

Farmer-to-farmer learning: farmer champion characteristics influence extent of scale out adoption in south-central coastal Vietnam

L Turner¹, J Corfield², NTD Thao³, M McCormack¹, R Smith³, L Bonnie⁴, NH Van⁵ & NX Ba⁵

¹ Tasmanian Institute of Agriculture, University of Tasmania, PO Box 3523, Burnie 7320, Tasmania

² Consultant (retired), 6 Galvani St, Wulguru 4811, Queensland

³ Tasmanian Institute of Agriculture, University of Tasmania, Private Bag 1375, Prospect 7250, Tasmania

⁴ Tasmanian Institute of Agriculture, University of Tasmania, Private Bag 98, Hobart 7001, Tasmania

⁵ University of Agriculture and Forestry, Hue University, 102 Phung Hung St, Hue City, Vietnam

Email: Lydia.Turner@utas.edu.au

Abstract. Improving the livelihoods of smallholder farming communities relies not only on the adoption of new practices by farmers directly participating in research, development and extension activities, but on the subsequent 'scale out' and 'scale up' of resources, knowledge and practices. This Case Study focused on the role of Farmer Champions in farmer-to-farmer learning among smallholder beef farmers in Cat Trinh commune, Binh Dinh province, Vietnam. Data was statistically and thematically analysed from surveys that captured the timing and extent of planting new grass forage cuttings, the implementation of related forage and cattle management practices, and the knowledge transfer that occurred following 15 farmers engaging in a 'Best Bet' participatory extension process. Of the Best Bet Farmers, three farmers adopted the proven technology faster, and to a greater extent ($p < 0.05$). The same farmers influenced the most Scale Out Farmers ($p < 0.05$), including a high proportion of women. These characteristics were associated with the three farmers being identified as Farmer Champions. Natural diffusion of the technology through Farmer Champions maintained high quality scale out (transfer of new knowledge as well as practices), due to their accessibility, availability and generosity during the knowledge transfer process.

Keywords: adoption, extension, farmer champion, farmer learning, knowledge transfer, smallholders

Introduction

People are the most important part of agricultural smallholder systems and understanding what they currently do and why, as well as the context they operate within, is essential for adoption of new knowledge or technology to proceed (Winter & Doyle 2008). Participatory research, development and extension activities have been established as an effective approach to facilitate the adoption and adaptation of agricultural technologies by participating farmers in developing countries (Horne & Stür 2003). The 'Best Bet' process is one of these participatory approaches that works intensively with a small number of farmers in a step-by-step process, building on farmers' existing knowledge and practices (Khanh et al. 2015). Lisson et al. (2010) and Khanh et al. (2015) have demonstrated the effectiveness of the Best Bet process in facilitating on-farm change in the smallholder crop–livestock systems of Eastern Indonesia and South-Central Coastal Vietnam, respectively. The success of this extension method lies not only in the implementation of new practices by participating Best Bet farmers, but in the subsequent natural 'scale out' of resources, knowledge and practices from the original participating farmers to neighbouring farmers and communities (Khanh et al. 2014).

Successful farmer-to-farmer learning and scaling out of agricultural technologies has been well documented in South East Asia (Millar et al. 2005; Khanh et al. 2014; Turner et al. 2015), where communities are culturally pro-development and committed to contributing to each other's welfare. For even greater impact, interventions are then needed to facilitate further farmer-to-farmer learning on a larger scale; 'scaling up' as well as scaling out. Scaling up involves decision-making and capacity building at higher levels and adapting the knowledge and technologies to end-users and across variable conditions (Menter et al. 2004). Adapting and applying technologies to different contexts requires an understanding of the principles underlying adoption of technologies to date. Millar & Connell (2010) suggest that farmers who 'champion' adoption of technologies in smaller-scale projects can act as 'sparks', or entry points that initiate scaling up efforts. Farmer Champions are early adopters, good communicators and demonstrate adaptable technologies. Once identified, Farmer Champions could be intentionally included in capacity building efforts at higher levels to help achieve wider-spread extension.

The selection of effective Farmer Champions is therefore essential for successful facilitation of farmer-to-farmer learning by competent extension staff (Millar & Connell 2010). For greatest impact, extension agencies need a greater understanding of farmer-to-farmer learning that occurs

through Farmer Champions, and increased knowledge about how to identify Farmer Champions for active engagement in participatory extension efforts.

