



Australian Government

**Australian Centre for
International Agricultural Research**



Management of classical swine fever and foot-and- mouth disease in Lao PDR

ACIAR PROCEEDINGS

128

Research that works for developing countries and Australia

Management of classical swine fever and foot-and-mouth disease in Lao PDR

**Proceedings of an international workshop held in Vientiane,
Lao PDR, 20–21 November 2006**

Editors: J.V. Conlan, S.D. Blacksell, C.J. Morrissy and A. Colling



ACIAR

Research that works for developing
countries and Australia

www.aciar.gov.au

2008

The Australian Centre for International Agricultural Research (ACIAR) was established in June 1982 by an Act of the Australian Parliament. Its mandate is to help identify agricultural problems in developing countries and to commission collaborative research between Australian and developing country researchers in fields where Australia has a specific research competence.

Where trade names are used this constitutes neither endorsement of nor discrimination against any product by the Centre.

ACIAR PROCEEDINGS SERIES

This series of publications includes the full proceedings of research workshops or symposia organised or supported by ACIAR. Numbers in this series are distributed internationally to selected individuals and scientific institutions, and are also available from ACIAR's website at <www.aciar.gov.au>.

© Commonwealth of Australia 2008

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without prior written permission from the Commonwealth. Requests and inquiries concerning reproduction and rights should be addressed to the Commonwealth Copyright Administration, Attorney-General's Department, Robert Garran Offices, National Circuit, Barton ACT 2600 or posted at <<http://www.ag.gov.au/cca>>.

Published by the Australian Centre for International Agricultural Research (ACIAR)
GPO Box 1571, Canberra ACT 2601, Australia
Telephone: 61 2 6217 0500; email: <aciarc@aciarc.gov.au>

Conlan J.V., Blacksell S.D., Morrissy C.J. and Colling A. (eds) 2008. Management of classical swine fever and foot-and-mouth disease in Lao PDR. Proceedings of an international workshop held in Vientiane, Lao PDR, 20–21 November 2006. ACIAR Proceedings No. 128, 98 pp.

ISBN 978 1 921434 98 3 (print)

ISBN 978 1 921434 99 0 (online)

Technical editing by Jo Mason, Mason Edit, Adelaide, Australia

Design by Clarus Design Pty Ltd, Canberra, Australia

Printing by Goanna Print, Canberra, Australia

Pig production and health in Bolikhamxay province, Lao PDR

James Conlan^{1,2,3}, Syseng Khounsy^{1,4}, Lapinh Phithakhep¹,
Manivanh Phruaravanh^{1,4}, Vilaywan Soukvilai^{1,4}, Axel Colling²,
Colin Wilks³ and Laurence Gleeson²

Abstract

Commencing in May 2002, a pig production and health survey was conducted in 16 villages of two districts in Bolikhamxay province to better understand the smallholder production system and assess the impact of infectious disease, with a particular focus on classical swine fever (CSF). The reproductive performance of sows in the smallholder sector was found to be low in comparison to tropical commercial pig production. The median litter size was 6.0 (range 4.7–6.8) and the median number of litters/year/sow was 0.8 (range 0.5–1.5). Piglets were traded out of the village production units early, with 76% of all sales comprising piglets in the 0–3-month age bracket. CSF had a major impact on village production units, affecting farmer confidence and sales patterns, and resulting in substantial piglet mortality. Overall, CSF incidence was 21 outbreaks per 100 village years, but it differed markedly in the two districts, with 38 and 4 outbreaks per 100 village years in Bolikhan and Pakading districts, respectively. A coordinated CSF vaccination program was, however, able to impact on CSF incidence in the target villages. Pig sales during disease outbreaks is a problem and facilitates disease spread within villages and to surrounding villages.

Introduction

The Lao People's Democratic Republic (Lao PDR) has a predominantly rural-based population and agricultural production is an important means of maintaining and improving livelihoods. The production of small livestock, including pigs and chickens, contrib-

utes significantly to household income. Greater than 50% of agricultural holdings raise pigs, compared to 14% raising cattle and/or buffalo (MAF 2000).

