Introduction

Food security has emerged in recent years as perhaps the most urgent issue facing humanity in the 21st century, as we ponder the challenge of whether or not we can sustain our food supply through the midcentury peak in population (Cribb, 2010). Future agriculture is a complex challenge. It requires a balance of dwindling land, water and non-renewable energy supplies including fertilizer, with increasing demand and trade in livestock and their products, in an environment of rapid urbanisation with a disconnect from food production, plus increasing risks from global financial turmoil, climate change and political fragility. No single or even group of scientists can claim to know a way to manage this complexity and to attempt to answer even some of the many questions that are raised by the rapid changes we are witnessing is intimidating. Where does animal health fit into this mix?

Livestock are vital to the livelihoods of 70% of the world’s rural poor, providing animal protein, cash income, draft power and financial security as a form of savings (Patrick and Kennedy, 2006). As livestock are central to the social and cultural fabric of rural communities, animal diseases can have very serious impacts on human health. However identifying priorities for future animal health needs is enormously difficult, posing many important questions. Should the aims of our animal health aid projects be directed at addressing the emerging risks posed by the changes in our agricultural environment? Should the focus be on potential or known...
emerging disease, transboundary diseases (TAD’s), zoonotic diseases or endemic diseases that limit productivity?
What have we been doing in recent years to improve animal health in developing countries and how successful has it been? Are we sufficiently focused on poverty alleviation or only really when it enhances potential trade from donor countries? Where does foot and mouth disease (FMD) fit into this mix, as a disease mainly of trade and therefore suggested as primarily of benefit to the commercial sector (Perry et al., 2002; Randolph et al., 2002), or should it be a priority of poverty alleviation programs? Are there more pressing agendas that are driving livestock health projects? What lessons have we learned that can assist us do better projects in the future?

Although these and many other questions need answers, what is becoming clearer is that we can expect increasing scrutiny of how and why we conduct animal health aid projects. This will include increasing demand for definition of the social and economic impacts of projects, including benefit to cost analysis and evidence of their longer term sustainability. This paper will examine some of these issues from the perspective of the author with a 20 year history of participating in Australian aid projects involved in regional animal health research and development.

Background

Roles of aid agencies

The two major government funded organisations that provide animal health aid projects from Australia to regional partners are our development agency Australian Agency for International Development (AusAID), and Australian Centre for International Agricultural Research (ACIAR) that is strongly research focused. The author has been involved in a number of animal health aid projects in several countries of South-East Asia, fulfilling different roles in each but mostly at the ‘coalface’. These include: trainer in pathology and disease investigation in Indonesia [Eastern Island Veterinary Services Project (EIVSP), 2002–2003, AusAID funded], veterinary field officer with FAO in the Philippines (FMD eradication, 1998–1999, AusAID funded), and research project leader in Lao Peoples Democratic Republic (PDR) and Cambodia (Best Practice Cattle and Buffalo Health and Husbandry, 2006-current, ACIAR funded). Some of the more recent work from these projects has been published (Bush et al., 2010; Nampanya et al., 2010; Rast et al., 2010) and some previous work has been submitted for publication (Windsor, Freeman, Abila, Benigno, Nim, Cameron, in preparation).

Participation in these projects has provided a broad range of opportunities, challenges and some spectacular experiences in achieving the ultimate goals of improving human welfare through enhancements in animal health. This paper responds to an invitation from the editor of this journal to document my reflections on these experiences and to try and identify the successes and failures. I am pleased to offer the following perspectives on animal health aid projects in this most interesting of regions, one that has progressed in our lifetime from the domination of paternalistic colonialism, through the extended conflicts of the communist-capitalist interface, to now emerge as one of the most rapidly growing regional economic power-blocks of current and future growth in the world and where 10% per annum growth in GDP is now not uncommon.

Livestock revolution

Despite the recent explosion in economic development in South-East Asia, it is largely urban-based and although a driver of broad societal change, in many instances rural areas have either largely been excluded from this development, or even compromised as rural labour has drained to urban development. This is despite the rapid escalation in demand for animal protein in South-East Asia that is part of the global ‘livestock revolution’ (Delgado et al., 1999). As per capita meat consumption in the region has increased, much of this increase in demand has been met by higher production levels within the more developed countries.

However in recent years the local supply of meat has failed to meet this demand and a considerable export trade of large ruminants from the less developed to the more developed countries in the Mekong region has emerged. This trade, much of which is unregulated, has created increasing difficulties in controlling TAD in the region (Rast et al., 2010). Significant improvements in regional animal health services are required to meet the many challenges that this expanding trade demands. As a result, animal health aid projects have been developed by a number of international agencies. Many projects are aimed at supporting the in-country institutions that are expected to manage the increasing risks to human and animal health posed by this developing trade in animals and their products. Others are directed more towards provision of improved pathways out of poverty through improved productivity for the majority of poor smallholder farmers.