Smallholder farming system context in South-Central Coast Vietnam

Enabling sustainable income generation by smallholder farmers is a major development priority for research and development workers focused on the Central provinces of Vietnam (Leddin et al. 2011). While pigs and poultry are the most populous livestock, cattle are a primary ruminant in the lowlands, and tend to be farmed in the more intensive cropping areas, particularly around irrigation systems and along river flats. The cattle are traditionally fed native grasses (grazing or cut and carry systems) and residues from rice, cassava, sugarcane, corn, peanuts and sweet potato. With demand for beef growing in urban Vietnam, there is the opportunity for households in the South-Central Coast provinces to increase and diversify farm income through improved cattle production. Cattle operations on the South-Central Coast are a major supplier of beef for the growing domestic market, but are constrained by low fertility sandy soils and harsh climatic conditions, with production limited by low feed quantity/quality, and undeveloped husbandry practices (Parsons et al. 2013).

A four-year ACIAR funded project (2009-2013; SMCN/2007/109) made considerable progress in integrating new forage and livestock technologies into smallholder farming systems in three South-Central Coast provinces, including Binh Dinh (Ba et al. 2013; Khanh et al. 2014; Khanh et al. 2020). The project initially introduced 15 farmers within a commune of each province to a range of activities including nine practices relating to new forage grass and legume resources and their management; better use of existing local crop by-product feedstuffs; and improved cattle feeding and management options. The selection criteria for the 15 Best Bet Farmer households were that their individual farms should be representative of the prevailing farming systems, with possession of cattle, access to sufficient land for new forage development, and labour availability to implement agreed interventions. Five of the BBFs were specifically recorded as female: three of these female BBFs had husbands who either worked off-farm or were fully occupied with cropping activities, while the wife was responsible for the cattle activities, and the remaining two female BBFs were widows who ran their farms with their children.

The step-wise, participatory approach involved regular interaction between research and development project staff and farmers, and introduced activities of increased complexity and associated risk. The success of the step-wise participatory approach became evident as adoption of forage and livestock technologies was observed to scale out beyond the original 15 Best Bet farmers per commune to farmers not originally involved in the project (Khanh et al. 2014). Best Bet Farmers who were observed as sharing a particularly high amount of resources and knowledge were identified as Farmer Champions (Turner et al. 2015). A second four-year ACIAR funded project (2014-2017; LPS/2012/062) continued using participatory research, development and extension processes to facilitate improved smallholder cattle production and profitability in this region, and also focused on understanding and enhancing the knowledge transfer processes involved in scale out. To further increase the development of smallholder cattle production on the South-Central Coast of Vietnam through the active engagement of Farmer Champions in extension activities (through scaling up), the adoption characteristics of these farmers and their role in knowledge transfer processes was investigated using Case Study methods.

The aim of this Case Study was to assess the role and influence of Farmer Champions on knowledge transfer and adoption outcomes within communes of the previous project. It involved research that evaluated the characteristics of naturally emerging Farmer Champions in Cat Trinh commune, Binh Dinh province, Vietnam, and how these characteristics influenced subsequent scale out in the community.

Methods

A Case Study was undertaken within ACIAR project SMCN LPS/2012/062 to understand the scale out process of forage resources and knowledge about forage and cattle management that followed 15 smallholder farmers engaging in Best Bet participatory extension activities in Cat Trinh commune, Binh Dinh province, Vietnam. This approach was chosen to answer “how” and “why” questions, gather descriptions of participants’ adoption behaviour, and understand the smallholder system context as well as the knowledge transfer phenomenon (Yin 2003).

The descriptive study drew from surveys of: the 15 Best Bet Farmers (original participants in the Best Bet process in ACIAR project SMCN/2007/109), three Farmer Champions (three of the 15 Best Bet Farmers who were subsequently identified as having the most influential role in Scale Out; Turner et al. 2015), and 31 of 60 Scale Out Farmers (who received resources and knowledge from the Farmer Champions; McCormack 2015). The semi-structured surveys collected quantitative and qualitative data that included individual and household demographics, and were

tested and refined before being conducted on farmers' properties by project team members in Vietnamese. Further details about the surveys are provided below in Table 1.