Approximately 88% of pigs are produced in the smallholder sector using labour-intensive but low-input traditional practices. Slow-growing indigenous breeds are raised and low-quality feed is used, leading to poor growth performance. Disease is also a major problem for pig farmers and classical swine fever (CSF), in particular, has been shown to be endemic and responsible for a large number of epidemic pig mortalities. Although CSF is a vaccine-preventable disease, only a small proportion (<10%) of pigs raised in the smallholder sector are vaccinated. This factor is compounded by vaccine delivery constraints, the most important being lack of an effective cold chain and inadequate vaccine stability (see Conlan et al. 2008 in these proceedings).

¹ ACIAR Project AH/2003/001, National Animal Health Centre, Department of Livestock and Fisheries, Ministry of Agriculture and Forestry, Vientiane, Lao PDR

² CSIRO Livestock Industries, PO Bag 24, Geelong 3220, Victoria, Australia

³ School of Veterinary Science, The University of Melbourne, Parkville, Victoria, Australia

⁴ National Animal Health Centre, Department of Livestock and Fisheries, Ministry of Agriculture and Forestry, Vientiane, Lao PDR

A longitudinal survey was conducted in the central province of Bolikhamxay commencing in May 2002. The primary objectives of the survey were to better understand production and trading practices and the impact of CSF on village pig production. CSF vaccination was carried out in the second half of the survey and the impacts of this campaign were measured.

Study site, village selection and survey design

Bolikhamxay province was purposely selected due to its proximity by road to Vientiane Capital (Figure

1). Approximately 80–90% of all pigs in Bolikhamxay province are raised by smallholders and 47% of agricultural holdings raise pigs (MAF 2002). The total herd size in 2005 was 54,000 head (MAF 2006).

Eight villages from each of two districts, Pakading and Bolikhan, were selected for inclusion in the survey (Figure 2). The survey commenced in these villages in May 2002, was expanded in March 2004 with the inclusion of a further eight villages, and finished in August 2006. The village selection criteria included the following: (i) pig production was important for the agricultural economy of the village and for household livelihoods; (ii) the live-



Figure 1. Study site: Bolikhan and Pakading districts, Bolikhamxay province

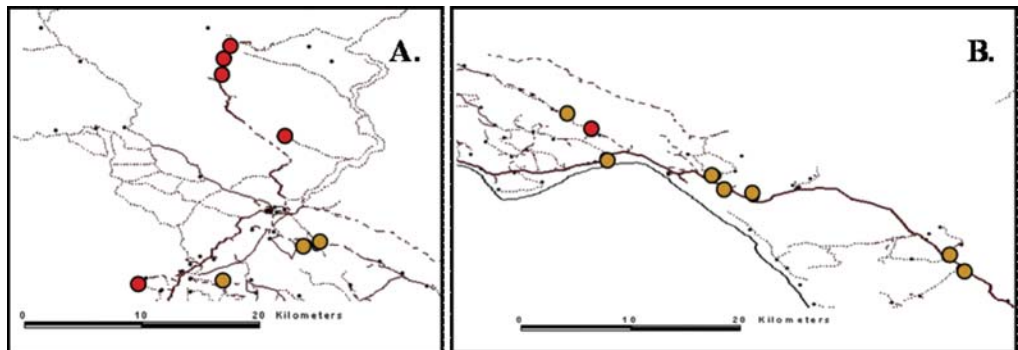


Figure 2. Study sites, A. Bolikhan district and B. Pakading district
 Note: Solid lines indicate good roads and dashed lines indicate poor quality roads. Survey villages are indicated by solid circles; orange = no CSF outbreaks, red = CSF outbreaks.

stock officers had a strong working rapport with the village administration; and (iii) the villages selected were accessible during the wet season (June to October).

The survey was initiated in each village at a meeting with village administration and pig farmers. All pig producers were recruited into the survey and the village veterinary worker or village chief compiled age-specific production and health data, which was collected by district and provincial livestock officers each month to determine reproductive performance, inputs and outputs from the production unit, and the impact of CSF on production.

