CURRENT LIVESTOCK DISEASE STATUS IN INDONESIA

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I. INTRODUCTION

Indonesia is a vast island continent spanning the equator and containing a large number of different peoples and cultures living in varied geographical locations. Oil is the most important resource, however agriculture is the most important activity and the most common livestock systems are the small holder and landless farmers, both of which are increasing in numbers (see Table 1). The most important constraints to livestock production include human overpopulation leading to land pressure (Java), climate leading to poor nutrition in dry areas (Eastern Islands) or to optimum development of certain diseases eg. Fascioliasis in wet areas (all islands West of Lombok) and less than optimal management, disease surveillance and marketing systems in some areas.

The most important animal production systems in Indonesia are poultry (both village and commercial) for meat and eggs, large ruminants and horses for principally draught and some meat, small ruminants for meat and fish for protein. Pigs and dogs are important protein sources in some areas. The estimated general livestock population trends overall in Indonesia and by region are shown on Tables 2 and 3. Most livestock species have shown a steady increase over the period 1974 to 1982 with the exception of large ruminants which show slight population increases during this period. In most species, these increases have been natural, however those in cattle especially dairy cattle have been due to large imports from Australia and New Zealand. Over the period 1978 to 1983 a regional distribution of livestock occurred with both Sulawesi and Sumatera showing large increases and Kalimantan and Bali/NTT and NTB showing moderate increases. Java island has the highest level of stock of any island having an estimated 52% of the total in Indonesia in 1978 which fell to an estimated 48% in 1983.

2. ANIMAL DISEASE RESEARCH AND DIAGNOSIS

The responsibility for animal health services in Indonesia fall under the Agency for Agricultural Research and Development (AARD) and the Directorate General of Livestock Services (DGLS). The former is responsible for all research which is undertaken at the Research Institute for Veterinary Science (RIVS), and the latter for disease diagnosis and extension through seven Disease Investigation Centres (DIC's) and provincial offices throughout the country.

The research programmes at RIVS have developed considerably in recent years (RIAD 1983, 1984) and have been largely based on information obtained from the DGLS system. However, the identification and execution of research priorities has only just begun and much remains to be done. Disease surveillance by the DGLS is at best patchy and diseases with obvious clinical symptoms tend to be emphasised (see Table 4) while others which may be very important, such as babesiosis and anaplasmosis of cattle, and copper deficiency (Stoltz *et al*, 1985) are barely mentioned. Other diseases have gained prominence due to the efforts of RIVS workers eg. Malignant catarrhal fever in buffaloes and Bali cattle, bovine mastitis in dairy cattle, swine brucellosis and trichostrongylosis in small ruminants.

3. ANIMAL DISEASE

3.1 General

A checklist of diseases which occur in the important livestock species in Indonesia has been produced (see Appendix I) and should be viewed as an attempt to update that described by Skaggs et al (1970). Diseases exotic to Australia are also noted. The diseases are divided into those having some significance and those whose significance is unknown. Many of the latter may be very important such as malignant catarrhal fever and anaplasmosis of cattle, Foot and Mouth Disease of small ruminants, Infectious Laryngotracheitis of chickens and Enzootic Pneumonia of pigs.

No attempt will be made to discuss any disease in great detail, however the most important diseases will be highlighted in sections 3.2 to 3.5. A number of important diseases affect all livestock species although apart from Trypanosomiasis (Surra) very little work has been conducted on horse diseases.

3.2.a. Important Bacterial Diseases

There are a number of important bacterial diseases of livestock in Indonesia. Some of these are controlled by vaccination (Haemorrhagic Septicaemia, an-

thrax) while in others the economic effects are currently being studied (Bovine mastitis, swine Brucellosis).

3.2.a (i) Pasteurellosis (Haemorrhagic Septicaemia and Fowl Cholera)

Aetiology. In Indonesia, haemorrhogic septicaemia (HS) is the disease in cattle and buffalo caused by *Pasteurella multocida* (type 1, Roberts; type B, Carter (Jan Nari and Syamsudin, 1973). Pasteurellosis was first reported in pigs and poultry in 1912 and in rabbits in 1926 (Utojo, 1958). Deaths due to pasteurella have been reported in horses, pigs, poultry, sheep, goats, deer and rabbits (Soemanagara, 1958; Utojo, 1958).

