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Response to Reviewers: Response to Reviewer #1 comments:

1a. We have referred to the participatory research and extension approach used in this case study as following accepted philosophies and methods of Pretty et al, Robert Chambers, Scoones and Thompson and Bainbridge et al. The focus of the paper is not compare this approach with other extension systems across the globe but to show how technologies can be scaled out effectively using participatory extension. I have included an additional reference that does compare extension systems in Asia (Van den Ban and Sumatra 2006)

1b. We have linked the research to adoption literature on page 5 (Scoones and Thompson, Cary et al and Pannell et al) and again on page 12 and 13 (Millar and Curtis 1999, Pretty, Chambers, Pannell et al, and Kiptot et al. ). The message being that scaling out is unlikely to occur unless attention is paid to local adaptation and the social context.

1c. We have added more references and information on the participatory methods used on pages 6 and 7.

2. We have explained on page 6 that districts and villages were not selected on the basis of land tenure but their proximity to livestock markets and presence of livestock numbers. I've also explained that no credit was offered so the scaling out has occurred purely on farmer interest in the technology (ie no handouts other than seed and advice). Laos is politically stable at present so not a factor. Scaling out to poorer provinces has been explained further on page 11 with reference to preliminary impacts.

3. We've created a new section on Impacts (page 7-8). The project had minimal input to village planning (compared to NGOs) so was not a key driver and not taken up by all villages.

4. We have changed the wording to be more prescriptive but in a general sense as contexts are so diverse. The skills provided by mentor extension staff have been added. The subject of capacity building of extension staff is being written up for another journal paper. I've mentioned the partnership between Lao govt, CIAT and Australian govt but decided it was not appropriate to mention skills and backgrounds of individuals. We have identified that partnerships with NGOs needs further development and evaluation in Laos.
Reviewer #3 comments:

1. Scaling up is defined and referred to in the background literature, then discussed in terms of institutional support in the discussion.

2. The issue of livestock health is discussed in more detail in another journal paper, Millar and Photakoun (2008). Livestock development and poverty alleviation: Revolution or evolution for upland livelihoods in Lao PDR. International Journal of Agricultural Sustainability Vol 6 (1).

3. Low literacy in women refereed to on page 8.

4. Wording changed

5. Significant impacts explained on page 7.

6. Grammar changed
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Dr Joanne Millar is a social scientist with expertise in action research for natural resource management, agriculture, rural development and conservation management. Joanne's research focuses on understanding landholders, farming families and community engagement processes in order to improve rural livelihoods and environmental management in Australia and South East Asia.
Strategies for scaling out impacts from agricultural systems change: the case of forages and livestock production in Laos

Abstract

Scaling out and up are terms increasingly being used to describe a desired expansion of beneficial impacts from agricultural research and rural development. This paper explores strategies for scaling out production and livelihood impacts from proven technologies. We draw on a case study of forages and livestock production in Laos, a South East Asian country undergoing rapid economic and agricultural change. A facilitated learning environment stimulated farmers to adapt forages, livestock housing and animal health practices to their own situations (scaling out). Regular follow-up visits and on the job mentoring for extension staff provided institutional support (scaling up). Within five years, the number of villages and households using forages and fattening livestock had increased six fold, with a 50% reduction in the time required for farmers to get significant benefits. The paper concludes that scaling out positive impacts from systems change requires field tested and proven technologies, evidence of significant livelihood impacts, fostering of local innovation, competent field staff, effective peer learning and ongoing institutional support.

Keywords

Scaling out, agricultural technologies, forages, livestock production, Laos.

Acronyms used

CIAT International Centre for Tropical Agriculture
CGIAR Consultative Group on International Agricultural Research
CSU Charles Sturt University
FSP Forages for Smallholders Project
FLSP Forages and Livestock Systems Project
IIRR International Institute for Rural Reconstruction
LAO PDR Lao Peoples Democratic Republic
NAFES National Agriculture and Forestry Extension Service
NGO Non government organisation
PRE Participatory research and extension

Introduction

Scaling out and scaling up of improved agricultural technologies and practices are terms increasingly being used to describe a desired expansion of beneficial impacts from agricultural research and rural development. Governments, citizens and donors across the globe want to see evidence that their investment in agricultural research and development leads to significant and widespread livelihood improvements amongst poor households (Pachico and Fujisaka 2004, pp. vii-viii).

Agricultural scientists and development specialists often face difficulties in moving beyond trialling technologies with farmers on a small scale, to enabling livelihood impacts across larger numbers of households, villages and districts (Harrington et al. 2001; Snapp and Heong 2003). In the past, the
assumption was that if technologies or practices proved useful to farmers, then technology diffusion would occur naturally via peers, family members or farmer associations (ie it would scale out by itself). While this can happen with simple, low cost and easy to use technologies, the adoption and scaling out of complex management practices and farming system changes is more problematic (Rogers 2003; Carter and Currie-Alder 2006; Pannell et al. 2006).