Methods and results

Reproductive performance

Three animal-level indicators of reproductive performance were measured during this study, namely live-born litter size, estimates of litters/sow/year and estimated piglet mortality. The sow:boar ratio, a village-level indicator of reproductive performance, was also measured. During the survey period a total of 546 litters were observed in all 16 villages, with a median live-born litter size of 6.0 (range 4.7–6.8); in Bolikhan district the median litter size was 6.1 (range 5.4–6.8) and in Pakading district 5.8 (range 4.7–6.4). The estimated number of litters/sow/year was calculated using equation (1) (see below).

In all 16 villages the median number of litters/sow/year was 0.8 (range 0.5–1.5) and the median litters/sow/year were 1.2 and 0.7 in Bolikhan and Pakading districts, respectively. The median piglet mortality in all villages was 2% (range 0–15%). The median sow:boar ratio was 22.5:1 (range 6–81; $n = 14$) but two villages that had no boars were excluded from this calculation. The two villages that had no breeding boar did, however, have a total of 52 litters during the survey period.

Offtake and intake

During the survey period 84% of pigs left the village production units by way of sale, 4% by death and 12% for home consumption. Seventy-six per cent of all offtakes out of villages were in the age group 0–3 months. Similarly, 76% of all sales were

in the 0–3 months age group, 12% were 4–6 months old and 6% were sows. The remainder were either boars or were in the 10–12 months age bracket.

Intakes into the village production units were primarily by birth, with 76% born and 24% purchased from a nearby village, a trader or a market. Sixty-three per cent of all purchases were in the 0–3 months age group, 16% were 4–6 months old and 13% were sows. Fourteen of the 16 villages (88%) had a majority of pigs entering the production unit by way of births. Donsai village in Pakading district purchased 736 young piglets in the survey period compared to the birth of just 28 piglets from six sows.

CSF and trade patterns

In the survey period a total of 10 CSF outbreaks in six villages were identified, representing a total incidence of 21 outbreaks per 100 village years. Outbreaks were considered separate if they occurred in the same village 6 or more months apart. The results were very different for each district; in Bolikhan district the incidence of CSF was measured at 38 outbreaks per 100 village years, and in Pakading district the incidence was 4 outbreaks per 100 village years.

Sales patterns associated with CSF outbreaks and/or piglet deaths are illustrated graphically in Figure 3. Sale spikes were evident during or immediately after CSF outbreaks in four of the six villages—Ban Phonsavath, Ban Nalong, Ban Borthoun and Ban Phonethong. In all but Ban Phonethong, the observed sale spikes were associated with a large decrease in the number of farmers raising pigs (see next section). In Ban Houana and Ban Nampa, pigs were sold during or immediately after piglet deaths but the same levels of selling off were not evident.

Farmer confidence

During the course of this survey, six villages experienced CSF outbreaks. In four of these villages the number of pig farmers decreased substantially following these outbreaks. In Borthoun village the number of farmers raising pigs decreased by 40% following a CSF outbreak in June–July 2003, decreasing from a monthly average of 76 to 46. In Nalong village the number of farmers decreased by 30% following an outbreak of CSF in August–September 2004,

$$\text{litters/sow/year} = \frac{\text{total number of litters} \times 12}{\text{median monthly sow population} \times \text{number of months in survey}} \quad \text{equation (1)}$$

decreasing from an average of 104 to 72. The nearby village of Phonsavath also incurred an outbreak of CSF in August–September 2004 and the number of farmers decreased by 26%, from 109 to 81. In all these villages the number of farmers raising pigs did

not return to pre-outbreak levels by the time the survey finished. Nampa village also incurred an outbreak in May–June 2003 and the number of farmers decreased by 26%, from 43 to 31. However, dissimilarly to the other three villages, the number of farmers

