Research on Buffalo Production in Malaysia

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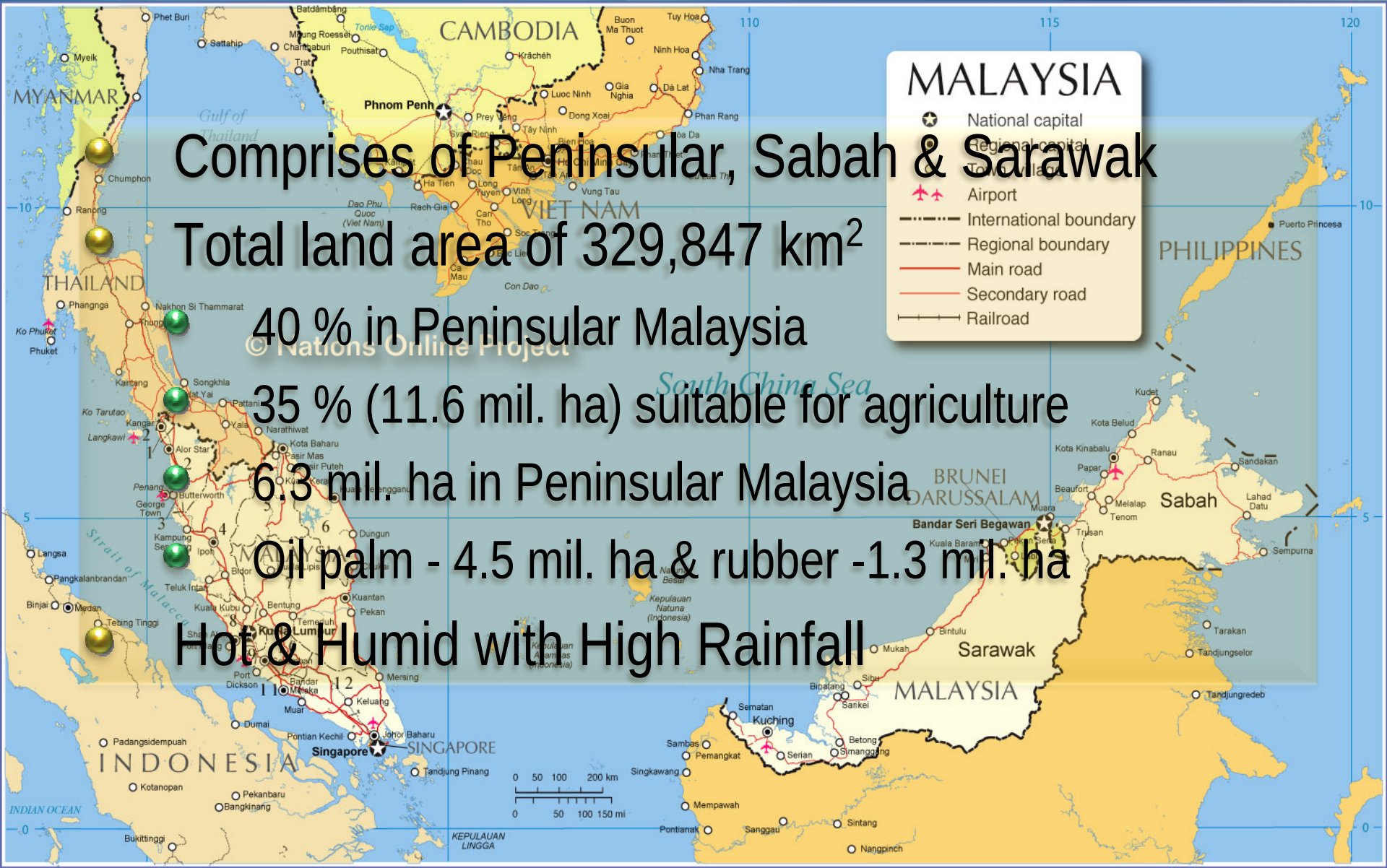
Malaysia