Too often, little attention is paid to understanding how introduced technologies impact on people’s lives and how they fit into a whole farm, livelihood and community system. If scientists are unaware of the subtle social, cultural and environmental differences between communities, then negative impacts from interventions can occur (Harrington et al. 2001; Snapp and Heong 2003). Numerous cases exist of social inequities, environmental degradation and loss of cultural connections arising from inappropriate technologies and scaling out processes (Pretty 2002; Anderson et al. 2006).

Negative impacts aside, more common outcomes of attempts to scale out complex or risky technologies are low farmer adoption or a decline in farmer participation over time (Fujisaka 1994; Walters et al. 1999; Cary et al. 2002; Kiptot et al. 2007). Furthermore, if the farmer-scientist learning process is not well facilitated or the capacity of organisations to support farmers in adapting technology is lacking, then communities soon lose interest (Anderson et al. 2006; Carter and Currie-Alder 2006).

The short term nature of many projects and the lack of impact evaluation often results in lack of learning as to why farmer uptake has been slow or why communities have been resistant (Douthwaite et al. 2007). A project may appear successful if incentives encourage early participation and adoption. However, if farmer participation is only because of incentives, the learning and commitment will not be sustainable (Kiptot et al. 2007). Ensuring there are significant, meaningful and long term positive impacts arising from agricultural systems change, requires planned and facilitated strategies.

The purpose of this paper is to explore strategies for scaling out useful technologies and their positive impacts on agricultural systems. Different definitions and dimensions of scaling out and up are drawn from literature including factors influencing the process in varied contexts. We then describe our experiences with the scaling out of forages and livestock production and the associated household impacts in Laos (also known as Lao Peoples Democratic Republic or Lao PDR), a South East Asian country undergoing rapid agricultural systems change. The paper concludes by discussing and recommending key requirements that need to be in place for successful scaling out of impacts from agricultural system changes.

Definitions and dimensions of scaling out and up

Scaling out and scaling up are often used interchangeably in rural development literature. In this paper we follow the definitions set by the Consultative Group on International Agricultural Research NGO
Committee which refers to scaling out as the geographical spread of a technology, practice or systems change over time. Scaling up refers to expanding beneficial institutional and capacity building practices within and across organisations and networks at local to international levels (Pachico and Fujisaka 2004 pp. 3-4). Both mechanisms are needed to achieve widespread and significant systems change.

Origins of definitions in agricultural development

The terms scaling out and scaling up first appeared in rural development literature in the 1990s in relation to expanding the practice of participatory research and extension (PRE). As participatory approaches began to prove effective at a local level, development organisations began to institutionalise learning and methods on a larger scale in order to cover more projects and locations (Thompson 1995; Bainbridge et al. 2000; Chambers 2005). The aim was for PRE and sustainable agriculture to become embedded within norms of agricultural policies and practice in order to benefit larger numbers of people (Scoones and Thompson 1994; Pretty et al. 2005).

For national and international agricultural research and extension organisations (mostly government and donor driven), the notion of scaling out and up provided a convenient way of explaining their desire to achieve more widespread impact from proven technologies (after trialling with farmers). The NGO committee of the Consultative Group on International Agricultural Research (CGIAR) held a workshop in 1999 at the World Bank in Washington DC to discuss scaling out sustainable agriculture initiatives.

The objective of scaling out and up was defined as leading to more quality benefits to more people over a wider geographic area more quickly, more equitably and more lastingly (CGIAR 2000). At the meeting there was also general agreement that,

‘Scaling up is not just about technologies but is more a development process of scaling up a vision starting from that of the farmers. It is a process for expanding learning, and organisational or community capacities to identify and solve new and different problems, and adapt to changing situations. It is expansion resulting from not just having more numbers and larger areas but also from evolving roles and responsibilities that go with improved capacities and diversification of benefits.’ (Gonsalves 2008)

Hence, the quality of the process and impacts from scaling out were deemed as important as the quantity of impact, particularly in terms of social equity and sustainability.
Dimensions of scaling out and up based on experiences

The same committee held another workshop in 2000 at the International Institute for Rural Reconstruction (IIRR) to examine specific themes and dimensions of scaling out and up established at the first workshop. These dimensions included having,

- Adaptable technologies (ie sparks of interest or entry points)
- Local capacity building (based on existing local dynamics and participatory approaches, sense of ownership and accountability)
- Effective management (start small, use step by step approach and keep simple)
- Partnerships (involvement of multiple stakeholders and learning alliances)
- Indicators and measures of success
- Market development (access and viability)
- Policy support
- Financial sustainability (CGIAR 2000)