Development projects are necessary

Although some promote the commercial sector as the leader of this change for consumers, it is the large development projects that are expected to make real progress in improving the capacity for delivery of the services required by smallholder producers. In developing countries such as Lao PDR and Cambodia where livestock provide up to 30% of GDP and smallholder producers
comprise up to 94% of the population (Patrick and Kennedy, 2006), a complex web of improvements to the agricultural domain is required. These include improving skills in cost-effective production technologies, appropriate infrastructure and finance, better market access, and supportive regulatory frameworks and policies that enhance and not hinder production potential. Poor consumers require lower-priced products of improved quality and quantity with minimal food safety risks. Access to and a practical understanding of knowledge-based interventions for rural populations that are generally poorly educated is perhaps the greatest of our challenges in alleviation of poverty in the rural communities of developing countries in South-East Asia.

Research is important

Underpinning the success of development projects is the necessity for research, to define problems, identify and test solutions, and then suggest the most appropriate delivery mechanisms for promulgating knowledge-based interventions that can ultimately prove to be sustainable. Animal health aid projects are needed to both improve livestock productivity and minimize risk to trade and human health. The allocation of resources to each of these priorities is a debate for funding bodies and they are often seen as competitive. However in reality they are potentially synergistic. Improved livestock productivity through better nutrition and health, including prevention of TAD’s and control of endoparasitism, is a major driver of producer and trader demand for improved marketing options, including disease risk management.

Improving large ruminant production, particularly through forages technology and infectious disease control, provides an enormous opportunity to move many smallholder producers from subsistence to small production enterprises involved in livestock trading (Nampanya et al., 2010). Importantly, this is a potential driver of trans-boundary and zoonotic disease control and potentially, FMD eradication in the region. However all too often we see the health components completely omitted from ‘production’ focused projects and *vice versa*, where ‘health’ projects attempt to work in isolation from the major concerns of the producers, that is, improving incomes through improved productivity.

**History of Recent Animal Health Aid Projects**

**Development projects**

The potential for significant contributions from animal health development aid projects was shown clearly in the 1970’s when Australian veterinary scientists through the for-runner to AusAID, assisted Indonesia to successfully eradicate FMD from that archipelago. Indonesia has continued to remain free of FMD for several decades. The success of this work encouraged the further support of projects such as the EIVSP to improve animal health surveillance capacity in the islands from Bali eastward, including Timor and others very close to the largely remote Australian northern coastal region.

Importantly, the success in Indonesia supported the provision of funds for a significant FMD control and eradication campaign in the Philippines following the incursion of a porcinophilic strain of the virus in 1994. Again, this aid project was a successful enterprise, leading to evidence of the economic benefits of vaccination programs (Randolph et al., 2002) and the eventual eradication of the disease with no cases recorded since 2005 (Windsor et al., in preparation). Importantly this campaign contributed to major improvements in the animal health surveillance and response capacity of the Philippines, with better trained farmers, traders and veterinary scientists, with several veterinary leaders progressing to senior positions in regional animal health agencies in South-East Asia.

The apparent sustainability of these investments in FMD eradication in these two countries has been remarkable, particularly in the context of the current re-emergence of widespread and serious outbreaks of FMD in many countries in the region. Both Indonesia and the Philippines share the advantage of Australia in their island geography that enhances border protection through control of sea transport of animals and product, although FMD is well known to be also transmitted by animal products transported by air services. Although animal movement controls present an enormous challenge for the countries of South-East Asia, the eradication of FMD in the Mekong is likely to be very difficult for a number of reasons, including:

1. The porous international borders where the ‘informal’ international trade of animals is ‘facilitated’ rather than regulated
2. Lack of established industry stakeholders for driving a private/public partnership that can share leadership with government and more readily institute policy
3. General reliance on vaccination strategies and a ‘top-down’ institutional approach together with substantial deficiencies in veterinary services capable of delivering rapid disease surveillance, reporting and emergency disease response capacity
4. Lack of access to vaccines
5. Low farmer awareness and knowledge of the wider impacts of disease

**Research projects**

Animal health aid research projects have also largely been a successful enterprise in the region. ACIAR has
participated in animal health research in developing countries in South-East Asia since 1983 and by 2006 had invested AUD$44 million into this program. The research has been directed at scientific capacity building because of the generally low technical capacity in partner countries (Patrick and Kennedy, 2006). Until recently, the majority of the health projects have been aimed at a single disease, either to improve diagnostic capacity (e.g. Classical Swine Fever), disease control (e.g. Newcastle Disease) or problem definition (e.g. endoparasitism). As more partner countries, such as Thailand, Malaysia and the Philippines have developed the required skills to become self-sufficient and implemented their own research and extension programs, the focus of ACIAR has been directed towards the less developed countries in the region. In 2006, the future proportion of the ACIAR animal health budget to be apportioned to each country was suggested as 65% to Indonesia, 25% to the Mekong (with emphasis on Cambodia and Lao PDR); and 10% to Papua New Guinea and Timor Leste (Patrick and Kennedy, 2006). The proportions of indicative budget by predominant theme were determined to be 51% to TAD, 20% to endemic disease and 29% to zoonotic disease.