Distribution. From early reports, HS was recognised throughout Indonesia (Utojo, 1958; Soemanagara, 1958). The disease is still considered to be widespread endemic throughout Indonesia in carrier animals (Bulletin Epidemiologi Veteriner Indonesia, 1982). The organism was recently isolated from the blood of cattle slaughtered at the Bogor abattoir, although the disease in these animals was probably in the shipping fever form (Balitvet, 1983a).

Epidemiology. There is little doubt that haemorrhagic septicaemia was the most important bacterial disease of livestock in South East Asia until major vaccination programmes were commenced in the region (FAO, 1955; Bain 1963).

In Indonesia HS is a disease with largely a seasonal distribution, the majority of deaths occurring during the rainy season. Major outbreaks with heavy mortality can occur (Djaenoedin and Soemanagara, 1958). Physiological stress through a prolonged period of poor nutrition and also scouring caused by the ingestion of the first green shoots following the rain are considered other predisposing factors (FAO Report, 1955; Jan Nari and Syamsudin, 1973).

Good control of HS is being achieved through annual vaccination with an oil adjuvanted strain Katha vaccine, developed and produced in Indonesia (Jan Nari and Syamsudin, 1973; Syamsudin, 1971). The disease is reported to have disappeared from the island of Lombok following a 3 year vaccination program (NTB Annual Report, 1983).

3.2.a (ii) Mastitis

Aetiology. Whilst Bovine Mastitis has long been recognised in Indonesia, there are no published reports on either clinical or subclinical mastitis. From recent studies the major mastitis pathogens have been shown to be *Streptococcus agalactiae* and *Staphylococcus aureus* predominantly in association with *Strep. dysgalactiae, Strep uberis* and *Staph. epidermidis* (Hirst *et al.* 1984; Rompis *et al*, 1985).

Distribution. Dairy farming in Indonesia is confined largely to the island of Java in the more elevated regions and in limited areas of North and Central Sumatera.

Epidemiology. Both small holder farmers (2-3 cows) and larger commercial herds (20-50 cows) have been studied. Quarter clinical mastitis prevalence rates were slightly lower in the small holder cattle (3.5%) compared with commercial herds (7.0%). Subclinical mastitis at the quarter level was 63.3% and did not differ markedly between the two farm types (Hirst *et al*, 1984).

Milk production losses have been estimated at 10% from clinical mastitis and 14.6% from subclinical mastitis causing estimated lost production in the National herd of 35 million Kg milk annually, worth to the producer in the region of AU$ 14 million (Hirst *et al*, 1984).

Mastitis control based on the reduction of cross infection at milking (hand washing and udder washing procedures) an iodophore teat spray, ampicillin - cloxacillin based Dry Cow Therapy and the prompt treatment of clinical mastitis is being recommended. Good results have been achieved in a pilot study herd which over a 7 months period has shown an initial 40% reduction in clinical mastitis and a 26% reduction in subclinical mastitis (Rompis *et al*, 1985).

3.2.a (iii) Brucellosis

Aetiology. Brucellosis in Indonesia is caused by B. *abortus* biotype 1 which has been isolated from the milk of dairy cows in East Java and *B. suis* biotype 1 from lymph nodes of pigs in East, Central and West Java (Soeroso *et al*, 1985).

Distribution. Brucellosis has so far remained undetected in male slaughter cattle (Balitvet 1983a) in Java but is present in ranch cattle in both North and South Sulawesi. In dairy cattle it is confined to the municipal areas of Surabaya and Jakarta and in North Sumatera (Soeroso *et al*, 1985). Swine brucellosis is found throughout the whole island of Java (Soeroso and Taufani, 1972; Soeroso *et al*,1985) and North and South Sulawesi (Scott-Orr *et al*, 1980).

The islands of Kalimantan and Bali were found to be negative (Scott-Orr *et al*, 1980).

Brucella melitensis has not been detected in sheep and goats in West Java. *B. ovis* infections have not yet been investigated.