A flurry of discussion and debate followed in the literature on institutional and methodological requirements for effective scaling out and up based on shared experiences from around the globe. Drawing from a range of case studies found in the literature, the authors concluded that success factors appear to be;

1. Clear and tangible benefits for farmers and target groups
2. Strong leadership and facilitation over the long term
3. Peer learning
4. Support from officials and donors
5. Presence of market drivers
6. Availability of credit and security of land tenure
7. A strong civil society
8. A history of relevant experience in the country (CGIAR 2000)

For example, where technologies have addressed genuine or immediate farmer problems and concerns such as livestock feed shortages, declining crop yields or damaging pests (eg Stur et al. 2002b; Ojem et al. 2006; Douthwaite et al. 2007), farmer uptake and adaptation of the technology has been greater than where benefits are more diffuse and long term (eg Pannell et al. 2006; Kiptot et al. 2007; Mendham et al. 2007). However, if farmers are engaged in a facilitated, interactive learning environment which enables them to play around with the technology within their specific environments (ie to innovate), compare results with their peers and see impacts as they emerge, then their initial judgement of the technology can change (Pannell et al. 2006; Bentley et al. 2007).
Some additional factors influencing the scaling out process were cited as socio-economic and cultural diversity across communities or areas, the quality of community participation, communication between development partners, and enabling government policies and resources (Gundel et al. 2001; Kolavalli and Kerr 2002; The World Bank 2003; Gillespie 2004).

For poor farmers living in highly diverse environments such as the uplands of South East Asia, the tenuous nature of their existence calls for careful adaptation of technologies using a problem solving approach. As reported from the IIRR workshop, ‘Scaling out is not just replication but adaptation and learning that is flexible and interactive ... Scaling out is really about people—of communicating options to people, of a balance between introducing options and farmers' ability to adapt to changing contexts.’ (CGIAR 2000). If research scientists and extension workers are working towards scaling out useful technologies, they need to have a sound understanding of how farmers learn, how they experiment and innovate, and how local decisions are made in the family and social structures (Scoones and Thompson 1994; Cary et al. 2002; Pannell et al. 2006)

Although access to markets, land, credit and political stability do influence the rate of scaling out, the absence of these factors does not necessarily preclude farmers benefiting from suitable technologies and systems changes particularly if the resulting livelihood impacts are significant. In the following section, we describe the scaling out process and methods developed for expanding forage and livestock production technologies in South East Asia and the uplands of Laos. The impacts in terms of livestock production, system changes, livelihood benefits and capacity building are highlighted.

The process, methods and impacts of scaling out of forages and livestock production systems in South East Asia

The foundations of forage participatory research in South East Asia

The scaling out of forages for livestock production in Laos followed a five year program of participatory research to identify and integrate robust and broadly adapted forage varieties at 19 sites across South East Asia (Stur et al. 2002b). Known as the Forages for Smallholder Project (FSP), managed by CIAT (International Centre for Tropical Agriculture) and funded by the Australian government, the project formed close partnerships between international, national and local forage researchers, extension workers and farmers. Using a problem solving and action learning approach, the FSP evaluated over 100 forage species and varieties on farms. By 2000, more than 1750 farmers had used 40 forage types at sites in the Philippines, Indonesia, Laos, Malaysia and Vietnam (Roothaert and Kaaria 2004).

Scaling out had not been an objective of the first phase of FSP, so the positive farmer response to adapting forages into their farming systems encouraged CIAT to continue expansion and consolidation of the technology. Important elements for the second phase included capacity building of local...
facilitators in each country, use of participatory approaches, formally establishing local forage multiplication sites and developing a regional network for sharing results (Roothaert and Kaaria 2004).

Scaling out forages for livestock production in the uplands of Laos

Laos (also known as the Lao Peoples’ Democratic Republic, Lao PDR) is a sparsely populated Southeast Asian country, situated in the Mekong River Basin with fertile river plains and rugged mountainous terrain. Total area is 236,800 square kilometres with an estimated population of 6.5 million, growing rapidly at 2.37% per year (CIA 2008). The economy is also growing fast at 7% due to increasing hydro-electric power production, mining interests, tourism and agricultural production. The majority of people (80%) rely on agriculture for their livelihoods, which contributes around 40% of GDP (CIA 2008).

However, many of these households are subsistence farmers who rely on shifting cultivation to grow upland rice and crops in remote upland areas. Poverty is more pronounced in the uplands than lowlands due to a lack of infrastructure and services, deforestation and land degradation, periods of food shortage and lack of opportunities to create farm or off farm income (GOL 2005). Livestock are an important component of household income and security, providing meat for home consumption, draught power and manure, cash income (up to 65%), and as a safety net for health, education and weddings (Stur et al. 2002a).