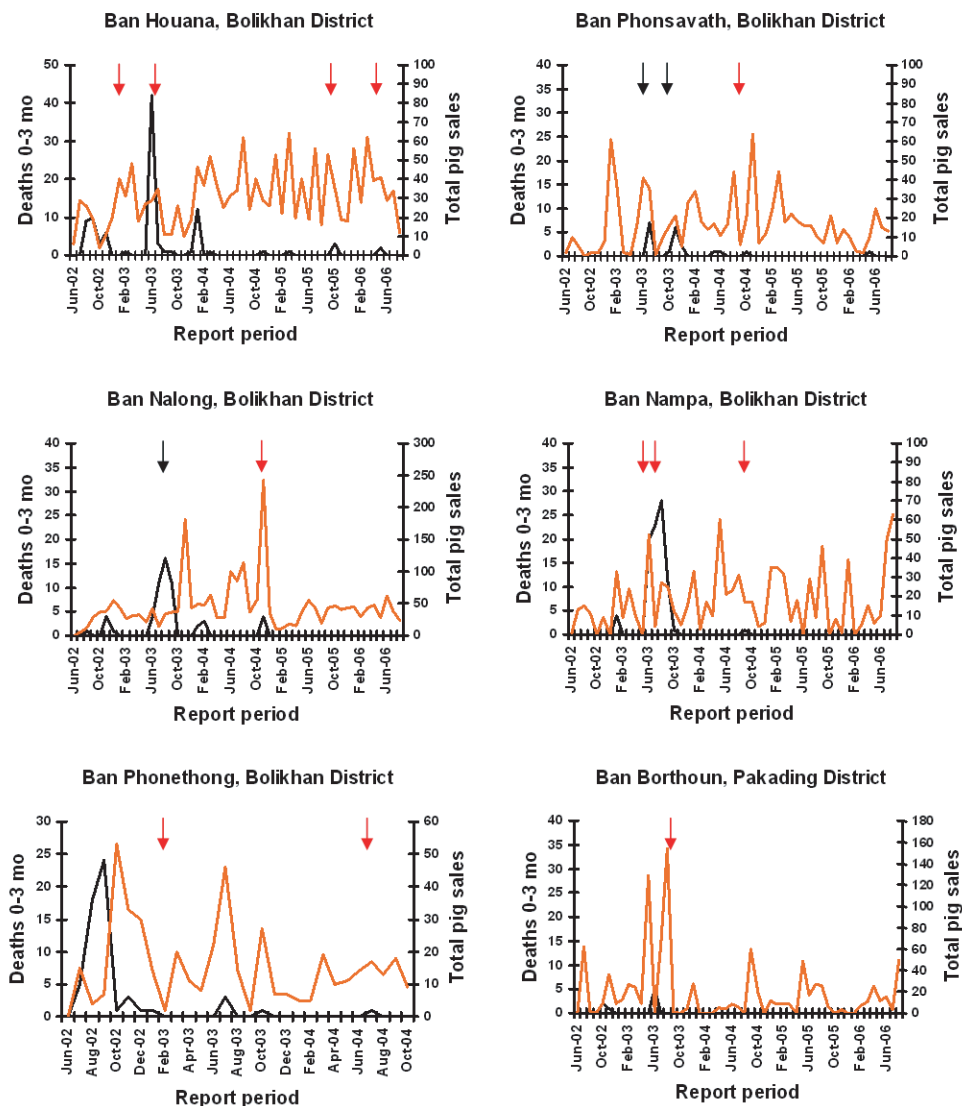


Figure 3. Piglet mortality and sale patterns associated with classical swine fever (CSF) virus outbreaks in villages in Bolikhamxay province, Lao PDR

Note: The black line represents monthly mortality of young piglets and the orange line represents total monthly pig sales. Red arrows represent when samples were first collected that tested positive for CSF virus antigen; black arrows represent suspected CSF outbreaks.

had increased to 41 in August 2006 when the survey was finished. This was despite another outbreak of CSF in August 2005.

Vaccination program

A CSF vaccination program was conducted in the 16 villages in December 2003 and January 2004. Vaccine was delivered under optimum transport conditions (see Khounsy et al. 2008 in these proceedings) to minimise any possible loss of quality. Training and awareness raising was conducted during the vaccination program to educate farmers about vaccination and places for purchase. Vaccination recommendations were made according to Khounsy et al. (2008 in these proceedings), and farmers and district agricultural extension officers were encouraged to continue vaccine delivery. The project thus provided a supporting rather than a driving role.