Epidemiology. B. abortus has been detected in only 2% of dairy cows (Soeroso *et al*, 1985), but prevalence rates of up to 80% were found in some beef herds in North Sulawesi. Major losses in beef herds are from abortion.

Serological prevalence rates of up to 30% have been found in swine in Java. The disease is present equally

in young males and females. It seems many infections are newly acquired in slaughter animals during the immediate preslaughter period giving rise to heavy lymph node infections thus exposing slaughter men and meat handlers to considerable risk of infection (Soeroso *et al*, 1985). In affected piggeries, abortion rates can exceed 10% (Hirst, unpublished observation).

Sporadic and indiscriminate use of both strain 19 and 45/20 vaccines have been used in some provinces in dairy cattle. This has complicated a test and slaughter policy which exists, although rarely implemented as there is no government compensation paid.

There is currently no Government policy for the control of swine brucellosis. However with a potential pig meat export market to Singapore and the clearly emerging human health hazard a vaccination programme would be needed in view of the high serogical reactor rates already detected.

3.2.a (iv) Salmonellosis

Aetiology. Salmonellosis has a world wide distribution and many of the Salmonella serotypes are pathogenic to man, animals and birds. *Salmonella pullorum* has been recognised in Indonesia for many years and was considered one of the most important diseases in poultry (Poernomo, 1980). More recently a considerable range of serotypes have been recognised, the most important being *S. dublin* in cattle (Purnomo *et al*, 1984).

Distribution. Salmonellae were isolated from a wide range of species submitted for laboratory examination and from slaughter animals thoughout Java and other islands (Purnomo *et al*, 1984; RIAD, 1984).

Epidemiology. The most important aspect of salmonellosis is the contamination of carcases at slaughter through the unsophisticated slaughter methods. Recent surveys have shown a 6-11% prevalence of salmonella infected cattle and buffalo. In North Sulawesi 58 % of pigs were infected. The most common serotypes were *S.lexington, weltevreden* and *emek* in cattle and *S. agona* and *dublin* in pigs (Purnomo *et al*, 1984). Pullorum disease has now been reduced to a negligable level through serological testing and the slaughter of infected breeding stock.

3.2.a (v) Leptospirosis

Aetiology. The disease leptospirosis results from infection with the organism *Leptospira interogans* of which there are wide range of serovars with varying degrees of pathogenity to different animal species. The important serovars in Indonesia are *L. icterohaemorragiae, L. hardjo* and *L.pomona. L.tarrasovi* is commonly detected but its significance is questionable. *L. pomona, tarrasovi, canicola* and *bataviae* have been isolated (Scott-Orr *et al*, 1980; Balitvet, 1984b).

Distribution. Pathogenic serovars have been detected in cattle, buffalo, and pigs, in Java, Bali, South Kalimantan, North Sumatera, South Sulawesi, Irian Jaya and West Nusa Tenggara. From other areas, reactor rates were very low or zero.

Epidemiology. There is an overall 20.7% reactor rate in cattle and buffalo with the predominant serovars being *hardjo* 9.1%, *tarrasovi* 4.5%, *rachmati* 3.0% and *pomona* 1.6% (Darodjat *et al*, 1985). Leptospires in the serogroups *Hebdomonas, Pomona Autumnalis, Javanica* and *Cellodoni* have been isolated from cattle kidneys at rate of 0.8 -9% (Scott Orr *et al*, 1980). In pigs there has been shown an overall reactor rate of 17.2% with *pomona* (12.3%) and *rachmati* (3.0%) being the predominant serovars (Darodjat *et al*, 1985). In a recent study in swine from 2 slaughter houses in West Java, 10% of pigs were shedding leptospires in their urine. Of the isolations made 10% were *pomona* and 16% *tarrasovi* (Balitvet, 1984b).

3.2.a (vi) Anthrax

Aetiology. Anthrax is a peracute or acute disease caused by *Bacillus anthracis.* In Indonesia the disease has been reported to commonly affect cattle and buffalo and less commonly horses, sheep, pigs and goats (Soemanagara, 1958).