Table 1. Participant numbers, timing and content of the surveys carried out with Best Bet Farmers, Farmer Champions and Scale Out Farmers

	Best Bet Farmers	Farmer Champions	Scale Out Farmers
No. participants	15	3	31*
Time of surveys	2010-2013	2015	2015
Survey content	Timing of practices implemented Extent of adoption Numbers of Scale Out Farmers	Details of Scale Out Farmers What resources, knowledge and practices were shared How, when and why knowledge transfer facilitated	Timing of practices implemented Extent of adoption Patterns of engaging in knowledge transfer Motivations for adoption Benefits experienced

*Scale Out Farmer contact details were provided by Farmer Champions

Data analyses

Quantitative data from the Best Bet Farmer surveys detailed in Khanh et al. (2014) were analysed using SPSS Version 2 (2013) and *Statistix 10* (2013). Quantitative data on the implementation of the nine recommended practices for each farmer was accumulatively 'scored', relating to the extent of their adoption. The sequence of practices was as follows: 1) introduction of new perennial grass forages; 2) introduction of tree legume forages; 3) improved management of new and existing fresh forages; 4) significant expansion of existing fresh forage plantings; 5) improved use of on-farm crop by-products to supplement cattle feed; 6) targeted feeding of fresh forages; 7) targeted use of feed supplements; 8) improved cattle infrastructure facilities; 9) improved market targeting for cattle enterprises.

The timing of implementing the recommended practices, extent of adoption, scale-out patterns and the relationships between these variables for Farmer Champions and other Best Bet Farmers were compared. The authors acknowledge that the small sample size limited statistical analyses, and therefore explored the knowledge transfer process further using qualitative methods.

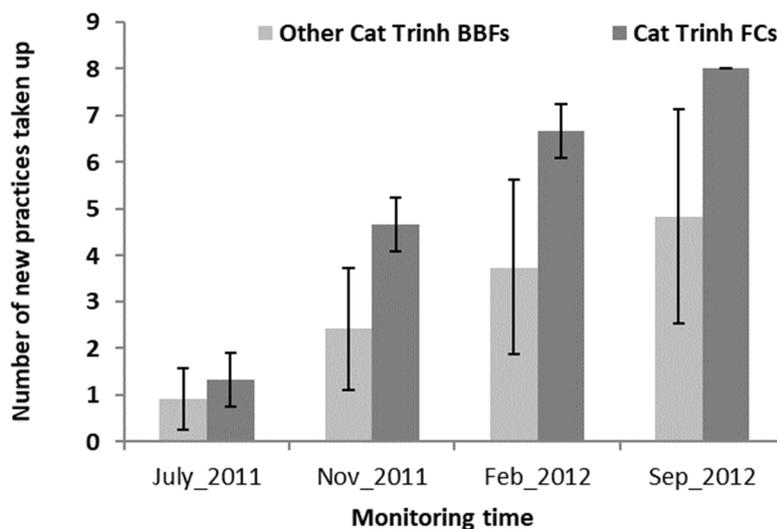
Qualitative data relating to the knowledge transfer process from the Farmer Champion and Scale Out Farmer surveys was thematically analysed and manually coded (Lincoln & Guba 1985; Ryan & Bernard 2000). Themes were shaped by the research aim and literature (Huberman & Miles 1994; Ryan & Bernard 2000). For Farmer Champions, coding focused on their roles as Sources of Knowledge and Resources, and Facilitators of Knowledge Transfer. For Scale Out Farmers, the factors influencing farmers' motivation to adopt, household demographics and the influence of practice change were evaluated.