Livestock production in Laos contributes around 15% to national GDP and 33% of agricultural GDP (GOL 2005). Livestock numbers have increased steadily over the last 25 years with rising domestic meat demand and exports to Thailand and Vietnam. Seasonal feed shortages and livestock disease remain the major constraints to livestock producers in Laos. For poorer households, lack of land and labour to look after animals are additional limitations (Stur et al. 2002a).

The Forage and Livestock Systems Project (FLSP) was established by CIAT in 2000 to build the capacity of national, provincial and district government staff in expanding the use of forages by upland farmers (Phengsavanh et al. 2004). Five districts in two northern upland provinces (Luang Prabang and Xieng Khouang) were selected due to the presence of significant livestock and proximity to Vietnam and Vientiane livestock markets [See Figure 1]. Security of land tenure did not influence the selection of districts as many villages run communal grazing areas, and farmers are able to plant forages where other crops cannot grow.

The project started with two provincial coordinators and 12 district staff who selected 18 villages known to have feed shortages but with potential for increasing livestock production. Staff were initially trained in technical aspects of forage production and some basic extension techniques such as organising village meetings, conducting a village problem diagnosis, setting up and evaluating forage plots with farmers and follow up visits (Horne and Stur 2003).
A key step was engaging villages in identifying major livestock problems (primarily feed shortage and diseases) and then embarking on a problem solving approach with farmers to find solutions using accepted participatory research methods (Scoones and Thompson 1994; Pretty et al. 2005). No credit was offered to farmers, only forage seed and technical advice. Two hundred farmers self selected to trial various forage options in small plots. These farmers were motivated to overcome critical feed shortages during the dry season when native grasses and forest vegetation is scarce, and during the wet season when livestock are constrained to stop them damaging crops.

The opportunity to save time and labour (up to 5 hours per day) looking for daily feed and cooking it (in the case of pigs) was the main motivational driver. Farmers also wanted to keep livestock close to home to avoid theft or injury and look after sick animals. Many farmers expressed a desire to improve weight gain of their livestock, although this was secondary to reducing labour input and livestock mortality.

Most farmers trialed a range of tropical grass varieties (eg, Guinea Si Muang, Brizantha, Mulato and Paspalum), a legume (Stylosanthes guianensis) and in some cases, sweet potato varieties and cassava. Plots were initially sown by seed or tubers in small areas (up to 1500m²) and expanded each year by transplanting cuttings, tubers or re-sowing seed. Forages are generally cut and fed to cattle and buffalo twice a day, goats and poultry are fed ad libitum and pigs are fed various rations of rice bran, stylo, sweet potato, cassava and local vegetable matter.

Forage groups were formed in each village to evaluate and share the results of forage establishment, cut and carry methods, livestock feeding and fattening. Field staff visited farmers on a monthly basis (and on demand) to trouble-shoot any problems and observe farmers innovating with recommended or traditional practices. In turn, they were supported by researchers from the National Agriculture and Forestry Institute and CIAT Asia. Staff workshops were held every six months to share experiences, update technical and extension skills and make monthly plans.

Impacts on livestock production and household livelihoods

Within two years, farming households began to gain livelihood benefits such as labour savings, increased livestock productivity, more security from having livestock close to home, available income to buy rice and other goods, and children able to go to school instead of tending to animals in the forest or grasslands (Millar et al. 2005). The number of villages and farmers growing forages increased to 38 and 480 respectively by the end of 2002 [See Table 1].
However, the number of households with significant impacts such as systematic fattening of cattle, housing and vaccinating of pigs or reducing upland rice areas was relatively small (50). Upland farmers were gradually changing from livestock keepers to livestock producers but only on a small scale. A new strategy was needed to accelerate expansion of forages and livelihood benefits for more farmers.

Expanding and accelerating impacts

In 2003, the Australian Centre for International Agricultural Research (ACIAR) funded Charles Sturt University, the Lao National Agriculture and Forestry Extension Service (NAFES) and CIAT Asia to research the process of scaling out forage and livestock technologies being carried out by the FLSP. It was determined that scaling out could occur in three ways;

1. Continue to introduce forage and livestock technologies to new villages.
2. Encourage more farmers within FLSP villages to adapt the technologies to their own farming systems and also benefit from the impacts.
3. Introduce the technology to other development projects.

Before embarking on these pathways to scaling out, the FLSP had to clearly demonstrate that the production and livelihood impacts were real, achievable and substantial (ie significant). Staff were subsequently trained in how to look for evidence of these impacts, capture them on digital cameras and describe what was happening in the photos at staff meetings and workshops. Peer discussion and questioning honed their skills at observation and critical thinking. Over time, field staff were able to distinguish the difference between visible, direct impacts (such as forage plots getting bigger or pigs fattening quickly) and significant livelihood impacts (such as changes to the way farmers traded their cattle, reduced labour, increased income and improved well being of families).