Distribution. Although anthrax is endemic throughout Indonesia outbreaks are sporadic, accurring most commonly in Nusa Tenggara province (Bull. Epidemiol. Indonesia, 1982) but also in other areas (Soemanagara, 1958; Gozali *et al*, 1985).

Epidemiology. Historically, anthrax in Indonesia has been recognized and control programmes in endemic areas through vaccination have kept the disease to minimal proportions. In the years 1906 to 1957 there were only 4 outbreaks which caused more than 1000 deaths (Bull. Epidemiol. Vet. Indonesia, 1982). Recent outbreaks diagnosed at Balitvet have all been associated with human deaths indicating the importance of anthrax as a zoonotic disease.

3.2.b Important Parasitic Diseases

Parasitic diseases are thought to be economically the most important in Indonesia (see Table 4, Skaggs *et al*, 1970) with prominent parasites in all domestic livestock. This group of diseases are generally widespread making their control very difficult.

3.2.b (i) Liver Fluke Disease

Aetiology. Two species of fluke can be found in the livers of large and small ruminants in Indonesia, namely *Fasciola gigantica* and *Gigantocotyle explanatum.* There are reports of *F. hepatica* (Rivai, 1979) occurring in the country but these need to be confirmed.

Distribution. Surveys in abattoirs have been conducted in many parts of Indonesia and show that Fascioliasis is both common and widespread, probably occurring on all the main islands. Prevalence rate as high as 90% have been reported in some areas (Edney and Muchlis, 1962). *G. explanatum* was found in 7% of cattle and buffalo examined at the Bogor abattoir (Henderson, 1979).

Epidemiology. The snail intermediate host is likely to be found in wet areas on all islands. Animals of any age can be infected with liver flukes with increased resistance with age occurring in large ruminants. Small ruminants develop little immunity to infection.

Fascioliasis can cause both acute (more common in small ruminants) and chronic disease. The latter is the most common type in large ruminants causing severe weight loss and condemnation of livers at abattoirs. The pathological effects of *G. explanatum* have not been studied in detail.

There is little control of liver fluke disease in Indonesia due to expense of chemotherapy and lack of drug distribution.

3.2.b (ii) Trypanosomiasis (Surra)

Aetiology. Surra in Indonesia is caused by *Trypanosoma brucei evansi* and is found in horses, cattle, buffalo and dogs.

Distribution. The parasite is thought to occur in all the main islands of Indonesia with the exception of Irian Jaya (Adiwinata and Dachlan, 1972). Few definitive studies have been conducted.

Epidemiology. T. evansi is spread mechanically by biting insects and at least 26 species can harbour the parasite in their mouthparts (Nieschultz, 1930). Buffalo are more commonly infected than cattle (Wilson *et al*, 1983; Partoutomo *et al*, 1984) both on serology and on detection of circulating parasites. Using the ELISA test, around 60% of buffalo in sentinel herds in Java were serologically positive compared to 35% of cattle (Luckins, 1983).

Trypanosomiasis can be acute (mainly in horses) or chronic (mainly in large ruminants) with anaemia and loss of weight being the main symptoms (Partoutomo et al, 1984).

Control varies from province to province where the trypanocides Suramin (Naganol) and Isometamidium (Trypamidium) are used.

3.2.b (iii) Haemonchosis

Aetiology. Haemonchosis, caused by *Haemonchus contortus* in the abomasum, is a disease of most importance in small ruminants.

Distribution. The parasite is widespread in Indonesia and is found in all islands. Most surveys indicate that 60-90% of both young and adult small ruminants harbour the worm. The percentage of cattle and buffalo infected with *Haemochus* is much lower (Balitvet, 1983).

Epidemiology. A direct life cycle occurs and most areas of Indonesia have optimal weather conditions for rapid larval development on the pasture. Both acute and chronic forms of the disease occur with death and poor weight gains respectively being the main symptoms.

Anthelmintics are not widely used in the field although recent trials have shown that improved weight gain can result from suitable drug treatment (Henderson, 1979; Stevenson *et al*, 1983). The latter study indicated that high cost-benefit ratios could result.