Comprises of Peninsular, Sabah & Sarawak

Total land area of 329,847 km^2

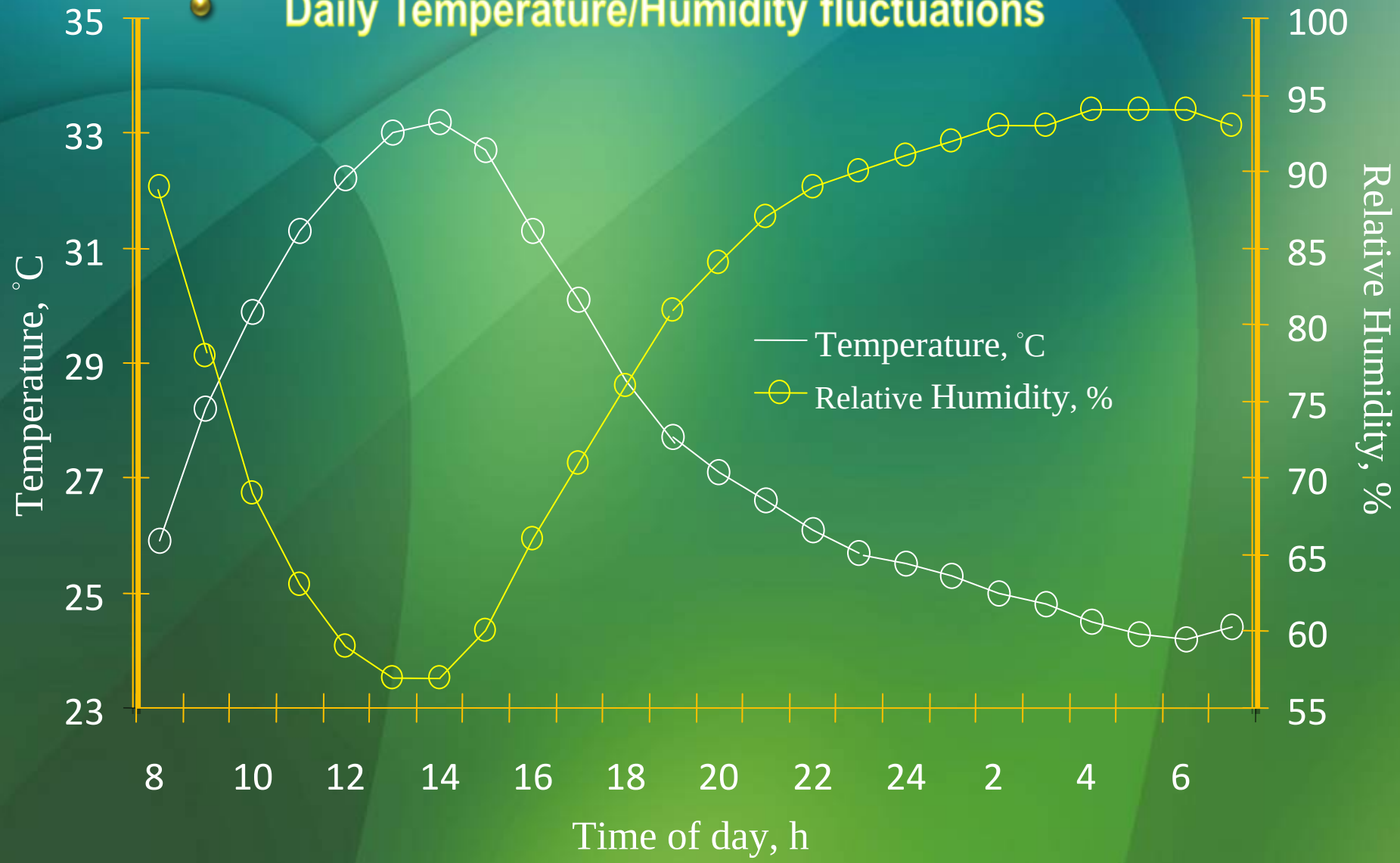
- 40 % in Peninsular Malaysia
- 35 % (11.6 mil. ha) suitable for agriculture
- 6.3 mil. ha in Peninsular Malaysia
- Oil palm - 4.5 mil. ha & rubber -1.3 mil. ha
- Hot & Humid with High Rainfall

Malaysia

- Average rainfall > 2,500 mm/y
  - Highest average rainfall = 4,128 mm Kuching)
  - Lowest average annual rainfall = 1,746 mm (Chuping)
- Temperature 24-33˚C
  - Lowest temperature variation = 1.1˚C
  - Greatest temperature variation = 15.7˚C
- Humidity 55% to 98%