Results

Best Bet farmer surveys

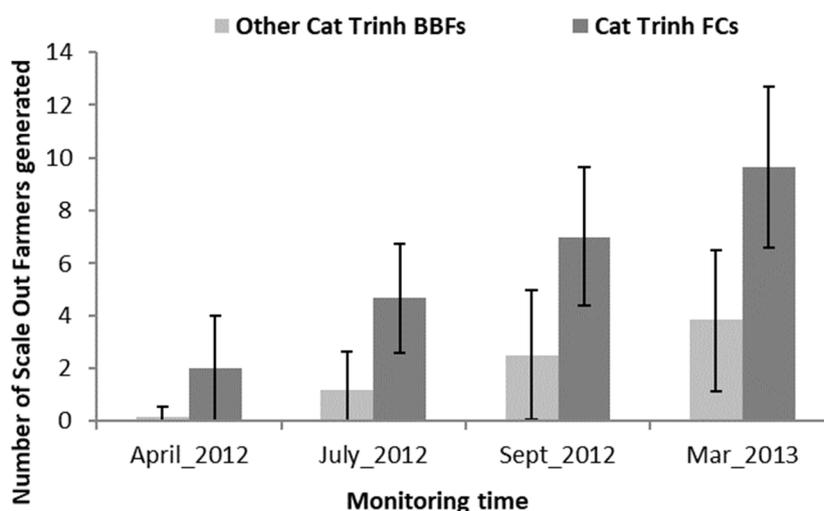
The three Farmer Champions had a faster adoption rate of practices than the other twelve Best Bet Farmers (Figure 1), with a significantly higher number of practices taken up in July 2011 ($p < 0.05$), November 2011 ($p < 0.05$), February 2012 ($p < 0.01$) and September 2012 ($p < 0.05$). By September 2012, Farmer Champions had adopted an average eight new practices of the total nine introduced practices, compared with an average 4.8 new practices adopted by the other Best Bet Farmers. The three Farmer Champions were also more effective agents of informal knowledge transfer than the other Best Bet Farmers (Figure 2), with a significantly higher number of Scale Out Farmers generated in April 2012 ($p < 0.01$), July 2012 ($p < 0.01$), September 2012 ($p < 0.05$) and March 2013 ($p < 0.05$). By March 2013, Farmer Champions had generated an average 9.7 Scale Out Farmers, compared with an average 3.8 Scale Out Farmers generated by the other Best Bet Farmers. By March 2013 there was a strong positive ($p < 0.001$; $R^2 = 0.79$) correlation between the extent of new practices participating farmers had adopted and the number of Scale Out Farmers they had generated (Figure 3).

Figure 1. Average number of new practices adopted by Farmer Champions (3) and other Best Bet Farmers (12) in Cat Trinh commune, between July 2011 and September 2012



Vertical bars represent Standard Deviation

Figure 2. Average number of Scale Out Farmers generated from Farmer Champions (3) and other Best Bet Farmers (12) in Cat Trinh commune, between April 2012 and March 2013

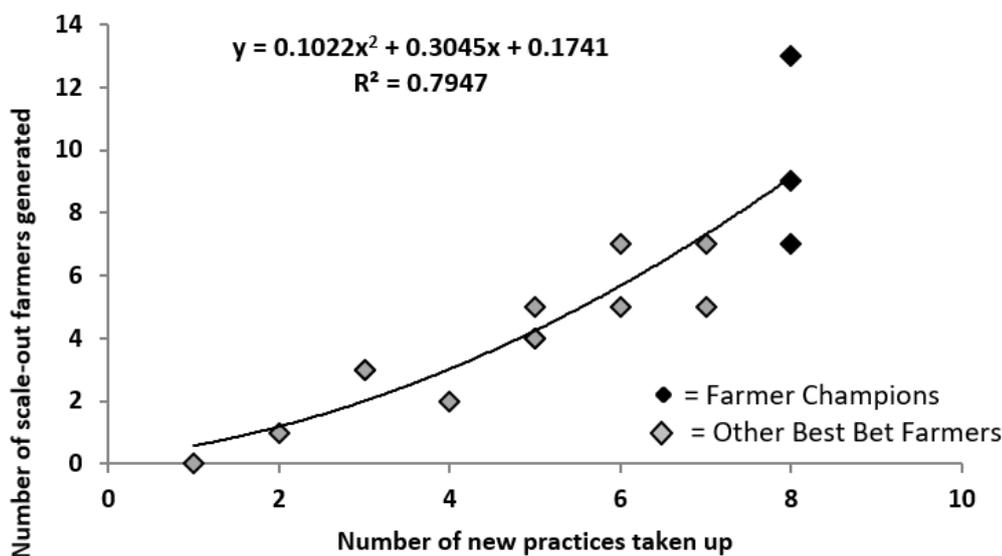


Vertical bars represent Standard Deviation

Farmer Champion survey

Some of the key practices that the Farmer Champions implemented as a result of the knowledge gained through the participatory process are summarised in Table 2. Utilising new forage species with improved quality, productivity and persistence, and increasing the quantity of cultivated forages for cut and carry, have reduced the requirement for cattle to graze marginal common land. Farmer Champion 1 emphasised the importance of his new knowledge and increased reliability of the feed source for his cattle:

now Mulato is always available in the garden...I can control the feed source in wet and dry seasons when native grass, rice straw and other crop residues may be scarce.