As more cases of impacts started to emerge and the number of experienced farmers grew, district extension staff were able to develop 32 case studies of households achieving impacts from using forages and changing their livestock systems. Some of these case studies were made into posters [Figure 2a] and handouts [Figure 2b]. The case studies were used as extension tools in new villages to demonstrate impacts occurring elsewhere (literacy is low amongst women so pictures and explanations were mainly used with written handouts for literate family members). Farmer feedback on the case studies revealed that the pictures and explanations by staff created awareness but that farmers wanted to know more detail based on local case studies in their areas not some other district or province with different conditions.

Insert Figures 2a and 2b here
Extension staff began conducting cross visits (where farmers are taken to another village) as a way of enabling new farmers to see and discuss forage and livestock production and impacts with experienced farmers. These visits stimulated farmer to farmer learning and proved very successful in accelerating farmer uptake of forages for livestock. From 2003 to 2005, a total of 350 farmers were involved in cross visits, study tours and field days. An evaluation of three extension methods (cross visits, case studies and champion farmer visits) for accelerating and expanding impacts revealed that all three methods were effective and complementary at different stages, but the majority of farmers preferred cross visits for learning about livestock production (Millar et al. 2005).

The number of upland villages increased from 54 to 107 and households from 467 to 1381 within a year [See Table 1]. During this time, the number of staff also increased to service the large number of families now planting and using forages. Village planning was introduced to encourage collective decisions about how much land would be devoted to growing forages. Village regulations and goals regarding disease prevention and livestock production were introduced. Some villages formed large and small animal production groups to facilitate learning about more advanced livestock management such as housing, health treatments, feed mixes and diets, breeding and marketing. Other villages began working together within a locality or ‘ket’ to learn about supply chains, set trading protocols and appoint animal health service providers (Connell and Pathammavong 2007).

By the end of 2005, the number of households using forages and improving their livestock management was approximately 1500 with 900 farmers benefiting from significant livelihood impacts. For example, about 670 farmers were able to start new livelihood activities due to labour savings and just over 150 farmers reported being able to reduce or stop shifting cultivation (Horne 2005). A significant outcome was a 50% reduction in the time required for new farmers to gain impacts from using forages compared to 2001-2003 when original farmers were starting out on their own.

Workshops were held for development organisations interested in using the forage technology within their project areas, including southern provinces of Laos. Topics covered the technical aspects of forage establishment and use as well as recommended participatory approaches. Participants were able to order seed from CIAT and liaise with agronomists if problems arose. However, no systematic evaluation has been done on how well the forages established in these project areas or how many farmers have integrated forages into their farming systems.

**Spontaneous and dynamic scaling out**

The process described so far was driven and facilitated by donor sponsored extension via the government system. However in some districts, a spontaneous and dynamic expansion of forages was evident from 2005. One such district is Nonghet, a north east district of Xieng Khouang bordering Vietnam and dominated by the Hmong ethnic group. Hmong farmers have a long history of cattle husbandry and they practice stall feeding of bulls for the New Year bull fighting festivals. Although
most of their cattle graze large extensive areas in communal herds, the opportunity to quickly fatten cattle and buffalo for the Vietnam trade was not lost on these producers! High prices being offered by Vietnamese traders and bull breeders stimulated farmers to increase the quality and quantity of livestock.

Forages enabled them to fatten more regularly, increasing their cash flow and capital investment without the need for credit. Forage adoption and livestock fattening in Nonghet expanded rapidly in 2005 from the original FLSP villages to two new areas [See Figure 3]. By 2007 it became evident that farmers outside the 24 project villages were buying and exchanging forage cuttings. Information exchange was facilitated via family or clan networks and by dedicated extension officers. A total of 50 villages (45% of all villages in the district) are now growing over 200 ha of forages involving 600 households of which 66% are fattening.

Insert Figure 3 here

**Scaling out to poor provinces and districts**

At the conclusion of the FLSP in 2005, there was sufficient interest from government and local officials to support scaling out of forages and livestock production to other districts and provinces. At a national level, the Lao government mandated that agricultural research and development be targeted at priority poor districts (GOL 2005). Scaling out of livestock production in northern provinces is now aimed at the poorest districts and provinces. With the support of the Asian Development Bank, the Lao government in 2006 began expanding livestock intensification to three additional provinces (Huaphan, Luang NamTha and Bokeo) using forages as an entry point [Figure 1].

