- Intermediate Severity
 - Annual rainfall > 200- <250 cm, well distributed with no long dry season
- Low Severity
 - Annual rainfall, variable with at least four months dry period with < 7 cm rain per month.

Source: Holliday, 1970

EFFECT OF CLIMATE ON SALB

- Temperature : *Conidia germinate between 8 – 36 °C (maximum 24 °C)*
- Humidity : *Months with 18+ days with RH exceeding 95% for 10 hrs - severe SALB*

SIMILARITY OF CLIMATE IN MALAYSIA WITH CLIMATE IN SALB REGION

Months	Bahia, Brazil	Trinidad	Malaysia (N.S)
January	22	7	14
February	18	12	21
March	22	17	17
April	26	4	23
May	26	3	25
June	27	14	29
July	24	16	30
August	21	21	30
September	18	23	29
October	22	25	30
November	20	25	29
December	20	17	30

Source:K.H. Chee

Wet Conditions (number of nights/month with RH >95% >10 hours/day) at different places

Month	Manaus	Una, Bahia	Ubatuba	Malaysia
January	30	22	21	14
February	28	18	22	21
March	30	22	26	17
April	30	26	26	23
May	31	26	27	25
June	30	27	29	25
July	31	24	28	30
August	29	21	29	30
September	26	18	29	25
October	29	22	19	30
November	30	20	19	29
December	30	20	24	30

POSSIBLE METHODS OF INTRODUCTION OF SALB

- **Infected *Hevea* Plants**
- **Spores Contaminating travelers, their belongings and imported commodities.**

PROBABILITY OF ENTRY THROUGH HOST MATERIALS

Vector	Probability of association	Probability of transit by Sea/Air	Probability of transfer to a suitable host	Conclusion of Probability of Entry
Budded stumps or budwood	High	High	High	High
Foliage (stem and leaf material not for planting)	High	High	Low(< 1cm ²)	Low(< 1cm ²)
Flowers, fruits and seeds	Moderate	Low (sea to Moderate (Air)	Low	Low
Plants in-vitro	Negligible	N/A	N/A	Negligible
Wood	Negligible	Negligible	Negligible	Negligible

PROBABILITY OF INTRODUCTION, SPREAD AND CONSEQUENCES THROUGH HOST MATERIALS

VECTOR	ENTRY	ESTABLISHMENT	SPREAD	IMPACT	RISK
Budded stumps or budwood	High	High	High	High	High
Foliage (leaf and stems not for planting)	Low	High	High	High	Moderate
Flowers, fruits and seeds	Low	High	High	High	Low
Plants in vitro	Negligible	Not applicable	Not applicable	Not applicable	Negligible

The spores of *Microcyclus ulei* remain viable for a reasonably long period

VIABILITY OF SPORES

- **LANGFORD (1945)**
 - High germination of conidia and ascospores kept for 3 days at 80°F and 70% R.H. and some still germinated after 7 days
 - Conidia sprayed onto young leaves, then kept dry for 7 days still infect when re-moist
- **HOLLIDAY (1970)**
Ten percent of conidia kept at room condition for 18 days germinated

VIABILITY OF SPORES OF M. ULEI

SPORES	CONDITIONS	VIABILITY
Conidia (detached)	24 °C, 65-85% RH	3-4 weeks
	24 °C, 85-100% RH	2 weeks
	24 °C, desiccation	16 weeks
Conidia (intact)	24 °C, 85-100% RH	9 days
	31 °C, 0-100% RH	3 days
Ascospores	24 °C, 65% RH	3 weeks
	24 °C, 100% RH	12 days

Source: Chee

**Survival Of Conidia Of *M. ulei* After
7 Days On Different Materials**

Material	Germination (%)
Infected leaves	53.3
Cloth	31.6
Polyethylene	29.3
Leather	26.5
Glass	26.0
Hevea leaves	21.0
Metal	6.3
Paper	5.8
Dry soil	50.0
Moist soil	10.0

Source: Zhang et al

THANK YOU
The author acknowledges
other scientists whose data or
photographs are used in this
presentation