Figure 3. Relationship between adoption of new practices and generation of Scale Out Farmers for Farmer Champions and other Best Bet Farmers in March 2013

Although cattle numbers have not changed, there has been a change from mainly cattle keeping (involving opportunistic sales when money is needed) to more efficient systems that involve regular sales. The three Farmer Champions indicated how important cattle production has become to their overall farming system by ranking it first of a number of farm activities, in terms of contributing to income and planning for future expansion.

Table 2. Changes implemented by Farmer Champions between 2010 and 2015

Change in Practices	Farmer Champion 1	Farmer Champion 2	Farmer Champion 3
Grazing in 2010 (hrs/month)	200	240	240
Grazing in 2015 (hrs/month)	120	120	160
Cultivated forages in 2010	250m ² local King grass	'Some' local King grass	500m ² local King grass
Cultivated forages in 2015	1000m ² Mulato >100m ² VA06 King grass	500m ² Mulato 200m ² Panicum 150m ² Paspalum 30 Leucaena trees	400m ² Mulato 200m ² Panicum

The benefits that the Farmer Champions experienced through adopting the study recommendations led to them becoming known as valuable sources of knowledge and resources. The benefits observed by neighbours, relatives, friends, acquaintances and service providers included:

- increased confidence about feeding and managing cattle due to new knowledge
- increased availability of labour due to decreased requirement for grazing cattle
- decreased costs due to decreased requirement to buy crop-residues for feeding cattle
- increased convenience and reliability of cattle feed supply due to cultivating new forages close to the home
- improved cattle condition due to improved management of their feeding
- increased financial security due to more regular income from cattle sales.

The three Farmer Champions collectively provided the knowledge and resources to increase the efficiency and profitability of at least 60 Scale Out Farmers between 2011 and 2015, through informal and formal knowledge transfer pathways. A key to becoming effective facilitators of knowledge transfer was their willingness to respond to requests and initiate helping other farmers. It was common for there to be multiple visits between farms as Scale Out Farmers developed questions around the next stage of adoption. The three Farmer Champions estimated that 90% of their knowledge transfer occurred informally through social interaction with other farmers and visits between the smallholder farms. An example of this facilitation flowed on from a conversation between Farmer Champion 1 and Mr K at a commune event, about difficulties Mr K was experiencing feeding cattle during the wet season. After the event Farmer Champion 1

immediately took Mr K to his house to provide him with 10 kg of forage cuttings and key advice about how to manage them to ensure a reliable feed supply. Similarly, Farmer Champion 2 described how a visit to his farm changed the life of Mrs M, who was running a small market business and did not have enough time at home to care for her three children. After observing the Farmer Champion's successful cattle production, Mrs M sought from him the knowledge and free forage resources needed to raise cattle and improve the wellbeing of her household. The Farmer Champions demonstrated a common desire to help improve livelihoods in their communities by providing forage resources and time to share advice. Their reputation as experts led to formal requests to be involved in other cattle-related projects, developing commune policy around forage and cattle management, and organising the collection of large quantities of forage resource for other communities.

Scale out farmer survey

Smallholder households: demographics and influence of practice change

Adoption of new forages and the associated changes to forage and cattle management resulted in a reduction in the number of hours spent with grazing cattle for 58% of the Scale Out Farmers (Khanh et al. 2014). Respondents saved an average of 3.9 hours per day (with values ranging from 1-10 hours per day) and this labour was reallocated to other tasks. These tasks included cropping, care of other livestock, other farm tasks (e.g. irrigating and fertilising), off-farm employment, family time and housework.

More than 50% of the Scale Out Farmers interviewed in Cat Trinh commune were women. Of the 17 female respondents, 14 stated that they were either the main person (10) or one of the people (4) responsible for feeding and management of cattle. Of the 14 male respondents 11 replied that either someone else (4) was the main person or they shared the responsibility (7) for cattle related tasks. The other person was either their wife, sister or an elderly relative. This means that in 25 cases out of 31, a woman was either the primary cattle carer or shared this responsibility.

Scale Out Farmers were asked to identify major sources of information used before or after the adoption of forage when they wanted to learn new things. Farmers were able to provide more than one answer, with 100% identifying other farmers as a source of information, 70% identifying other sources, and 35% stating that media was a source of information. Television was the primary media source – a medium through which some ACIAR project extension material is delivered. Fewer Scale Out Farmers identified local extension (13%) and other projects (3%) as sources of learning. The category referred to as 'other projects' was specified as either other ACIAR projects or those run by Government Organisations and Not-for-profit Organisations in the region.