3.2.b (iv) Stephanofilariasis (Cascado)

Aetiology. At least two species of Stephanofilaria occur in Indonesia, namely *S. kaeli* which mainly affects the legs of cattle and has been reported in West Sumatera (Partoutomo, 1979) and *S. dedoesi* which generally causes lesions around the eyes, neck, withers shoulders and dewlap of cattle. The latter species is the main cause of Cascado.

Distibution. Stephanofilaria infection is widespread in the country but only in certain areas, such as Sulawesi, Kalimantan and parts of Sumatera, are large lesions of cascado frequently seen. Infection rates of up to 90% have been reported (Muchlis and Partoutomo, 1972).

Epidemiology. The parasite can be transmitted by different species of biting flies, however the role of specific vectors requires clarification. Infection with *S. dedoesi* can lead to extensive dermatitis. The main economic loss results in loss of draught power in affected animals. There is also reduction in the value of hides.

Control of the infection is difficult. Neguvon (Trichlorfon) has been tested in buffaloes and cattle infected with Stephanofilariasiss but prolonged treatment is required (Fadzil, 1977). Recently Ivermectin has been tested in Indonesia with some success (Balitvet, 1984).

3.2.b (v) Sarcoptic Mange

Aetiology. Sarcoptes scabei is an important parasite of buffalo and goats.

Distribution. It is widespread in Indonesia.

Epidemiology. The mite causes a severe dermatitis and is found in goats and buffalo but not in cattle, sheep and horses in Indonesia (Sangvaranond, 1979). The incidence of the disease in buffaloes increases during the dry season (Griffiths, 1974). Economic loss has not been assessed and there is little information on comparative treatment regimes. Recently Ivermectin has shown good results (Balitvet, 1984d).

3.2.c Important Viral Diseases

A number of important viral diseases occur in all the main species of domestic livestock in Indonesia. This group of diseases is most important in poultry with Newcastle Disease being the most pathogenic. Respiratory viruses notably Infectious Bronchitis and Infectious Laryngotracheitis, and Marek's and Gumboro disease viruses are also thought to cause severe loss to the poultry industry.

3.2.c (i) Newcastle Disease (ND)

Aetiology. ND virus of a single antigenic type occurs in differing pathotypes from lentogenic through velogenic strains. Although lentogenic strains are common (Ronohardjo, 1984) the dangerous mesogenic and velogenic strains are not uncommon.
Distribution. The disease is widespread in Indonesia and occurs on all islands where poultry are maintained.
Epidemiology. The disease spreads rapidly on contact. Vaccination is practiced in all commercial flocks where outbreaks of ND do occur. ND is very common in village chickens where vaccination procedures often are not undertaken. The disease is endemic in village chickens (Balitvet, 1984a) and ND is thought to cause the greatest loss of any disease in Indonesia (see Table 4). There are many symptomsless carriers in chickens, ducks and wild birds. Mesogenic strains produce incoordination, paralysis and low to moderate mortality 6-12 days after exposure. Velogenic strains produce swelling around the eyes, diarrhoea and very high mortality 4-8 days after exposure in unvaccinated birds.

3.2.c (ii) Foot and Mouth Disease (FMD)

Aetiology. FMD has been reported for many years in Indonesia with outbreaks occurring at regular intervals, although no outbreaks were reported during the period 1980 to 1983. Only type 'O' virus has been identified. In a recent outbreak in Java 1983, the causal virus was identified as similar to 'Ol Campos' by Pirbright.
Distribution. FMD is currently thought to occur only on the island of Java, although in previous years, it has been reported from other islands.
Epidemiology. The Indonesian FMD virus is thought to occur mainly in large ruminants, and these animals only are vaccinated. The virus can cause severe clinical disease. However, clinical cases have been observed in small ruminants and these animals are possibly reservoirs. A number of 'O' vaccines from various sources are used in Indonesia and these have been evaluated (Ronohardjo, 1984a). Control relies on bi-annual vaccination of all large ruminants on Java island.