The vaccination program had a positive impact on the incidence of CSF in both districts. In Bolikhan district the pre- and post-vaccination incidences of CSF were 63 and 17 outbreaks per 100 village years, respectively, and in Pakading district 15 and 0 outbreaks per 100 village years, respectively.

Discussion and conclusions

The reproductive performance of the sows described in this study was poor in comparison to the commercial sector and other smallholder tropical pig sectors. The average live-born litter size in Bolikhamxay province does not compare favourably with the smallholder sector in Kenya or the Philippines, where sizes of nine (Wabacha et al. 2004) and eight (Lanada et al. 1999) were observed. The average live-born litter size in Thailand ranges between eight and 10 (Kunavongkrit and Heard 2000) and in European countries such as Denmark it is greater than 12 piglets (see Cutler 2008 in these proceedings). Good genetics and breeding is probably a substantial factor in the discrepancies seen between litter sizes in Bolikhamxay province and those in the smallholder sectors of Kenya and the Philippines. The pigs studied in both Kenya and the Philippines were predominantly native/exotic crossbreeds (Lanada et al. 1999; Wabacha et al. 2004), whereas in Bolikhamxay province the predominant breed was the indigenous black pig. The nutritional status of the sow and inbreeding are also important factors

affecting reproductive performance. A median sow:boar ratio of 22.5:1 indicates that significant inbreeding is occurring in villages, and this was further highlighted by two villages not having a recognised breeding boar at any stage during the survey. However, a low sow:boar ratio is not necessarily indicative of good reproductive management, and farmers need to understand and manage reproductive cycles and have access to boars when oestrus is detected.

A majority of pigs in the 16 survey villages left the village production unit by the age of 3 months, suggesting that the dominant form of pig production in the survey group was farrow-weaner, where each farmer owns a small number of sows and piglets are sold on to be consumed or fattened elsewhere. A number of farmers in each village also raise only growers, and some villages predominantly practise this form of production. The main reason for a majority of farmers selling pigs at this young age was limited feeding resources, and a contributing factor was fear of disease. The potential for economic gain would be greatly increased if smallholder producers could afford to hold pigs for a longer period and sell at a greater weight.

The incidence of CSF was substantially different between the two districts included in the survey, being almost 10 times greater in Bolikhan district than in Pakading district. Previous research in Lao PDR has also indicated that disease prevalence can vary quite substantially between districts (Blacksell 2001). The research presented in this paper indicates that Bolikhan district was hyper-endemic for CSF; further research is required to better understand the epidemiology of CSF at the village level. Neighbourhood infections play an important role in disease spread in Europe (Crauwels et al. 2003) and this is also likely to be the case in Lao PDR, although farming practices, pig densities and farm sizes are vastly different.

CSF outbreaks significantly impact on farmer confidence. Four of the villages experiencing outbreaks during the course of this study saw a substantial decrease in the number of farmers raising pigs following an outbreak, with 40% of farmers in one village discontinuing pig production. This research paper demonstrates that disease has a negative impact on production and trade in a village, with farmers selling off sick pigs when a disease event is recognised in order to maximise profits from a valuable yet vulnerable asset. This practice is not nec-

essarily limited to CSF; disease in general severely impedes production potential. However, the exodus of potentially infected stock from a village during an outbreak only serves to exacerbate the overall problem.

Effective CSF vaccination as a control strategy has the potential to provide benefit to smallholder pig farmers. While the cold chain continues to be a problem (see Conlan et al. 2008 in these proceedings), the research presented in this paper indicates that the incidence of CSF can be substantially decreased if a sustainable vaccination strategy is put in place and farmers are well informed.