A mentoring approach was used to train and guide 24 trainee extension officers from six new districts by some of the more experienced FLSP staff throughout 2006 and 2007. Mentoring the trainees on the job proved effective in fast tracking capacity building, particularly where mentors and trainees were located in the same or adjacent provinces. Formal training workshops were held every 6 months for trainee staff on forages, animal health, livestock production; market orientation and extension methods (Photo 1). Mentors hosted two visits a year by trainees to meet experienced farmers using advanced livestock systems. Mentors also visited trainees and their farmers to observe progress and give advice (Photo 2). Monthly provincial coordination meetings allowed trainees to discuss problems, share experiences and make monthly plans with their provincial livestock coordinator (Photo 3).
Table 1 summarises the results of scaling out forages and livestock technologies from 2000 to 2007, including the technical areas and extension methods developed. Preliminary results indicate that pig production is providing greater benefits for poor households and districts as they are unable to afford large livestock. However, in some poor districts villages are moving from pig to goat production with some families investing in small numbers of cattle and buffalo as they accumulate more wealth.

The next five years will see expansion of forages and improved animal health across the five northern provinces in Laos designated as having potential for livestock production due to proximity to developing markets, a base breeding stock and potential to benefit poorer districts and households. This will result in a total of 68 new staff, working in an additional 68 villages across 17 new districts.

The new project aims to benefit an estimated 21,000 rural upland households. The economic impact on most households is expected to be in the order of doubling of income from livestock production in the first year, and tripling in the second year until the desired level of production is reached relative to land and labour available.

Issues which may present future challenges include changes in domestic and export markets, more competitive or incompatible agricultural systems (e.g., rubber, maize), loss of rural labour to major towns, loss of land to commercial interests, domination by peri-urban livestock industries or availability of credit and land (for poor households).

Discussion

In this section we draw on our experiences with forages and livestock management practices in Laos and the wider literature to discuss key elements necessary for scaling out impacts at different stages of agricultural systems change. Having a clear idea of these stages is essential to good planning and implementation.
Proven technologies suited to social, cultural and environmental conditions

Before embarking on scaling out a technology, a comprehensive understanding is needed of the environmental, cultural and social context in which technologies or practices might be scaled out. For example, adapting forages for livestock systems in the highly diverse environments of the highlands is a different proposition to introducing a new variety of rice in more uniform lowland irrigated rice production systems (Fujisaka 1994). Greater experimentation, adaptation, time and patience are required in complex environments such as the uplands of South East Asia and Latin America (Van den Ban and Samantra 2006; Bentley et al. 2007).

What has worked in one locality or region may not work elsewhere due to a range of environmental, social, political, historical or cultural reasons (Walters et al. 1999; Mendham et al. 2007). This is particularly the case in a country like Laos where there has been war, population shifts, resettlement of villages and changing government policies on land use and tenure (Fujita 2006; Thongmaniavong and Fujita 2006). We found some communities more receptive than others depending on the cultural traditions of ethnic group, enthusiasm and leadership shown by village leaders, remoteness from markets and alternatives options to livestock production (eg cash crops).

Our findings also demonstrated that scaling out is more likely to occur where agricultural technologies have been fully tested and evaluated in different environments. Simple, robust technologies such as forages that overcome immediate demands for labour and livestock feed provide convenient starting points for farmers to begin making changes. Over time, farmers see new opportunities emerge such as regular fattening and trading or better disease control. So they change their farming practices to take advantage of these opportunities.

It is generally known that social acceptance of a technology or set of practices depends on how the technology fits with the goals of farming households (Pannell et al. 2006; Douthwaite et al. 2007). If technologies are easy to use, require low inputs, have low risk and high returns, are compatible with existing resources and have advantages over traditional practices, then scaling out is more likely to occur. In our case, forages provided an entry point or ‘spark of interest’ which enabled farmers to see that gains could be quickly made from livestock production with little effort.

Evidence of innovation, adaptation and significant impacts

Even if the technology is suited to a range of locations, farmers need to see that it is had led to significant production gains and/or household and labour benefits. Farmers will commit to scaling out once they are confident that the new system will work for them. This in turn, requires a degree of technology innovation and adaptation within their farming systems, which often yields unexpected outcomes. Some examples of ‘surprise’ innovations that farmers were using included;
farmers planting forages near their working fields so they could carry forages home at the end of the day;

- integrating stylo with maize crops;
- feeding cattle at the top of a forage plot so manure runs down the slope, and;
- feeding forages to fish!

We found that some farmers would innovate with little outside stimulus or support. These farmers tend to be individuals who are able to take greater risks due to having sufficient land, livestock and paddy rice. Poorer households are less able to take risks and often wait to see what happens (Kiptot et al. 2007). Nevertheless, farmer innovation is often unpredictable and can occur in the most surprising situations (Van Mele 2006).

The most effective innovations are often those that build on existing local knowledge and blend with traditional practices (Millar and Curtis 1999; Pretty 2002; Chambers 2005). A simple example of this has been the mixing of *Stylosanthes guianensis* with local forest taro leaves, cassava and rice bran for pigs. Our case studies provided an opportunity to capture the richness of local innovations and show other farmers the type of impacts that could be achieved.