Malaysia

Daily Temperature/Humidity fluctuations



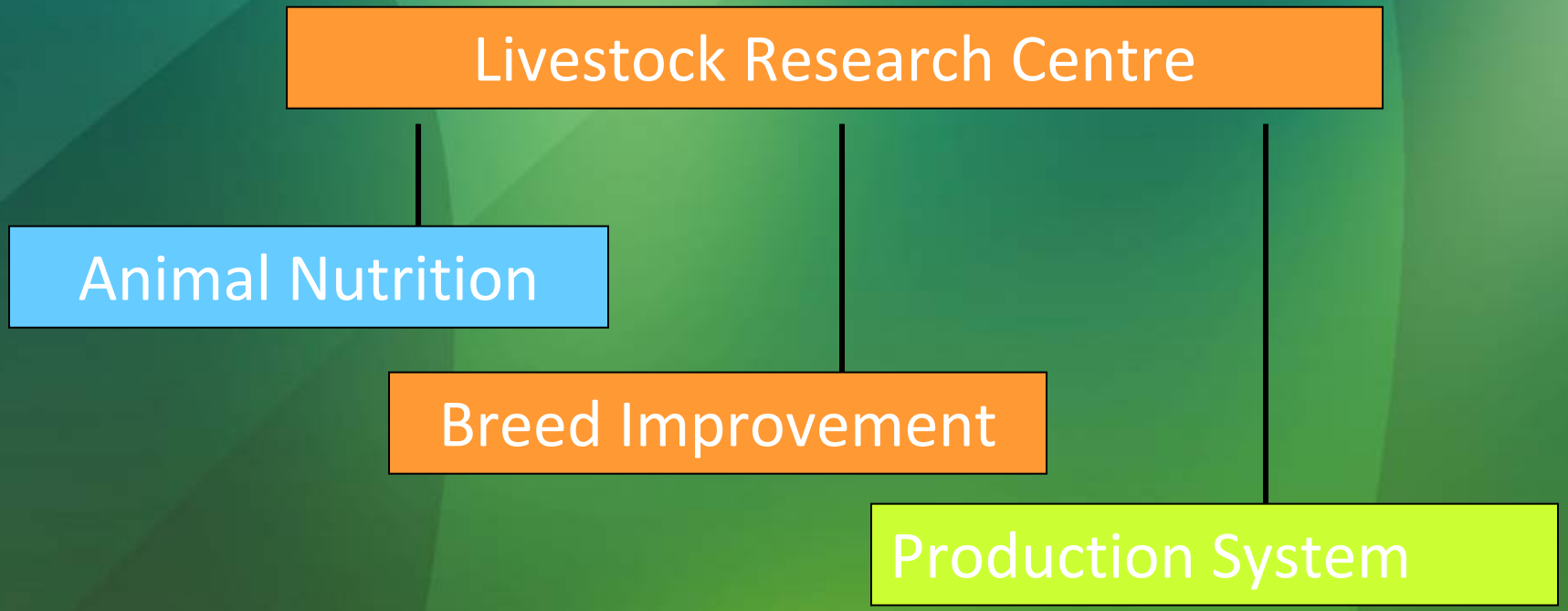
Malaysia

- Agencies related to Livestock
  - DVS (Department of Veterinary Services
    - Disease Control & Regulatory
  - MARDI (Malaysian Agricultural Research & Development Institute)
    - Research & Development of Production Animals
- Other agencies – crops, fisheries etc


MARDI
Research
Stations
Kangar
Langkawi
PERLIS
Bukit Tangga
KEDAH
Alor Star
Bukit Raya
Seberang Prai
PULAU PINANG
Kuala kangsar
PERAK
Kubang Keranji
Telong
Jeram Pasu
Pasir Puteh
Kuala Terengganu
Jerangau
KELANTAN
TERENGGANU
Cameron Highlands
Kemaman
Sungai Baging
PAHANG
Hilir Perak
Tanjung Karang
Kundang
SELANGOR
IBU PEJABAT/SERDANG
Jalan Kebun
Seremban
NEGERI SEMBILAN
Bukit Ridan
Jelebu
MELAKA
Kuala Linggi
Melaka
JOHOR
Kluang
Johor Bahru
Pontian
K. Kinabalu
SABAH
Bintulu
Sessang
SARAWAK
Kuching
Stesen MARDI
Pejabat Pengarah Negeri MARDI

Malaysia

MARDI (Malaysian Agricultural Research & Development Institute)



Historical Perspectives

Buffalo Production in Malaysia

- Historical perspectives
  - Important for meat & draft
  - Utilized for paddy planting & oil palm harvesting

Table: Utilization of buffalo for paddy cultivation

Location (Area)	No. of Respondents	Tractor only (%)	Buffalo only (%)	Tractor and Buffalo (%)
Coastal	166	10.2	2.4	87.4
Central	160	14.4	5.6	80.0
Fringe	86	2.3	5.8	91.9
Overall	412	10.2	4.4	85.4

Source: Lai, Devendra, Mohd Yusof, Mohd Ishak and Jegathesan (1973)