References

- Blacksell S.D. 2001. Classical swine fever in the Lao People's Democratic Republic: Virological, epidemiological and clinical studies. PhD thesis, Department of Microbiology and Parasitology, University of Queensland.
- Conlan J.V., Vitesnik T., Khounsy S., Wilks C.R. and Gleeson L.J. 2008. Classical swine fever virus vaccine stability in Lao PDR. These proceedings.
- Crauwels A.P., Nielen M., Elbers A.R., Stegeman J.A. and Tielen M.J. 2003. Neighbourhood infections of classical swine fever during the 1997–1998 epidemic in the Netherlands. *Preventive Veterinary Medicine* 61(4), 263–277.
- Cutler R. 2008. International pig production and implications for Lao PDR. These proceedings.
- Khounsy S., Vitesnik T. and Conlan J.V. 2008. Recommended vaccine programs for village-based pig production systems in Lao PDR. These proceedings.
- Kunavongkrit A. and Heard T.W. 2000. Pig reproduction in South-East Asia. *Animal Reproduction Science* 60–61, 527–533.
- Lanada E.B., Lee J.A., More S.J., Taveros A.A. and Cotiwan B.S. 1999. The reproductive performance of sows raised by smallholder farmers in the Philippines. *Preventive Veterinary Medicine* 41, 171–186.
- MAF 2000. Lao Agricultural Census, 1998–99: Highlights. Ministry of Agriculture and Forestry Steering Committee for the Agricultural Census, Vientiane.
- MAF 2002. Ministry of Agriculture and Forestry, Agricultural Statistics of Lao PDR. Permanent Secretary Office of Ministry of Agriculture and Forestry, Vientiane.
- MAF 2006. Ministry of Agriculture and Forestry, Agricultural Statistics of Lao PDR. Permanent Secretary Office of Ministry of Agriculture and Forestry, Vientiane.
- Wabacha J.K., Maribei J.M., Mulei C.M., Kyule M.N., Zessin K.H. and Oluoch-Kosura W. 2004. Health and production measures for smallholder pig production in Kikuyu Division, central Kenya. *Preventive Veterinary Medicine* 63, 197–210.



Australian Government

**Australian Centre for
International Agricultural Research**



Management of classical swine fever and foot-and- mouth disease in Lao PDR

ACIAR PROCEEDINGS

128

Research that works for developing countries and Australia

Management of classical swine fever and foot-and-mouth disease in Lao PDR

**Proceedings of an international workshop held in Vientiane,
Lao PDR, 20–21 November 2006**

Editors: J.V. Conlan, S.D. Blacksell, C.J. Morrissy and A. Colling



ACIAR

Research that works for developing
countries and Australia

www.aciar.gov.au

2008

The Australian Centre for International Agricultural Research (ACIAR) was established in June 1982 by an Act of the Australian Parliament. Its mandate is to help identify agricultural problems in developing countries and to commission collaborative research between Australian and developing country researchers in fields where Australia has a specific research competence.

Where trade names are used this constitutes neither endorsement of nor discrimination against any product by the Centre.

ACIAR PROCEEDINGS SERIES

This series of publications includes the full proceedings of research workshops or symposia organised or supported by ACIAR. Numbers in this series are distributed internationally to selected individuals and scientific institutions, and are also available from ACIAR's website at <www.aciar.gov.au>.

© Commonwealth of Australia 2008

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without prior written permission from the Commonwealth. Requests and inquiries concerning reproduction and rights should be addressed to the Commonwealth Copyright Administration, Attorney-General's Department, Robert Garran Offices, National Circuit, Barton ACT 2600 or posted at <<http://www.ag.gov.au/cca>>.

Published by the Australian Centre for International Agricultural Research (ACIAR)
GPO Box 1571, Canberra ACT 2601, Australia
Telephone: 61 2 6217 0500; email: <aciarc@aciarc.gov.au>

Conlan J.V., Blacksell S.D., Morrissy C.J. and Colling A. (eds) 2008. Management of classical swine fever and foot-and-mouth disease in Lao PDR. Proceedings of an international workshop held in Vientiane, Lao PDR, 20–21 November 2006. ACIAR Proceedings No. 128, 98 pp.

ISBN 978 1 921434 98 3 (print)

ISBN 978 1 921434 99 0 (online)

Technical editing by Jo Mason, Mason Edit, Adelaide, Australia

Design by Clarus Design Pty Ltd, Canberra, Australia

Printing by Goanna Print, Canberra, Australia