MODEL PARAMETER JUSTIFICATION, LEAST COST ANALYSIS AND REFERENCES

A. Model Parameters

1. The Northern Region Sustainable Livelihoods through Livestock Development Project (LDP) has been successful in initiating a transformation of traditional smallholder livestock production, where animals were kept mainly as a store of wealth that could be easily converted to cash at any time, to a more market-oriented system where farmers were producing animals for regular sale to generate income. This has been achieved largely by growing feed for animals on-farm, changing the way animals are managed and protecting animals from diseases. This has resulted in a modest increase in productivity but further increases are needed to make commercial livestock production economical and sustainable for smallholder farmers. The project completion report (PCR) estimates of the LDP models were based on best practices observed in the visits to LDP villages during the PCR mission.

2. To transition to commercialization requires two changes. First, farmers need to grow, fatten and produce more animals per cycle to achieve a modest economy of scale. Second, farmers need to improve animal growth rates, which can be achieved by growing more on-farm feed and by purchasing small amounts of high-protein supplementary feed such as soybean or fish meal.

3. This pathway to commercial smallholder livestock production has occurred in neighbouring Viet Nam for both cattle and pig production, and has been documented for cattle[1]. Between 2007 (early adoption) and 2010 (farmers more experienced with cattle fattening), the characteristics of cattle fattening parameters of Vietnamese farmers changed as follows, farmers:

(i) tripled their area of feed production from 890 to 2,860 m^2;
(ii) more than doubled the number of cattle fattened per cycle from 1.5 to 3.9 animals; and
(iii) increased the growth rates from 690 to 770 g/day.

4. In Lao People's Democratic Republic (Lao PDR), similar changes have been observed in Xieng Khouang and other LDP areas for a small number of innovative farmers but have not been documented formally. Actual farm gate liveweight gains are not available as cattle are not sold on the basis of liveweight (no animal scales are available), but by using an estimate of the amount of meat on an animal. However, given the increase in value of animals over the fattening period, growth rates are not dissimilar to the situation just across the border in Viet Nam. Nevertheless, the assumption of achievable liveweight gains for the Northern Smallholder Livestock Commercialization Project (NSLCP) has been lowered to a conservative 500 g/day.

5. For pig production, the commercialization process is similar and Lao PDR's data are available from research funded by Australian Centre for International Agricultural Research (ACIAR) and implemented by National Agriculture and Forestry Research Institute (NAFRI) and International Center for Tropical Agriculture (CIAT)[2]. This project investigated potential and achievable growth rates of the local Moolath pig breed and found that growth rates of up to 700

[1] Werner Stür, Truong Tan Khanh & Alan Duncan. 2013. *Transformation of smallholder beef cattle production in Vietnam.* International Journal of Agricultural Sustainability Volume 11, Issue 4. International Center for Tropical Agriculture (CIAT). Published by Taylor & Francis. http://dx.doi.org/10.1080/ 14735903.2013.779074

[2] W. Stür, et al. 2010. *Final Report: Forage Legumes for Supplementing Village Pigs in Lao PDR.* Canberra: ACIAR. http://aciar.gov.au/publication/fr2010-21

g/day are possible with high-quality feed. Follow on research investigating a range of cost-effective feed found that by including a small amount of soybean meal in the diet of local pigs growth rates of approximately 400 g/day were achievable. For the NSLCP this figure has been lowered to a conservative 350 g/day. Commercialization of smallholder livestock production is a new concept for Lao smallholder farmers but a small number of LDP farmers are well on the way to demonstrating they are following a similar pathways as those observed in similar situations in neighbouring countries.

B. Least Cost Analysis

6. A least-cost analysis, using average incremental economic cost method, was undertaken to compare the LDP and NSLCP livestock production options for pigs and cattle. The economic opportunity cost of capital assumed at 12% was used as the discount factor over a 20-year period analysis. The results of the analysis (Table 1) show that the NSLCP option for pigs and cattle production is the least-cost option.

Table 1: Least-Cost Analysis

	Pigs		Cattle	
Item	**LDP**	**NSLCP**	**LDP**	**NSLCP**
Number of animals per fattening cycle	6	9	3	5
Incremental live weight per animal (kg)	35	45	50	75
ENPV (discounted @ 12% over 20 years)				
Incremental investment economic cost (KN thousand)	4,842	6,239	41,390	47,633
Incremental seasonal economic cost (KN thousand)	62,406	105,003	173,682	286,328
Total incremental economic costs (KN thousand)	67,248	111,242	215,072	333,961
Incremental live weight (kg)	3,045	6,050	1,120	2,801
AIEC (KN/kg)	22,086	18,386	191,957	119,227

LDP = Livestock Development Project, NSLCP = Northern Smallholder Livestock Commercialization Project, kg = kilogram, ENPV = economic net present value, KN = kip, AIEC = average incremental economic cost
Source: Asian Development Bank estimates.

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