Adoption motivations

The motivations for Scale Out Farmers approaching Farmer Champions for forage resources and pursuing the associated new knowledge and skills around forage and cattle management were also explored in interviews with Scale Out Farmers. The emerging adoption motivation themes are grouped in Figure 4, with each of the circles representing a theme and the sizes of the circles representing the relative prevalence of the theme in the interview data (with the 31 Scale Out Farmers numbered). Many of the responses from Scale Out Farmers aligned with more than one theme, represented by the overlapping circles.

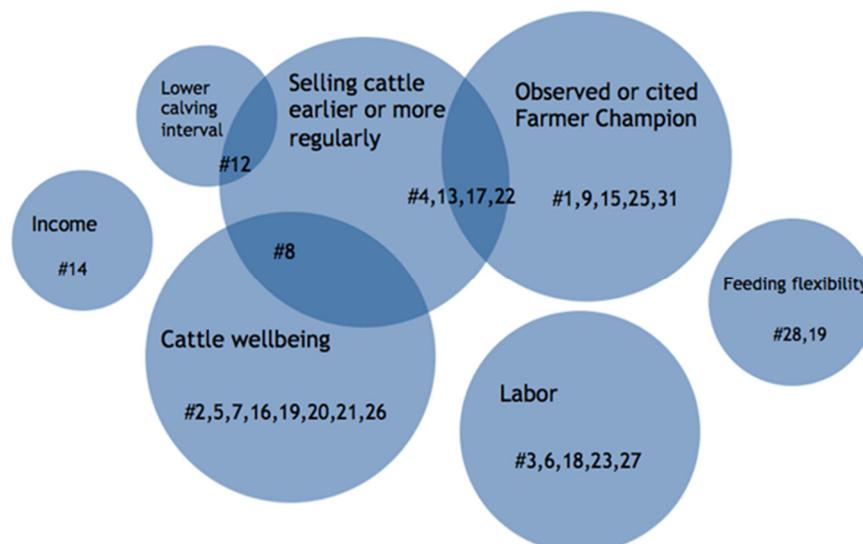
The three major adoption motivation themes that emerged from the data were:

- recognising the opportunity to sell cattle earlier and/or more regularly
- observing increased cattle wellbeing
- influential interactions with a Farmer Champion regarding the successful management of forages.

The majority of Scale Out Farmers discussed cattle welfare, nutrition and saleability as the main motivation for embarking on the adoption process. This is an important indicator about the priorities of farmers in Cat Trinh commune; they were motivated by the desire to improve their cattle production and management and trialled new forage technologies in their smallholder systems to achieve this. Improving cattle production ultimately leads to improved income for their households but only Scale Out Farmer #14 identified increased income as a primary motivator for adoption. Scale Out Farmer #12 identified decreased calving interval as a major benefit of growing new forages and had taken up a number of new practices including early weaning, fattening housed calves for two months before selling, targeted feeding and controlled mating (through AI). The combination of early weaning and increased nutrition from new forages and concentrates had: 'saved a lot of money in feed (for cows) and cows now get pregnant faster'. Adopting the recommended practices had led to the desired change in her cattle production

system, and at the time of being interviewed she was selling calves sooner and more regularly. Of the Scale Out Farmers who were motivated through observing Farmer Champions successfully growing and utilising forages, a couple purchased cattle for the first time as a result of this influence. Scale Out Farmer #9 initially farmed pigs but observed how a Farmer Champion 'had many cattle with low labour inputs, (they) only need straw and forage'. He realised that becoming a cattle producer had the potential for: 'less work for more gain'.

Figure 4. Adoption motivation themes that emerged from the qualitative interview data



Bubble size relates to the number of Scale Out Farmers within each theme and overlapping circles represent where Scale Out Farmers identified multiple motivations/benefits