Adaptation of any practice is an ongoing dynamic learning process, and learning to house and intensively manage livestock is no exception. In the beginning, farmers’ lack of experience initially created some uncertainty, with some farmers waiting for extension staff to visit them before doing anything! However, they slowly gained confidence as benefits emerged.

As uncertainty decreases, farmers are more likely to continue or scale up a recommended practice (Douthwaite et al. 2007). Some people may stop using a technology temporarily or permanently due to economic circumstances, an illness in the family, loss of markets, change of enterprise, a better technology, withdrawal of incentives or sale of land (Pannell et al. 2006; Kiptot et al. 2007). The challenge is to provide appropriate technical support for farmers without impeding their innovation and adaptation process.

**Facilitation of farmer learning by competent extension staff**

Once there is substantial evidence of livelihood and production impacts, a peer learning environment can be created to enable farmers to share their experiences. We found that cross visits were a powerful way to stimulate interest in forages as well as peer learning about livestock management. Although only a handful of farmers can go on a cross visit, the onus is on them to report back to other farmers in their village and assist households to get started. Selection of farmers who are active and good communicators is essential to this process. It is also important to allow gender balance to ensure women farmers are involved in their own right (Pachico and Fujisaka 2004).
Extension staff need to follow up with technical advice and encouragement, and facilitate regular village meetings and farm walks within villages and between villages in a locality. Learning works best at a local level (Carter and Currie-Alder 2006) to build local capacity to create system changes and improve livelihoods. Some ownership by farmers of the learning process is desirable so they are motivated to continue adapting and improving. Participatory learning approaches based on livelihood needs are central to this process (Van den Ban and Samantra 2006). Farmer field schools developed in South East Asia work well in this regard where farmers meet on a regular basis and actively solve problems as they arise (Pretty 2002; Van den Ban and Samantra 2006).

Extension methods may need to be adjusted according to local dynamics and the availability of resources. The corollary is that without competent and committed staff who can execute a well facilitated learning process, it is unlikely that technologies requiring systems change will travel very far (Harrington et al. 2001; Anderson et al. 2006).

Institutional support and partnerships

A key element of scaling out impacts was building the technical and extension skills of staff using experienced people as mentors, and providing on the job training and reflection. Mentor staff had good technical knowledge of forages and livestock production, and were skilled in extension planning and reporting. Setting goals and having regular meetings to review and plan extension activities is an essential part of scaling out. Close monitoring of impacts in the field and a flexible extension approach enables staff to look for opportunities for scaling out.

Despite the on-ground success of scaling out forages, it would not have gone far without institutional approval and support of district and provincial governors, and heads of departments. Extension staff worked hard to gain local support from district and provincial officials by keeping them informed, inviting them to meetings and taking them to villages to see the results. At the national and international level, strong leadership was provided by the project team ensuring engagement of donors and government officials in evaluation and decision making (Horne 2005).

Establishing formal partnerships and informal networks can strengthen institutions to scale out technologies (Carter and Currie-Alder 2006). The partnership between the Lao government, CIAT (International Centre for Tropical Agriculture) and the Australian government over a ten year period allowed time for skills and support to develop. Partnerships between government and non-government organisations (NGOs) can further extend beneficial technologies from research to the poor, whilst also building capacity of scientists to understand social and poverty related issues (Kolavalli and Kerr 2002). Such networks not only spread the costs of scaling out, they also spread the word and bring diverse roles to enabling scaling out of technologies or participatory approaches. This is an area needing further application and research in Laos for livestock development.
Conclusion

Scaling out is more than increasing adoption of proven technologies. It is a process of enabling farmers in different locations to identify their problems, trial a range of options and make informed decisions about improving their livelihoods (one of which may be not to adopt the recommended technology!).

Scaling out doesn’t just happen by itself; it needs to be well planned and facilitated. Our experience with scaling out forages and livestock production in Laos indicates that certain strategies are needed to ensure successful outcomes for rural households, particularly in diverse and complex environments, such as the uplands of South East Asia.

These strategies include finding simple technologies that can be easily trialed in diverse environments by a wide range of people. As farmers trial new practices, significant impacts may emerge as they change their farming systems to take advantage of the technology. These impacts can be captured in case studies or shown at cross visits and field days, to stimulate interest and learning amongst other farmers. Innovative practices can be also encouraged through structured and regular peer learning.

Ideally, farmers should play a key role in planning the process of scaling out in their villages or districts to develop ownership and commitment to improving livelihoods. Supporting organizations need to demonstrate a willingness to facilitate the scaling out process beyond short term research or development projects. Challenges for scaling out are ensuring the process is focused on those in greatest need, flexible enough to adapt to different circumstances, and sustainable so that impacts resonate for generations to come.