Historical Perspectives

- Utilization for draft

Buffalo Production in Malaysia

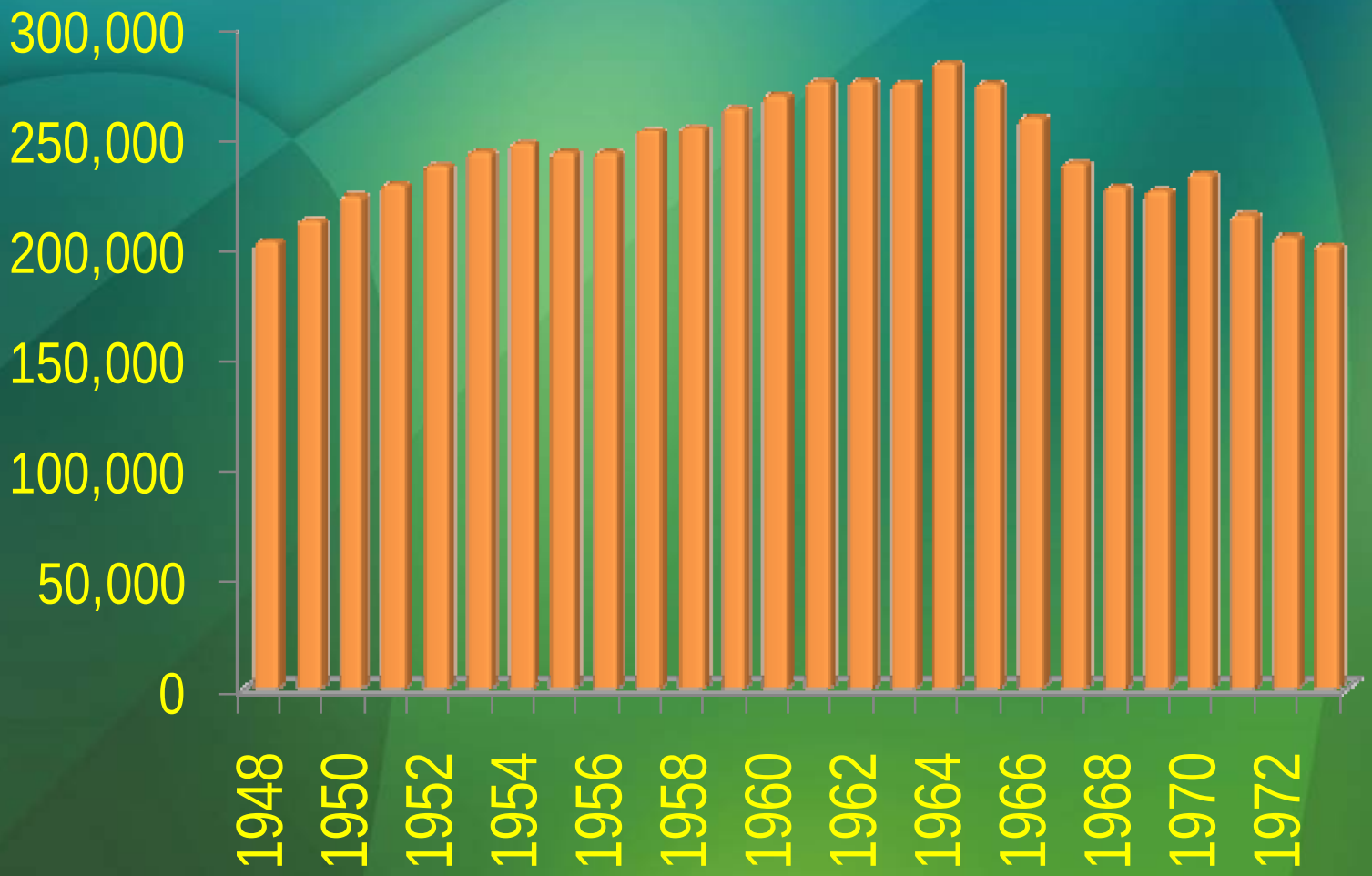
- Historical perspectives
  - Competition with mechanization
  - Problems associated with feeding & management

Table: Survey on the continued used of buffalo for paddy cultivation

Location (Area)	No. of Respondents	Yes (%)	No (%)
Coastal	165	69.1	30.9
Central	156	39.7	60.3
Fringe	85	49.4	50.6
Overall	406	53.7	46.3

Source: Lai, Devendra, Mohd Yusof, Mohd Ishak and Jegathesan (1975)

- Declining populations of swamp buffaloes



Source: DVS (2009)

Buffalo Production in Malaysia

- Buffalo production after 1970's
  - Reduced preference for buffalo as drought animal
  - Rapid decline in buffalo population
  - Need to conserve and utilize the buffalo species
- Need to relocate from paddy areas to multiplication farms (government) for evaluation and establishment

Buffalo Research in Malaysia

- Basically conducted by MARDI, UPM, DVS and other plantation agencies
  - Physiological Adaptations
  - Nutritional requirements
  - Systems of production

Initiation of Buffalo Research -70's

Muadzam Shah

(Bukit Ridan)

Buffalo Research in Malaysia

- Types – Murrah & Swamp
- Early 1970's - Swamp Buffalo
  - draft & meat
- Buffalo research station – Bukit Ridan
  - Physiological adaptations
  - Reproduction/ Breed improvement
  - Production systems
  - Nutrition