**Estimating the Impact of Projects**

The usual approach to evaluating projects has been to conduct an economic estimate of their impacts, despite the difficulty in obtaining accurate measures of many of the project outcomes, particularly where there have been incremental gains in societal development and institutional capacity. Economic analyses depend upon the quality of data that can be very difficult to obtain, the comprehensiveness of the analyses, key questions on estimates of future markets and the assumptions used in the epidemiological modeling (Randolph et al., 2002).

**Development projects**

An economic study of the impact of eradication of porcinophilic FMD in the Philippines used cost-benefit analysis, comparing a scenario in which FMD control is maintained at pre-2002 levels with continued presence of the disease, with scenarios in which a publicly funded program achieves eradication by 2005, 2007 and 2010 (Randolph et al., 2002). Using varying assumptions regarding the development of exports of livestock products following eradication, estimated benefit-cost ratios for the investment in eradication range from 1.6 (2010, no exports) to 12.0 (2005, export of 5000 tonnes each of low-value and high-value livestock products annually), indicating eradication of FMD in the Philippines to be an economically viable investment.

The study of FMD in the Philippines also estimated that the commercial swine sector would capture 84% of the benefits generated by the public investment in eradication, versus 4% by backyard swine producers. It was noted that FMD often occurs in smallholder production systems in which the control costs to producers are often greater than the direct benefits gained, so incentives to participate in control efforts are low (Randolph et al., 2002). This finding supports the argument that the private sector should be more active in financing national FMD control efforts. However the historical reality is that the FMD eradication program achieved, through a successful public awareness program, high participation rates in disease control by smallholders who recognized that piglet mortality from FMD was a major concern to their household income and improved household hygiene and biosecurity were important (Windsor et al., in preparation). As history has shown, the estimated benefits from export income have yet to be realized, yet many benefits to smallholders that were not able to be included in the 2002 study, have been accrued through healthier pigs and enhanced household incomes.

**Research projects**

ACIAR has conducted a recent study of the impact of a range of animal health projects, including a cluster analysis of Newcastle disease (ND), internal parasites of ruminants and two case studies on important TAD (Patrick and Kennedy, 2006). From the available economic analyses of projects, it was determined that ACIAR has invested a total of AUD$12.3 million (in 2005 dollar terms) in 16 projects with a benefit cost ratio (BCR) of 18.7 (that is, for each dollar invested there is a return of AUD$18.70) but noted that this result was heavily influenced by a high expected return from the ND projects. When these were excluded, the benefits reduced to a BCR of only 2.3 : 1, producing a return on investment estimated to be over AUD$100 million from a total investment of AUD-$44.5 million. It was acknowledged that whilst the small BCR indicates that actual returns per dollar were low, this estimate does not include the required inputs of both partner countries and other research providers, nor does it include an estimate of the significant spillovers within partner countries and Australia of improved researcher capacity and institutional strength (Patrick and Kennedy, 2006).

Of note in this analysis is that considerable investments were made in large ruminant endoparasitism research, particularly on fascioliosis. Results from this work have generally been poorly adopted, probably because subsistence producers have historically been more concerned with survival of their animals than production. With
recent increases in regional exports of ruminants and signs of increasing interest in productivity and risk management by smallholder farmers, the opportunity for benefits to accrue from endoparasitism research work in the Mekong may only now be emerging.

Strategies for Successful Animal Health Aid Projects

There is an enormous list of potential factors that contribute to making some animal health aid projects more successful than others. The ACIAR review in 2006 identified that in particular, future programs need to be more focused, more integrated with overall development efforts, and sufficiently flexible to respond and contribute to the immediate and emerging issues (Patrick and Kennedy, 2006). But how is this achieved? From the experiences of participation in a range of projects, this author has assembled a checklist of key strategic components that should be considered of potential value to project design and management (Table 1). These are illustrated as follows.