3.2.c (iii) Rabies

Aetiology. Rabies is a virus disease affecting mainly carnivores and is an important zoonosis.
Distribution. The disease occurs in 21 of Indonesia's 27 provinces. Only the provinces of Bali and the eastern islands are considered Rabies-free.
Epidemiology. In recent years, there has been an increased incidence of Rabies in Indonesia. Although dogs are the most important reservoir, the disease also occurs in sheep and cattle. Control is attempted by encouraging dog owners to vaccinate.

3.2.d Important Toxicological Diseases

There are probably a number of important toxicological diseases in Indonesia but most of these have yet to be elucidated.

3.2.d (i) Mycotoxicosis

The climate of Indonesian is ideal for the growth of fungi and fungus-damaged animal feedstuffs are commonly seen. However, to date, only aflatoxicosis has been investigated locally indepth. Aflatoxin contaminates 60–90% of broiler diets in Indonesian (Ginting, 1984) at low levels which may or may not affect the broiler industry. These levels however are a serious constraint to intensive rearing of ducks, since this species is very sensitive to afflatoxins (Ostrowski-Meissner, 1983). Other mycotoxicoses undoubtedly occur in Indonesia.

3.2.d (ii) Poisonous Plants

Earlier reports indicate that a large number of Indonesian plants contain potentially - toxic alkaloid, nitrate, oxalate or cyanide based on qualitative assays (Indraningsih, *et al.*, 1981). Recent advances in analytical toxicology in Indonesia have lead to the diagnosis of cyanide poisoning of livestock consuming sorghum (Syamsul *et al.*, In press). Poisoning has also been linked to *Brachiaria sp.* (Murdiati *et al.*, 1983), *Lantana camara* (Sobari, 1983) and several other plants (Murdiati *et al.*, In preparation).

3.2.d (iii) Heavy Metal Poisoning

Heavy metal poisoning of livestock has not yet been demonstrated in Indonesia. However, a public health problem, mercury poisoning of heavy fish consumers around Jakarta has been reported (Sinar Harapan, 1983).

3.2.d (iv) Pesticide Poisoning

Pesticides are used in large quantities throughout Indonesia and reports of acute poisonings and residue levels (Indraningsih, unpublished observations) are beginning to appear. Pesticides are considered a major cause of death in ducks herded in sawah (Sabrani and Argono, 1983; Tarmudji, 1985).

3.2.e Miscellaneous Diseases

3.2.e.(i) Jembrana Disease

Jembrana disease is an acute disease of Bali cattle *(Bos javanicus)* and buffalo of unknown aetiology but which is thought to be tick-transmitted and does respond to tetracycline. It only occurs on Bali island. A similar disease occurs in Bali cattle in South Sumatera (Rama Dewa disease). Research is being conducted on the aetiology and pathogenesis of this disease at the DIC, Bali.

4. CONCLUSION

Indonesia is Australia's most important neighbour and it is important that veterinarians in both countries collaborate to their mutual benefit as there are a number of diseases occurring in Indonesia which are exotic to Australia.

There are a number of important livestock diseases in Indonesia which are causing major constraints to development. An important research effort is occurring at the Research Institute for Animal Disease, Bogor where Australia has a team managed by James Cook University. Adequate solutions to many of the disease problems are possible but require sustained efforts by the research, diagnostic and extension components of the Indonesian Government and by interested foreign governments including Australia.

Table 1. Number of subsistence farmers

Number of farmers	Years 1973	1980	% increase per year
	million		
Subsistence of farmers (0.5 ha)	6.60	11.00	9.52
Landless farmers	0.49	2.00	44.02
Total	7.09	13.00	11.91

Source : Indonesian Bureau of Statistics (1982).