Physiological Adaptations

Influence of physical environment

Time of day	Ambient Temp (°C)	RH(%)	Wind speed (m/s)	Rectal temp (°C)	Respiration rate/minute	Pulse rate/minute
1-2 years						
0800 hrs	25.3	66.5	1.5	38.4	51.2	43.6
1100 hrs	36.4	56.5	2.8	39.2	64.1	58.6
1430 hrs	29.4	84.7	3.8	39.3	55.7	53.5
1630 hrs	34.8	83.2	2.0	*39.2*	*48.9*	*54.3*
2000 hrs	33.5	100.0	0.0	39.1	38.0	41.4
2-4 years						
0800 hrs	25.3	66.5	1.5	38.1	42.9	42.5
1100 hrs	36.4	56.5	2.8	39.0	57.7	50.0
1430 hrs	29.3	84.7	3.8	39.0	52.6	50.9
1630 hrs	34.8	83.2	2.0	*38.8*	*42.2*	*48.2*
2000 hrs	33.5	100.0	0.0	38.8	35.5	39.0

Source: Pathmasingam, Ahman Aman, Abdul Wahab and Mohd. Kamal (1982)

Physiological adaptations

- Heat stress *vs* system of production
  - Water turn over studies (isotopes)
  - open pasture >2x

Location	Temperature		Relative humidity		Water turnover
	min	max	min	max	(ml/d/kg$^{0.82}$)
Open pasture	24.6[a]	33.5[a]	62[b]	99.0	918[a]
Plantation	23.0[b]	31.5[b]	70[a]	99.0	418[b]

Source: Dollah, Marsom, Kamaruddin and Liang (1986)

Nutritional Studies

Nutritional studies

- Growth performance (type of feed)

Parameters	Palm based	Cassava based
Initial BW (kg)	171.8	173.1
Final BW (kg) @ 10 months	320.7	319.3
Total BW gain (kg)	148.9	146.3
ADG (kg)	0.6	0.6
Feed Intake (kg/day)	5.3	5.3
Feed Efficiency	9.0	9.1

Source: Mohd Shukri, Jariah, and Rozali (1987)

Buffalo Research in Malaysia

- Growth performance (body weights in kg)

Age (months)	Swamp buffalo	Murrah buffalo	F1 crossbred
0	29.8[b]	31.4[a]	33.7[a]
3	86.1[b]	99.3[a]	98.6[a]
6	129.1[b]	154.7[a]	149.4[a]
12	177.2[b]	233.2[a]	221.3[a]
18	235.2[b]	295.8[a]	315.8[a]
24	308.2[b]	363.7[a]	385.0[a]
36	383.8[b]	424.8[b]	485.3[a]
48	415.3[b]	486.2[a]	498.3[a]
60	470.7[a]	487.2[a]	534.1[a]
Pre-wean ADG	0.55[c]	0.69[b]	0.64[b]
Post-wean ADG	0.32[a]	0.36[a]	0.38[a]

Source: Harisah (1988)

Buffalo Research in Malaysia

- Nutritional studies
  - Energy for maintenance
    - Swamp buffaloes = 422 kJ ME/kg$^{0.75}$
    - Murrah buffaloes = 443 kJ ME/kg$^{0.75}$
  - Energy for growth
    - Swamp buffaloes = 0.349 kJ/kg$^{0.75}$
    - Murrah buffaloes = 0.462 kJ/kg$^{0.75}$

Source: Devendra and Wan Zahari (1981); Liang and Samiyah (1989)

Buffalo Research in Malaysia

- Nutritional studies
  - Dietary CP
    - Swamp buffaloes = 1.50 g DCP/kg$^{0.75}$
    - Cattle (KK) = 1.37 DCP/kg$^{0.75}$
  - Average Ca & P requirement
    - Calcium = 17 g/d
    - Phosphorus = 13 g/d
- Growth rates
  - 0.6 kg/day

Source: Devendra (1985); Wan Zahari and Devendra (1984)

Energy requirements for work

Work load	Body weight (kg)			
	200	300	400	500
Maintenance	29.0	40.0	50.0	59.0
Draught				
1 hour	2.8	4.3	5.7	7.1
2 hours	4.8	7.3	9.7	12.1
3 hours	6.8	10.3	13.7	17.1
4 hours	8.8	12.3	17.7	22.1

Source: Liang and Mohamed Ariff (1990)

Buffalo Research in Malaysia

- Plants available under oil palm plantation

Palatable	Non-palatable
Paspalum conjugaturn	*Ageratum conyzoides*
Axonopus compressus	*Cleome rutidosperma*
Ottochloa nodosa	*Croton hirtus*
Digitaria adscendens	*Borraia spp*
Imperata cylindrica	*Cyperus spp*
Chrysopogon aciculatus	*Eupatorium odoratum*
Commeli nadeffusa	*Hyptis brevipes*
Mimosa pudica	*Lantana camrara*
Oil palm seedlings	*Melastoma malabathricum*
Nephrolepis biserrata (fern)	*Mimosa invisa*
Stenochlaena palustris (fern)	*Passiflora foetida*