References


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Table 1  
Summary of expansion of villages, farmers, forage area and staff  
with the technical, extension and capacity building methods used.

<table>
<thead>
<tr>
<th>Year</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004-5</th>
<th>2006-7 (+ new provinces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of villages</td>
<td>18</td>
<td>39</td>
<td>54</td>
<td>107</td>
<td>131</td>
</tr>
<tr>
<td>No. of farmers</td>
<td>247</td>
<td>467</td>
<td>803</td>
<td>1381</td>
<td>1960</td>
</tr>
<tr>
<td>Total forage area (ha)</td>
<td>5.5</td>
<td>17.2</td>
<td>31.9</td>
<td>74</td>
<td>545</td>
</tr>
<tr>
<td>No. of staff</td>
<td>14</td>
<td>14</td>
<td>20</td>
<td>28</td>
<td>52</td>
</tr>
</tbody>
</table>

**Technical aspects introduced (accumulative)**
- Forage preparation, sowing, cutting, feeding,  
- Basic animal health, housing forage expansion, seed collection  
- Drying feed  
- Feed mixes  
- Cuttings  
- Using manure  
- Grazing  
- Making silage, fattening, deworming trading marketing  
- Forage nurseries, watering systems, manure composting

**Extension methods used (accumulative)**
- Village Problem Diagnosis, 1:1 advice, forage focus group  
- Forage evaluation Animal health demonstrations,  
- Case studies  
- Cross visits  
- Champion farmer visits  
- Follow up  
- Village planning, Large and small animal groups Cross visits Study tours  
- Village Learning Activities (old districts)

**Capacity building methods used (accumulative)**
- Training workshops  
- Monthly meetings  
- Regular reflection and learning  
- On the job learning  
- English training Database records  
- Staff cross visits  
- Facilitation training Study tour to Vietnam  
- Training workshops, Mentoring, Monthly provincial meetings

**Examples of impacts**
- Supplementary feeding  
- Labour saving of 1-2 hours  
- Increased weight gains  
- Labour saving of 2-5 hours  
- Reduced disease and morbidity  
- Substantial income from fattening  
- New house  
- More livestock  
- Education
Figure 1  Map of Laos showing where and when forages were introduced.
Figure 2a  Example of a Lao case study poster showing farmers using forages for buffalo fattening
Forages help farmer to reduce poverty

In the past
Mr. Chan Ouan from Had Pang village in Pak Ou district of Luang Prabang province produced upland rice and raised livestock especially pigs and poultry. He had problems with animal diseases and lack of animal feed. It was difficult to collect taro and other local feed and was too far to cut and carry. It was also difficult to buy rice bran because there was not enough and sometimes prices were high. He spent a lot of time collecting firewood and cooking feed for the pigs. When he sold pigs he got a low price so did not make much money. So he decided to sell 2 pigs and bought 2 goats. Why did he decide to buy goats? Because goats get a better price than pigs during this time. He exchanged knowledge and experience from Mr Nan Hak in the same village who said that now the goat market is good and every day the traders come to buy goats in the village, because people like to consume goat meat more than before.

Implementation
In 2003 he planted about 1000m2 of *Stylosanthes guianensis* (legume), sweet potato, and grasses (*Brizantha, Paspalum, Guinea Si Muang, and Mulato*). He increased the number of goats from two to four, then he bought 10 goats. In 2004 he expanded forages to a larger area and he bought 11 goats. In the end he had 31 goats. He kept goats in pens, cut and carried the forages to feed and sometimes let the goats graze in a paddock. He found he could not keep so many goats so he sold some to buy 2 cattle and rice for consumption in his family.

Impacts
- Save time and labour
- Increasing number of goats
- Improved raising system
- Get income from selling goat
- Changing animal from pigs to goat to cattle
- Reduced area of upland rice.

Future Plans
To stop growing upland rice of 1 ha and change to forages. He has decided to raise livestock and sell animal to buy rice for consumption.

Reported by Ms. Chansouk
Mr. ThongKham
DAFO in Pak OU
LPB province
Figure 3  Scaling out of forages and livestock fattening in Nonghet district

- Original introduction of forages
- Expansion from facilitated scaling out
- Spontaneous scaling out
Strategies for scaling out impacts from agricultural systems change: the case of forages and livestock production in Laos

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Keywords
Scaling out, agricultural technologies, forages, livestock production, Laos.

Acronyms used
CIAT International Centre for Tropical Agriculture
CGIAR Consultative Group on International Agricultural Research
CSU Charles Sturt University
FSP Forages for Smallholders Project
FLSP Forages and Livestock Systems Project
IIRR International Institute for Rural Reconstruction
LAO PDR Lao Peoples Democratic Republic
NAFES National Agriculture and Forestry Extension Service
NGO Non government organisation
PRE Participatory research and extension