Table 1. Checklist of strategies for successful animal health research and development projects in South-East Asia and ascribed value 1–5 of 5

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Value for research project</th>
<th>Value for development project</th>
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<tr>
<td>Institutional commitment of recipient</td>
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<td>Strong leadership, donor agency</td>
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<td>Strong leadership, recipient and partner</td>
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<tr>
<td>Multidisciplinary team, recipient</td>
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<tr>
<td>Multidisciplinary team, partner</td>
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<tr>
<td>Stability of staffing and succession planning</td>
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<td>Previous experience in developing country aid</td>
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<td>Alignment with other project(s)</td>
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<td>Pre-project research activities</td>
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<tr>
<td>Clear and achievable objectives and communication</td>
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<tr>
<td>Flexible design to seize opportunities</td>
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<td>3</td>
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<tr>
<td>Appropriate socioeconomic drivers</td>
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<tr>
<td>Enthusiastic farmers and extensions staff</td>
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<td>4</td>
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<tr>
<td>Training at appropriate standards</td>
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<tr>
<td>Absence of ‘hand-out’ mentality</td>
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<td>Rigour at selection of project sites</td>
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<td>3</td>
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<tr>
<td>Central and field demonstration sites</td>
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<tr>
<td>Spare capacity of staff (few projects)</td>
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<tr>
<td>Sufficient financial resources (per diem)</td>
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<tr>
<td>Regular project reviews and post-project monitoring</td>
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<td>3</td>
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<tr>
<td>Single disease focus</td>
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<td>2</td>
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<tr>
<td>Productivity focus</td>
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<td>5</td>
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Institutional commitment

The project design process should have been sufficiently rigorous and inclusive to have built significant commitments from the key leaders in the donor, recipient (host) and partner institutions. In reality much of the project design process is led by an energetic team leader in the partner institution with hopefully, important and consistent inputs by the team leader or leaders from the recipient institutions and the donor agencies. However essential to the success of the design and implementation of the project is the commitment required of the most senior staff in the recipient institution and preferably the Minister of the department(s) where the work will occur. This may require consideration of initiatives that would not normally be considered, such as the inclusion of a much wider staff attendance at the implementation workshop. Working in several provinces will also require establishing good relationships with the most senior political figures in each province. In the Philippines FMD eradication, provincial governors were invited to present the graduating certificates to the farmers trained in the ‘school on the air’ programs and this generated high level support for the project.

It is advisable for the partner leadership to be as flexible as is necessary as the priorities of all the institutions and/or senior staff can change. This may be due to external events (such as a global financial crisis when directives may be issued to cease expenditure) or internal institutional staff positioning (promotional or lateral transfers of key staff). Budget processes can be particularly difficult as even when agreements have been made and contracts exchanged, hosts or partner leaders may argue strongly for alterations in budget allocations, especially for capital items. This can also be advantageous to the project, as was discovered in the Philippines. Many locally made jeeps manufactured from recycled engines were delivered to the field by the FMD project instead of the few imported project management vehicles.

Strong leadership of donor agency

There are many competing priorities and potential projects for the senior management of the donor agency and a strong and experienced Animal Health Project Manager (AHPM) is required to influence this process for the benefit of the project and ultimately, the key beneficiaries. It is desirable that the AHPM communicate regularly with both the host and partner project leaders and their institutional leadership to ensure that the project design and delivery meets all the expectation of the institutions involved and the external stakeholders. One issue of importance may be the length of contract of the
AHPM, the usual being 5 years. This might just allow sufficient time for a project to be designed and implemented, although our experience is that the review process and documentation of outcomes is more likely to the responsibility of a new AHPM. Initially the new AHPM has no ownership of the project design and is unfamiliar with the environment and processes that initiated the project, although it could be argued that this fresh set of eyes potentially offers greater objectivity.

Strong leadership, recipients and partners
Cultural and educational differences between these two groups mean that an understanding of the meaning of ‘strong leadership’ is usually an entirely different paradigm, particularly where the recipient management has received high level training in an ‘eastern’ or ‘totalitarian’ dimension. This presents an opportunity for collaborative learning and lively discussions on how project staff and participants can best be managed and motivated. The concept of ‘shared leadership’ is often both difficult to explain and to demonstrate within an autocratic system. A useful strategy is to expose the recipient leaders to postgraduate training opportunities where these issues are delivered in a collaborative learning environment, as in the leadership and project management units in the Masters in Veterinary Public Health Management program as offered by the University of Sydney (UOS).

Multidisciplinary team, recipients and partners
If the project design is systems-based and this is generally desirable, the partner team requires discipline expertise beyond any single individual. The UOS is fortunate in having the critical mass required to meet this multi-skilling from within two Faculties. This would not be the case with many institutions and has significant budget implications as private consultants may be required to provide the deficient disciplines, at significant cost to the project. It would be unusual to expect the recipient country to have discipline partners for all members of the partner team and even if they were present, they would be unlikely to be available due to capacity limitations.

Stability of staffing, recipients and partners
Flexibility is required to accommodate the expected changes in staffing that will occur during projects that will be of 4 years duration or longer. The reasons why project staff may decide to move on are many and although each move may provoke intense reflection on the reasons, unless the project is being mismanaged, the reasons are generally of little consequence, provided the project has sufficient momentum. In research projects, this is expected as in academia, there is often a culture that encourages the movement of staff to enable broadening of experience, a feature rarely found in public service institutions.