Source: Chen, Chang, Singh and Wahab (1978)

Buffalo Research in Malaysia

- Chemical composition on plants under plantation

Species	N	P	K	Ca	Mg	Na
Paspalum conjugatum	2.52	0.19	1.71	0.36	0.40	0.08
Axonopus compressus	2.09	0.15	1.21	0.29	0.29	0.01
Ottachloa nodosa	2.69	0.22	1.23	0.31	0.43	0.04
Nephrolepis biserrata	2.91	0.54	4.24	0.57	0.52	-
Imperata cy lindrica	1.39	0.18	1.45	0.18	0.10	-
Chrysopogon aciculatus	1.76	0.25	2.32	0.06	0.10	-
Mikania cordata	3.47	0.48	4.03	1.45	0.31	-

Source: Chen, Chang, Singh and Wahab (1978)

Energetic efficiencies

Parameter	KK (Cattle)	Buffalo
Energy for maintenance (E_m)	335	313
Efficiencies of use of energy for maintenance (K_m)	0.64	0.48
Efficiencies of use of energy for gain (K_g)	0.30	0.25

Source: Roch Liang and Young (1983)

Breeding & Reproduction

Reproductive performance

Parameters	Cattle		Buffalo	
	Mean	Range	Mean	Range
Age at puberty (months)	19	14-24	21	15-36
Gestation length (days)	290	285-295	315	305-330
Age at 1st parturition (months)	40	24-72	42	16-60
Calving interval (months)	16	13-19	18	15-21
Post-partum interval to:				
uterine involution (days)	36	30-42	35	16-60
1st ovulation (days)	60	30-120	75	35-180
conception (days)	154	52-258	180	40-400

Source: Jainudeen (1985)

Reproductive performance

- Semen characteristics

Semen characteristics	Swamp (n=357)		Murrah (n=401)	
	Mean	SD	Mean	SD
Volume (ml)	1.79[a]	0.61	2.19[b]	0.93
Progressive motility (%).	73.43[a]	933	71.52[b]	10.95
Spermatozoa conc. ($l0^6$/ml)	1177.80	477.3	1140.60	509.68
Live sperm (%)	89.24[a]	4.53	86.87[b]	8.14
Percent intact acrosome	89.40[a]	4.81	86.33[b]	9.18
Sperm head abnormalities (%)	2.61[a]	1.23	2.63[b]	2.72
Sperm mid-piece abnormalities (%)	2.79[a]	1.2	3.71[b]	2.08
Total sperm abnormalities (%)	9.07[a]	2.64	12.2[b]8	5.03
Ejaculation time (seconds)	467.24[a]	353.95	112.57[b]	62.40

Source: Ramakrishnan, Adnan, Nordin and Shanmugavelu (1989)

Productive performance

Parameter	Sahiwal cow	Murrah buffalo
Average body wt (kg)	300	480
Annual mild yield (kg)	1800	1200
DM intake (kg/lactation)	2460	3630
TDN intake (kg/lactation)	1520	2265
Protein intake (kg/lactation)	305	465
DM intake/litre of milk (kg)	1.10	2.09
TDN output/input (%)	28	19
Protein output/input (%)	24	15
No. of cows to produce		
25 million tons of milk/yr	14	21
DM intake for 25 million tons/yr	28	52

Source: Devendra (1979)

Production Systems

Buffalo Research in Malaysia

- Production systems
  - Intensive
  - Extensive (open pasture)
  - Semi-intensive
  - Integration under oil-palm

Buffalo Research in Malaysia

- Production Systems

Parameter	Semi-intensive		Open-pasture	
	Male	Female	Male	Female
Birth weight	29.8	28.2	29.3	27.3
Weaning weight	134.3^{ab}	117.3^{a}	142.3^{b}	147.2^{b}
Total pre-weaning gain	104.5^{ab}	89.1^{a}	113.0^{b}	119.9^{b}
Pre-weaning daily gain	0.61^{ab}	0.50^{a}	0.62^{a}	0.66^{b}
Yearling weight	277.2^{b}	221.5^{a}	215.7^{a}	206.6^{a}
Total post-weaning gain	134.2^{a}	104.2^{a}	104.6^{a}	59.5^{b}
Post-weaning daily gain	0.73^{a}	0.59^{a}	0.44ab	0.33^{b}

Source: Mohd. Sukri, Nordin and Abdullah Sani (1995)