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Table 3. Regional livestock population trends* by species (1978-1983) in heads (1000) or A.U. (500 kg live weight)

	1978	1983	% change
CATTLE			
Sumatera	1058	1268	20
Java	3746	3913	4
Kalimantan	173	196	14
Sulawesi	1036	1666	61
Bali/NTB & NTT	910	1077	18
BUFFALO			
Sumatera	812	1077	24
Java	1063	990	—7
Kalimantan	71	78	10
Sulawesi	481	569	18
Bali/NTB & NTT	318	319	—
GOATS			
Sumatera	1179	1730	47
Java	4895	5459	12
Kalimantan	137	175	28
Sulawesi	577	767	33
Bali/NTB & NTT	404	584	45
SHEEP			
Sumatera	276	364	32
Java	3131	4033	29
Kalimantan	19	24	26
Sulawesi	29	52	78
Bali/NTB & NTT	89	91	2
ALL SPECIES (A.U.)			
Sumatera	869,625	1,022,788	23
Java	2,399,164	2,501,330	4
Kalimantan	111,323	126,394	14
Sulawesi	675,998	958,905	42
Bali/NTB & NTT	545,308	624,046	14

* These figures are compiled from provincial figures and differ substantially from national animal population figures. Only for Java and Bali/NTB and NTT are these figures similar.

Table 2. Livestock population in Indonesia, 1974-1982 (thousands)

Year	Dairy cattle	Cattle	Water buffalo	Goats	Sheep	Swine	Horses	Village chicken	Layer chicken	Broiler chicken	Duck
1974	86	6,380	2,415	6,517	3,403	2,906	600	89,650	3,450		13,620
1975	90	6,242	2,432	6,315	3,374	2,707	627	94,572	3,903	— —	14,123
1976	87	6,237	2,288	6,904	3,603	2,947	631	97,504	4,878	— —	15,182
1977	91	6,217	2,292	7,232	3,864	2,979	659	101,686	5,807	— —	16,032
1978	93	6,330	2,312	8,051	3,611	2,902	615	108,916	6,071	— —	17,541
1979	94	6,362	2,432	7,659	4,071	3,183	596	114,350	7,007	— —	18,689
1980	103	6,440	2,457	7,691	4,124	3,155	616	126,310	22,940	25,462	21,078
1981	113	6,516	2,488	7,790	4,177	3,364	637	131,878	24,568	28,110	22,426
1982	140	6,594	2,513	7,891	4,231	3,587	658	139,787	26,312	31,033	23,861

Source : Informasi Data Peternakan (1983).
Directorate General of Livestock Services, Jakarta.

Table 4. The estimated annual loss caused by the ten most important diseases in Indonesia as identified by Directorate General of Livestock Service, Jakarta (1973)

Disease	(Economic loss (US$ in millions; 1973 values converted to 1984)
Newcastle Diseases (Po)	40.32
Fascioliasis (B, C, S, G)	32.00
Trypanosomiasis (B, C, H)	22.40
Foot and Mouth Disease (B, C)	14.72
Haemorrhagic Septicaemia (B, C)	8.64
Haemonchosis (B, C, S, G)	7.04
Ascariasis (C, Pi)	6.72
Brucellosis (C, Pi)	3.52
Cascado (C,)	3.52
Anthrax (All)	3.20

Species affected :

B	Buffalo	Pi	Pigs
C	Cattle	Po	Poultry
G	Goats	S	Sheep
H	Horses		

APPENDIX 1. A shortlist of diseases of domestic livestock in Indonesia

Key :

W	Widespread
L	Localised
end	endemic
epi	epidemic
+	low
++	moderate
+++	high
++++	very high
o	exotic to Australia

HORSE DISEASES

A. Diseases known to have some significance

Disease	Cause	Distribution	Significance
Trypanosomiasis	Parasitic	W. end	++++ o
Tetanus	Bacterial	L. epi	+ to ++

B. Diseases known to occur (significance unknown)

Anthrax	Histoplasmosis
Melioidosis	Rabies o
Babesiosis o	

LARGE RUMINANT DISEASES

A. Diseases known to have some significance (suggested order of economic importance)

Disease	Cause	Distribution	Significance
Fascioliasis	Parasitic	W. end	++++ o
Trypanosomiasis	Parasitic	W. end	++ to +++ o
Foot & Mouth	Viral	L. epi	++ to +++ o
Haemorrhagic Septicaemia	Bacterial	W. end	++ to +++ o
Haemonchosis	Parasitic	W. end	+ to ++
Ascariasis	Parasitic	W. end	+ to ++
Brucellosis	Bacterial	L. end; L. epi	+ to ++
Cascado	Parasitic	L. end	+ to ++
Anthrax	Bacterial	L. end; L. epi	+ to ++
Mastitis	Bacterial	W. end	++ to +++
Lantana poisoning	Toxicological	W. end	++
Copper deficiency	Nutri deficiency	W. end	++