Major development projects are usually of >5 years and is required to achieve sustainability of the project outcomes. The donor, recipient and partner institutions need to continuously focus on ensuring the project is achieving sustainable outcomes. The history of foreign animal health aid is dominated by the litter of idealistic projects that achieved little benefit other than to prolong the careers of the partners as they planned new ways to extract additional funding from the donor agencies.

As discussed below, clear and achievable project objectives that include capacity building are more critical for project sustainability than staffing issues. It is wise to include sufficient staff training and development in the project to enable junior staff to progress to leadership positions during the project. Succession planning often appears to be lacking in developing counties and in our current work there is critical shortage of the younger generation of well-educated scientists prepared to enter government or teaching institutions in Lao PDR and Cambodia. Provision of English training and scholarships for education abroad is required to enable and a critical mass of future staff that can build the local higher quality education facilities that are needed. Support from donor agencies to enable ‘foreign’ scientists to work for both short and longer term periods in these institutions is also required.

In the case of FMD eradication in the Philippines, it was always the intention that the Australians embedded in the project would be removed after a few years and that the Filipino FMD Task Force would complete the job, as occurred (Windsor et al., in preparation). This experience suggests that there is a critical competency level that should be achieved by the recipient animal health staff, ensuring there are adequate surveillance, disease investigation and disease control project management skills.

Perhaps of equal or greater importance is a critical competency level of the smallholder community. Producers need to be sufficiently aware of the importance of disease prevention, detection, reporting and response, such that emergency procedures can be instituted if a TAD should be diagnosed. The challenge of improving TAD control in developing countries is that unlike productivity interventions where weight gains are observed and additional revenues are raised, producers need to be educated to focus on demanding interventions that minimize the risk of diseases and loss of revenues. This is more readily achieved where there is a recent history of outbreaks of haemorrhagic
septicaemia (HS) or FMD, and smallholders can see the benefits of vaccination (Rast et al., 2010). However to move producer awareness from the ‘technical solution’ of vaccination to the ‘adaptive change’ of improved biosecurity is extremely challenging. For poor smallholder farmers, this requires education, preferably through experiential extension programs that can create productivity drivers of improved health risk management.

**Previous experience in developing country aid**

One question that is often asked is what level of previous experience of developing country aid projects is necessary prior to their committing to the project? This is particularly important for staff to be embedded in-country and daily challenged by cultural and environmental uncertainties including isolation, language difficulties, heat and humidity, typhoons, floods, food safety issues, physical and mental ill-health and the stress of constant travel. These challenges can be overwhelming, particularly for young families. In addition issues involving evidence of corruption, exploitation, criminal activity, poor attitudes to work and ethical concerns regarding ‘incentive payments’ and gender issues can undermine morale. Selection of appropriate persons for this work is important and should focus on their previous history in meeting formidable challenges and resolving problems, particularly those involving personal conflicts.

**Alignment with other project(s)**

Our recent experience in Lao PDR has shown there is an enormous benefit in aligning a research project with a development project where some of the objectives of both projects are shared. In this case, a large (AUD$20 million) Livestock Development Project (LDP) to alleviate rural poverty in five northern Lao PDR provinces, commenced in 2007 and will continue until 2014, managed by the Department of Livestock and Fisheries (DLF). In 2008, a small (AUD$0.62 million) 4 year ACIAR project entitled ‘Best Practice Health and Husbandry in Cattle and Buffalo, Lao PDR’ commenced, working in three of these five provinces and involving a collaboration of the DLF with the UOS. The research project aims to identify the key knowledge-based interventions required to build the capacity of large ruminant industry stakeholders and includes farmer knowledge and trader surveys plus a 3 year longitudinal survey of morbidity, mortality and production in six villages, comparing the impacts of a series of interventions in 3 ‘high intervention’ compared to 3 ‘low intervention’ villages. As results have emerged from the research, they have been transferred through a ‘train the trainer program’ described below.

Outcomes from the applied research at this stage include: enhanced vaccine coverage of 65% for HS, improved vaccination capacity with 30% of farmers having knowledge of animal injection, identification of the risks of young calves to and need for treatment for *Toxocara vitulorum*, identification of *Fasciola gigantica* as an endemic problem in adult buffalo, better nutrition with 1000 ha of forages planted and silage technology introduced, improved animal housing for fattening, introduction of animal breeding management through castration of males to minimize inbreeding, use of animal identification, development of a girth tape to measure live-weight gain and assist farmers in estimating values of sale animals (Bush et al., 2010) and marketing training with visual estimation of body condition score and live-weight and an understanding of market demand of animal type.

The co-location of the small research project with a large development project and inclusion of a research and extension training program, is a robust model to enable the timely introduction of new learning across a broad region, offering many opportunities for both projects to produce positive impacts in the targeted villages.