Buffalo Research in Malaysia

Influence of System of Production

Variables	Management system	
Productive performance	Intensive	Free grazing
Av. daily gain (kg/d)	0.46[a]	0.29[b]
Age at puberty (months)	21.5[a]	28.0[b]
Weight at puberty (kg)	335.6	320.0
Libido (Reaction time in sec)	129.3	159.3
Semen characteristics		
No. ejaculates	33	8
Volume (ml)	1.2	1.5
Motility (%)	67.0	66.3
Concentration ($x10^6$)	1061.8	967.5
Live cells (%)	88.8	91.4
Intact acrosomes (%)	80.0	88.5
Head abnormality (%)	5.6	3.1
Mid-piece abnormality (%)	4.0	2.9
Tail abnormality (%)	6.7	5.2

Source: Nordin, and Ramakrishnan (1992)

Buffalo Research in Malaysia

Influence of System of Production

Growth and Reproductive Performances of Buffaloes Under Oil palm

Parameters	Un-supplemented	Supplemental feed
No. of dams (heifers)	12	12
Days under oil palm	365	365
Initial wt of dams, kg	257	278
Initial age of dams, days	733	757
Final wt of dams under oilpalm, kg	297[a]	333[b]
ADG under oil palm, kg	0.11[a]	0.15[b]
% dam pregnant (1st pregnancy)	58[a]	92[b]
Age at 1st calving, days	1359	1499

Source: Abdullah Sani and Hassan Wahab (1992)

Diseases

Buffalo Diseases

- Common buffalo diseases under smallholder conditions

Disease condition	Calves		Adults	
	Number	*Percent*	*Number*	*Percent*
Recumbency and General Weakness	9	13.9	0	0.0
Emaciation	3	4.6	8	10.4
Wounds	6	9.2	15	19.5
Diarrhoea	35	53.9	8	10.4
Lameness	2	3.1	8	10.4
Anorexia	0	0.0	18	23.4
Dermatitis	6	9.2	3	3.9
Miscellaneous	4	6.1	17	22.0

Source: Mohd. Zamri, Abdul Aziz and Abdullah (1988)

Buffalo Diseases

- Common buffalo diseases under farmed conditions

Disease condition	Calves		Adults	
	Number	Percent	Number	Percent
Recumbency and General Weakness	2	3.1	3	3.3
Emaciation	7	10.9	10	11.2
Wounds	4	6.3	7	7.9
Diarrhoea	8	12.5	11	12.4
Lameness	1	1.6	2	2.2
Pneumonia	12	18.8	4	4.5
Pulmonary Congestion and Oedema	3	4.7	9	10.1
Dehydration	4	6.3	0	0
Peritonitis	5	7.7	5	5.6
Haemorrhagic Septicaemia	0	0	7	7.9
Trypanosomiasis	0	0	4	4.5
Pyrexia and Anorexia	0	0	5	5.6
Miscellaneous	18	28.1	22	24.8

Source: Mohd. Zamri, Abdul Aziz and Abdullah (1988)

Future of Buffalo Production

Buffalo Population Trends

State/Species	Swamp			Murrah			Total		
	1976	1988	2006	1976	1988	2006	1976	1988	2006
Perlis	4,889	1,884	0	143	0	0	5,032	1,884	0
Kedah	54,642	31,260	9,896	12	6	290	54,654	31,266	10,186
Penang	3,680	852	479	235	37	0	3,915	889	479
Perak	11,547	18,921	17,221	920	343	155	12,467	19,264	17,376
Selangor	913	590	216	720	908	452	1,633	1,498	668
W. Persekutuan	0	0	0	130	35	0	130	35	0
N. Sembilan	9,042	1,323	4,519	0	17	63	9,042	11,340	4,582
Malacca	17,466	8,836	5,153	0	4		17,466	8,840	5,153
Johore	2,556	3,974	3,194	279	30	11	2,835	4,004	3,205
Pahang	23,788	20,475	18,400	10	7		23,798	20,482	18,400
Trengganu	27,054	16,562	11,567	0	0	4	27,054	16,562	11,571
Kelantan	54,488	23,559	7,292	0	51	7	54,488	26,310	7,299
Total	210,065	128,236	77,937	2,449	1,438	982	212,514	142,374	78,919