B. Diseases known to occur (significance unknown)

Virological	Parasitic	Bacterial	Rickettsial	Toxicological
Akabane	Babesiosis	Actino bacillosis	Anaplasmosis	Pesticide poisoning
Ephemeral Fever	Coccidiosis	Blackleg	Eperythrozoonosis	Cyanide poisoning
Ibaraki	Cysticercosis	Colibacillosis	Haemabartonellosis	
IBR	Demodex	Infectious bovine Kerato-conjuctivitis		Mycotic
Malignant Cattarhal Fever	Echinococcus	Leptospirosis	Aetiology unknown	Dermatomycoses
Rabies o	Gigantocyle o	Salmonellosis	Jembrana disease o	Nutritionally related
Bovine herpesvirus 2	Myasis (Screw worm) o	Tuberculosis		Copper deficiency
Bluetongue	Paramphistomes			Phosphorus deficiency
	Theileriosis			

SMALL RUMINANT DISEASES

A. (Diseases known to have some significance (suggested order of economic emportance)

Disease	Cause	Distribution	Significance	
Gastrointestinal Parasitic nematodes (Haemonchosis most important)	Parasitic	W. end	+++	
Fascioliasis	Parasitic	W. end	++	o
Mange (Sarcoptic most important)	Parasitic	W. end	++	
Pneumonias	Bacterial (aetiology uncertain; *Pasteurella* important)	W. end	++	
Plant intoxication	Toxicological	L. epi	++	

B. Diseases known to occur (significance unknown)

Virological		Parasitic		Bacterial
Bluetongue		Primary Myiasis	o	Anthrax
Contagious ecthyma (Orf)		(Screw worm)		Salmonellosis
Foot & Mouth Disease	o	Secondary Myiasis		Tetanus
Rabies	o			

DUCK AND CHICKEN DISEASES

A. Diseases known to have some significance

Disease	Cause	Distribution	Significance	
Newcastle Disease	Viral	W. end; L. epi	++ to ++++	o
Marek s Disease	Viral	W. end; L. epi	++ to +++	
CRD Complex	Mycoplasma/bacterial/viral	W. end	++ to +++	
Lymphoid Leucosis	Viral	W. end	+ to ++	
Infectious Bursal Disease	Viral	L. epi	++ to +++	
Pullorum	Bacterial	U	+ to ++	
Infectious Bronchitis	Viral	U	+ to ++	
Coccidiosis	Parasitic	W. end	+ to ++	
Leucocytozoon	Parasitic	U	+ to ++	o
Ascaridiasis	Parasitic	W. end	+ to ++	
Aspergillosis	Mycotic	U	+ to ++	
Aflatoxicosis	Toxicological	E. end	+++	

B. Diseases known to occur (significance unknown)

Virological	Bacterial	Mycotic	Parasitic
Avian influenza	Mycoplasmosis	Candidiasis	Cestodiasis
Fowl Pox	Necrotic Enteritis		Haemoprotozoa
Infectious Laryngotracheitis	Pasteurellosis (Ducks)	Toxicological	
	Staphylococcosis		
Nutritionally related	TB (Ducks)	Pesticide poisoning	
Calcium/Phosphorus deficiencies			

PIG DISEASES

A. Diseases known to have some significance

Diseases	Cause	Distribution	Significance
Brucellosis	Bacterial	W. end; L. epi	+++
Erysipelas	Bacterial	L. epi	++
Hog Cholera	Viral	L. epi	++ o
Colibacillosis	Bacterial	W. end	+ to ++

B. Diseases known to occur (significance unknown)

Virological	Parasitic
Swine influenza	Ascariasias
Japanese B Encephalitis	Metastrongylus
	Sarcoptic Mange
	Cysticercosis

Bacterial

Salmonellosis
Pasteurellosis
Leptospirosis
Enzootic Pneumonia
Swine Dysentery

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