**Pre-project research activities**

The importance of pre-project research activities is illustrated by an outline of the lead up to the above ACIAR projects in Cambodia and Lao PDR. Defining the problems for these projects to address required a deep understanding of the constraints to large ruminant production systems in the region and ACIAR commissioned the UOS to conduct a short research activity (SRA) to identify research priorities for the development for the beef industry in Cambodia and Lao PDR (Windsor, 2008). The SRA examined previously published (Wilson, 2007; Millar and Photakoun, 2008) and unpublished survey work on the northern Lao PDR smallholder farming systems (W. Stur and J. Miller, personal communication) and conducted surveys in three provinces in each country (Cambodia and Lao PDR) on farmer attitudes to change and their knowledge of health and husbandry.

The SRA examined both the economic drivers for large ruminant production, the question of farmer receptivity to project interventions and the significant constraints to large ruminant production. In addition to FMD and HS, these included endemic diseases; poor husbandry and management practices; lack of financial skills of farmers, poorly trained field staff; inadequate resources and difficulty of access, particularly in the northern provinces of Lao PDR where many villages are remote and 80% of the land is mountainous. The SRA process more clearly defined the need for applied research to identify which of the many potential interventions that could address these constraints.
Clear and achievable objectives and communication

Identifying achievable objectives, when faced with a complex web of health, production, societal and economic constraints as described, is a major challenge and requires broad dialogue and reading. For research projects, the SRA process provides a more informed strategy for project development, as discussed (Windsor, 2008). The SRA defined a role for ACIAR research as assisting the definition of ‘best practice’ interventions that can potentially be ‘scaled out’ through existing livestock development projects, for enhancing large ruminant production systems in each country. The SRA process led to a large ruminant health and husbandry research project proposal for each country, based around similar methodology. Clear and achievable project objectives are even more important for development projects where the project design process is more complex and the budget implications of poor decisions more dramatic.

Regular communication is required between all the project stakeholders, with annual workshops, regular training or other forums for sharing of learning advised. Consideration of the cultural differences, language, education and availability of technologies for the range of project participants is necessary. A very useful recent initiative for co-sharing of information between large ruminant livestock projects in the Mekong has been the development of the ‘forages alliance’ enabling regular meetings of research and extension staff involved in the various projects.

Flexible design to seize opportunities

Serendipity is a powerful friend of researchers, provided the research team is flexible enough to seize the opportunities as they are presented and have the appropriate contingency budgets in place. One of the more pleasing aspects of the current research is the ability of the recipient partner to foster the enthusiasm of final year veterinary students from Australia, keen to participate in the project. Despite having a pre-planned project outline, it is often the case that a disease outbreak or other needs for field visits will emerge that will alter the planned research, providing much needed technical input to projects that have limited budgets.

Appropriate socioeconomic drivers

As described, the SRA process identified the emergence of a rural development initiative in Lao PDR that is more appropriately considered an attempt to implement significant social change, moving rural communities from smallholder subsistence where large ruminants are mainly a store of wealth and draft power, to an intensive disease-free production-focused system.

Through numerous meetings, field visits and workshops, the SRA confirmed that momentum was building for changes as a consequence of the increasing adoption of forage technology by smallholder farmers, enabling large ruminant fattening for the expanding demand for better quality red meat in the region. Increasing returns from this trade has provoked interest by early adopter farmers in animal health risk management to protect the increasing value of their emerging large ruminant enterprise. It was identified that this presented an opportunity to address vaccination and biosecurity needs that will assist TAD control at both the village level and through the supply chain, particularly for FMD.

Engaging smallholder farmers in these initiatives through assisting them enhance their large ruminant productivity is now considered a major socioeconomic driver of poverty alleviation. When village leaders are asked what the ACIAR research project has done, where FMD is endemic, control of FMD through vaccination is usually the highest priority outcome, particularly where traders are preferentially targeting the project villages due to knowledge that these animals are vaccinated.

Enthusiastic farmers and extension staff

Considerable effort can be put into identifying the best village sites and extension staff to work with the project. These decisions are mainly the province of the recipient country project leaders and their teams. Projects are generally slow to gain momentum as apart from the early adopters of which there are usually only a small proportion in the village, the majority of villagers prefer to wait and see what is delivered and what benefits they accrue from the project. In Laos we have observed that in villages where we applied vaccination only and not an extension package of health and husbandry training, the villagers are generally aware of what is required to make progress with livestock productivity but there is considerable inertia and reluctance to change. This illustrates the importance of training farmers and extension workers.