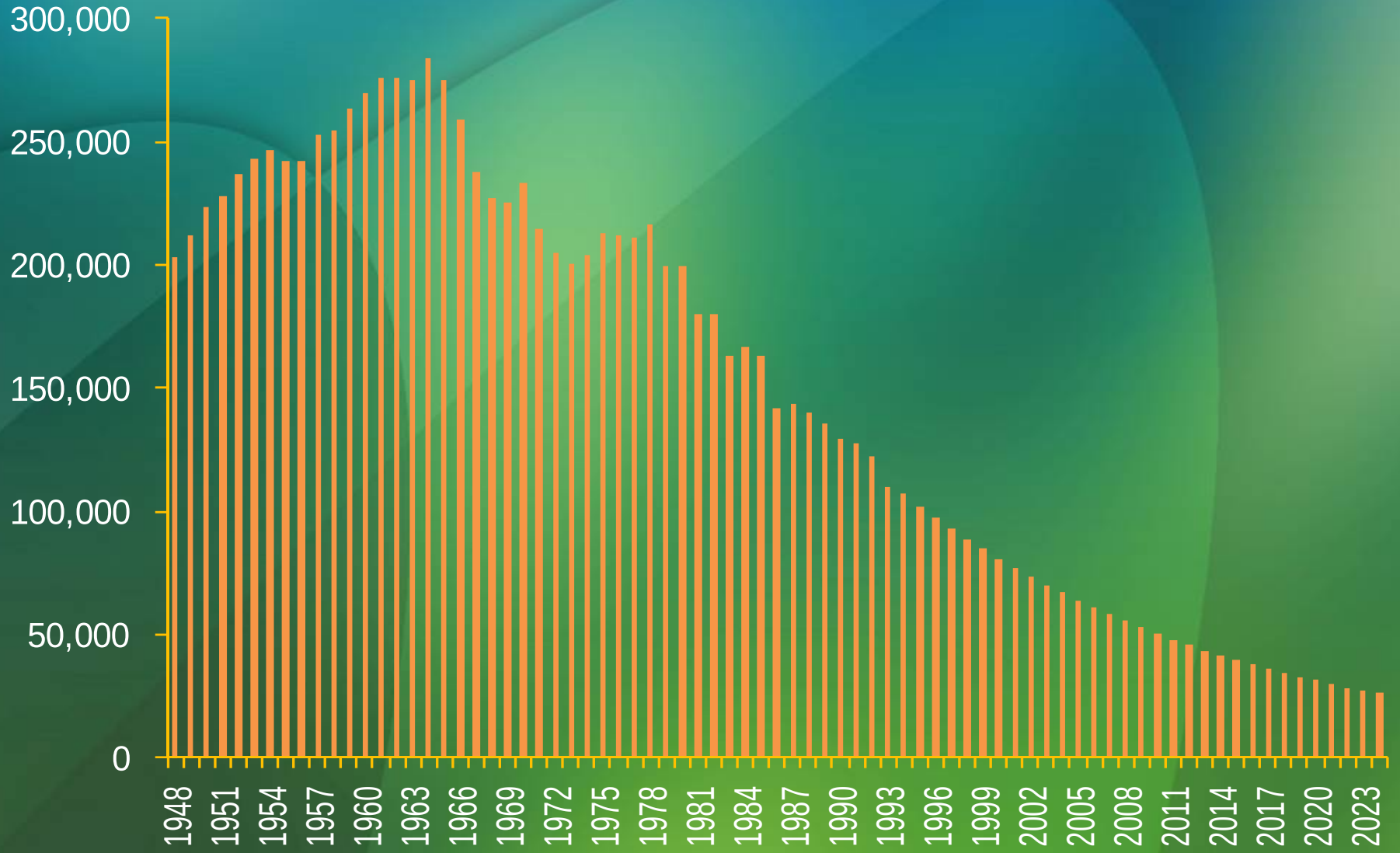
Source: Peninsular Malaysia (DVS, 2009)

Livestock Population Trends

Livestock Type	2002	2003	2004	2005	2006	2007	2008
Cattle	714,154	752,500	787,384	781,316	775,110	830,960	847,757
Buffalo	131,245	133,368	138,098	133,232	132,932	134,003	133,381
Goat	234,795	246,977	264,394	287,670	335,289	412,678	437,805
Sheep	125,836	115,131	115,498	115,922	116,261	125,860	124,749
Pig	2,047,176	2,070,686	2,110,847	2,035,647	2,029,119	1,742,047	1,733,466
Poultry	170,395,132	183,345,888	191,655,949	174,694,165	179,221,304	185,373,194	201,012,404
Duck	6,963,397	8,177,449	7,919,865	8,052,997	8,640,628	8,275,232	8,829,133
Ostrich	2,304	2,678	2,256	1,137	797	641	463
Dear	12,298	11,615	13,183	13,955	14,446	11,802	12,080
Quail	2,816,523	2,583,789	2,152,857	1,945,060	1,851,051	2,368,597	2,574,650

Source: DVS (2009)

Projected Future of Buffalo Population



Source: DVS (2009)

Key factors for reduction in buffalo

- Increased mechanization
- Preference of cattle over buffalo – higher productivity
- Lack of suitable land for extensive farming
- Lack of superior breeds
- Reproductive problems
- Susceptibility to endemic diseases (HS, FMD)

The Future of buffalo production

- Need for government intervention/incentives
- Infusion of superior genetics (use of ARB)
- Utilization of availability of agro-waste by-products – OPF, PKC – buffalo > cattle
- New government farms eg in East Malaysia (Bintulu) under establishment


95 3 29

Thank you