In Cambodia, the research team applied a substantial farmer training package and we have seen a spectacularly exponential increase in adoption of forage technology in the three seasons since the seeds were first planted. There are likely to be several reasons for this, including the labour saving advantage and superior quality of forages that reduces the considerable effort required to ‘cut and carry’ sufficient feed from the ‘paddy line’ for the cattle. Forages have rapidly spread beyond the project sites as Cambodian smallholder farmers have seen a means of addressing the year-round deficit of energy for cattle.
There is now increasing interest from farmers and extension workers to learn more about how best to utilise these forages when feeding animals, including conservation of excess forage as silage to help fill ongoing feed gaps.

Training at appropriate standards

The training needs of staff in each country will differ and as described above, they were very significant in Lao PDR where many young and poorly trained extension workers were employed in the DLF. None have had veterinary training as this is not available in Lao PDR. The training consisted of a series of seven workshops conducted through 2009–2010, supported by the Crawford Fund. The workshops involved 26 LDP project extension staff, currently working in 18 districts and 300 villages involving over 8000 households, with plans to extend to 15 000 households. Topics covered in training have included biosecurity and animal health, nutrition, reproduction and marketing, with workshop outcomes identifying interventions for testing in the projects. It was found that the more highly skilled staff in Cambodia were more than happy to also receive this training, and have been better able to ‘extend’ the information as they had better initial training and recent experience of relevance through their participation in previous ACIAR projects.

Absence of ‘hand-out’ mentality

This issue is mentioned as ‘aid dependence’ is often discussed in relation to such projects and it is to be expected that ‘hand-outs’ will be requested from both staff and farmers participating in the project. In the experience of this author, this is of less concern than is often suggested. There may be several reasons for this, including the nature of the projects, the capabilities of the recipient project leaders and the strategy of explaining clearly at the beginning of the project with frequent reminders, the objectives of the project are aimed at co-learning to increase knowledge, rather than provision of resources. However it is wise to request that the project is not placed in a site where the recipients have had many experiences of generous projects and expect everything to be done for them.

Rigour at selection of project sites

The partner and recipient project leaders need to agree on the selection criteria for projects sites and smallholder participants, recognising that these will be ‘best case’ considerations and that compromises may have to be made. As described above, a pre-project SRA can enable detailed surveys to be conducted of prospective project sites and enables informed choices of appropriate sites with the most willing participants.

Central and field demonstration sites

Where technologies are implemented that can readily be extended by visual demonstration, such as the growth and harvesting of forages, central and field sites are advised. Field sites in the vicinity of the project villages enable cross-visits by farmers to be readily achieved and provide a source of information and in the case of forages, seeds and stems for distribution. The central site, as in a field research station, enables additional experimentation, such as plantings of less certain species, trials with different forage storage mechanisms, feeding trials and many nutritional and health research opportunities. Importantly, this site provides a useful site for the training of staff and for demonstration of research to project visitors and senior staff. This has been a very useful adjunct to the current research program in Cambodia that is not available to the Lao PDR project.

Spare capacity of staff (few projects)

One of the major issues for project development is that many institutions in the developing countries are at maximum capacity for absorption of projects. With limited numbers of senior staff in the recipient country and a multitude of potential donor countries keen to participate, it can be very confusing for all parties involved to achieve an understanding of mutual expectation. Duplication of effort is also a potential consideration, although experience has been that the needs are so great, the limiting factor is finding the appropriate recipient country staff with the capacity to be involved at the level needed.

Sufficient financial resources (and per diem)

The importance of careful budgeting design and management that includes contingencies has been mentioned. One factor of concern can be the international exchange rates used in the initial design. We have seen through the course of the last few years, this to work as both a negative and more recently a very positive factor as the Aus$ initially weakened and then significantly strengthened.

A ‘given’ in aid project work is that generous ‘per diems’ or incentive payments are a necessity for full participation of staff involved in the project and this is not surprising considering the salary rates of many staff involved. Payments may also be required for smallholder farmers, although non-cash incentives may also be welcome and may be deemed to be more appropriate,
such as free de-worming, vaccination or other veterinary services, or even project souvenirs.

Regular project reviews
As there are multiple stakeholders in animal health aid research and development projects, regular reviews are required to not only manage the enormous data and outcomes of the project but importantly, to manage the relationships between the relevant institutions. The advantage of smaller research projects over development projects is that they are inherently evidence-based, with outcomes generally more clearly definable, measureable and reportable. Participation of academics in the leadership group will usually drive efforts to achieve publishable results and the reviews will often be less about the budget and more about the technical achievements.

Post-project monitoring and review to ensure sustainability of the project outputs is highly desirable, but usually difficult to achieve especially if donor, recipient and partner move onto other priorities. Sustainable research project outputs are more achievable if the research is closely linked to a development project, particularly if the research team (usually from partner and recipient staff) is involved in training the development project extension staff. This provides an opportunity as the project progresses, for research findings to be implemented into development extension strategies, accompanied by measures of farmer knowledge to provide evidence of progressive learning by the participating smallholders. A current example of this is occurring in northern Laos (Nampanya et al., 2010).

Continuity of the research team may also contribute to sustainability of outputs together with working with the same institutions, teams and leaders. This provides an opportunity for research outcomes from previous projects to be incorporated into future projects, even though the priorities of the research work evolve. A current example of this is our work in Cambodia on cattle health and husbandry. This project is examining if productivity improvements can drive a demand for disease risk management, resulting in improved disease control through vaccination and biosecurity (Windsor, 2008). The methodology used in this project evolved from a previous project on fasciolosis led by the same recipient research team. Although outcomes from the fasciola project have not yet been widely adopted, probably due to lack of focus on productivity by the majority of smallholders, investigations for fasciola are routinely performed in new project sites and disease management incorporated. It is expected that as producers move from subsistence as described and more fattening of large ruminants occurs, the importance of the fasciola project work that has shown significant BCR’s at the village level will finally be more widely adopted.

Single disease focus
As discussed, ACIAR has generally moved from research with a single disease focus such as improving laboratory diagnostic methods, to projects where the research has broader implications, including improving productivity. However animal health priorities remain dominated by the importance of TAD’s and for large ruminants in South-East Asia, this means FMD and HS. However FMD research is not simply a single focus disease but has important implications for the provision of veterinary services in countries and the region due to the well recognised impact of FMD on trade.

Less understood is the impact of the disease at the village level. FMD causes significant reductions in the value of large ruminants for sale, loss of draft power, reduction of weight, lower local consumption of meat and loss of income security due to use of large ruminants as the major store of rural wealth (Khounsy et al., 2008). FMD is endemic in Cambodia and Lao PDR with major outbreaks occurring commonly, particularly in recently recognised ‘hotspots’ where recurrent outbreaks are recognized, such as Xieng Khuang in Lao PDR (Rast et al., 2010). Plans for the eventual global eradication of FMD (Rweyemamu et al., 2008) require a concentration of effort on FMD eradication in the Mekong region and a roadmap for the regional eradication of FMD has been developed by the SEACFMD initiative (R. Abila, personal communication). Enhanced veterinary services that can lead to effective quarantine, surveillance, vaccination and public awareness programs aimed at delivering an emergency TAD preparedness and response system, are desperately needed in the Mekong region.

Productivity focus
In the FMD eradication program in the Philippines, the public awareness program became a very powerful mechanism to improve smallholder understanding of biosecurity (Windsor et al., in preparation). However many smallholders that participated in the ‘school on the air’ training program for FMD eradication awareness, commented that they would have been very happy (or preferred) to have also received training in nutrition and other interventions that could enhance their pig husbandry skills. Increasingly it is being recognised that increased productivity is a key driver of adoption of risk management and improved animal health (Nampanya et al., 2010). It is advisable to at least consider whether productivity interventions can be included in the animal...
health project to increase the participation rate and sustainability of the project. We have noted that producers who have witnessed the benefits of improved nutrition are far more receptive to vaccination and endoparasite control. Failure to enhance nutritional options may well be the main reason for the poor uptake of health strategies including endoparasite control, as was observed in previous ACIAR projects (Patrick and Kennedy, 2006). Enhanced productivity is likely to drive improved health management and eventually, it is hoped, improved animal welfare in South-East Asia.

Conclusions
With increasing prosperity and demand for red meat in recently developed countries, the emerging but largely unregulated trade in large ruminant livestock and their products from developing countries in the Mekong region, poses enormous risks of TAD epidemics in South-East Asia, as is currently occurring. However there is considerable potential for substantial improvements in large ruminant production and health through implementation of appropriate knowledge-based interventions, including forages technology and control of infectious diseases. These interventions can potentially move the largely rural smallholder populations of Lao PDR and Cambodia from subsistence to a productivity focus as they engage in the so-called livestock revolution. This paradigm is offering a new pathway for rural poverty alleviation in the region.

Large development projects have been implemented in the Mekong region to facilitate the process of livestock development. However research is needed to define problems, identify and test solutions, and then provide the most appropriate delivery mechanisms for promulgating the most sustainable interventions for improving livestock productivity. Animal health aid projects are particularly needed to minimize risk to trade and human health and enhance the capacities of countries where there are significant gaps in the provision of veterinary services. Improving large ruminant production, particularly through forages technology and infectious disease risk management including village-level biosecurity, provides a potential driver of FMD control and eventual eradication in the region. An extensive list of potential factors is discussed that may contribute to making some animal health aid projects more successful and sustainable than others. These include ensuring that future programs are more focused, integrated with development efforts where possible, are sufficiently flexible to respond and contribute to immediate and emerging issues, and where possible, enhance productivity so that socioeconomic impacts for smallholder producers are achieved. In this perspective on issues involved in Australian animal health aid projects, a checklist of strategies to consider when designing and managing such projects is provided.

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