Discussion

When farmer training is carried out in development projects, its impact can be increased by using step-wise and participatory processes that support subsequent farmer-to-farmer learning. In this Case Study, the effectiveness of the step-by-step transfer of new knowledge through the Best Bet process was evident in participating farmers adopting and adapting many of the recommended forage and cattle management practices. The incremental introduction of new knowledge supported the farmer learning process due to new knowledge building on existing knowledge; to make sense of new information it must connect with an existing frame of reference (Weick 1979, 1995). True learning does not therefore usually result from a single training session, but requires continued support and interaction with knowledge sources (in this case Best Bet facilitators) over time as farmers adapt knowledge and trial applying it on-farm (Turner & Irvine 2017). When initial practice change was successful and some benefits experienced by the farming households, farmers progressed on to apply varying proportions of the subsequent practices. Winter & Doyle (2008) note that even when benefits experienced as a result of change are not monetary, such as reduced time spent by women and children in livestock husbandry activities, they still provide the motivation and confidence for farmers to continue in the learning and adoption processes. Ko et al. (2005) suggest that practice change is evidence that true learning is taking place, as farmers apply and adapt new knowledge to best suit their own farming systems. In this Case Study, true learning among participating farmers was not only demonstrated through positive changes in their own farming systems, but through the extensive sharing of knowledge and resources with other farmers.

The scale out of knowledge and practices from Best Bet farmers interviewed in this Case Study demonstrates the common observation that many farmers prefer to learn about new agricultural technologies from other farmers who have already adopted or adapted that technology on their own farm (Millar et al. 2005; Turner et al. 2017). In the project communities, farmer-to-farmer learning has been identified as a primary mode of knowledge transfer, with far fewer Scale Out Farmers in Cat Trinh commune identifying media (35%), local extension (13%) and development projects (3%) as information sources, compared to other farmers (100%) (McCormack 2015). Farmer-to-farmer learning extends knowledge transfer beyond that achievable through direct extension because it occurs mainly through informal and ongoing interactions between neighbours and relatives (McCormack 2015). Informal interactions also circumnavigate the cultural gender division often observed in organised extension activities, where it is culturally appropriate for males to attend cattle training activities despite females in the household carrying out more of

the cattle-related management role. Of the 31 Scale Out Farmers interviewed in this study, 17 were females who had learned directly from the male Farmer Champions. Bryk & Schneider (2003) highlight the importance of credibility and trust in these effective learning relationships. The informal interactions and existing relationships in the project communities allowed the benefits of changing practices to be observed, provided living examples of how practices were successfully adapted in a similar farming context, and allowed change to gradually take place as communication between farmers continued and confidence to apply new knowledge increased.

The extent of scale out from Best Bet Farmers was related to characteristics of their own adoption. Best Bet Farmers who adopted forage and cattle management practices rapidly and to a greater extent (i.e. a fuller range of the practices taught through the incremental Best Bet training process) were those who shared forage resources and knowledge and skills around forage and cattle management with a larger number of relatives and neighbours. The reputation of these emerging Farmer Champions as experts also led to formal requests by commune extension staff to be involved in other cattle-related projects, developing commune policy around forage and cattle management, and organising the collection of large quantities of forage resource for other communities. Interviews with the three Farmer Champions from Cat Trinh commune revealed that their successful scale out was largely due to their accessibility, availability and generosity. A key to becoming effective facilitators of knowledge transfer was their willingness to respond to requests and initiate helping other farmers.

The benefits that the Farmer Champions had experienced through adopting the Best Bet recommendations led to them becoming known as valuable sources of knowledge and resources and sought out by relatives and neighbours. It was the improved health and saleability of the Farmer Champions' cattle that motivated many Scale Out Farmers to commence changing practices. It was common for there to be multiple visits between farms as Scale Out Farmers developed questions around the next stage of adoption. Between 2011 and early 2015, the three Farmer Champions collectively provided the knowledge and resources to increase the efficiency and profitability of an estimated 60 primary and secondary Scale Out Farmers, through informal and formal knowledge transfer pathways (Turner et al. 2015), 31 of which were interviewed (McCormack 2015).

Monitoring the high quantity and quality of scale out from Farmer Champions led to the suggestion that their active engagement in further development activities to fast track scale out and initiate scale up was likely to be highly effective. The active engagement of Farmer Champions in extension of proven technologies has been limited in terms of testing methods and evaluating impacts. Millar et al. (2005) facilitated smallholder farmers from selected villages in Laos being visited by Farmer Champions from another village, to share the benefits of his/her changed practices. Farmers appreciated being introduced to new knowledge by farmers (preferred over extension providers), but this method was not as successful in terms of adoption outcomes as farmer cross visits, which involved farmers from selected villages visiting other villages (with similar farming systems) where the new technology had already been adopted. Cross visits allowed farmers to see technologies at work, question host farmers, exchange experiences and learn practical aspects of how to use the technology (Millar et al. 2005). Given the important role Farmer Champions play in accelerating natural scale out in their own villages, there is the potential to combine these extension methods by using Farmer Champions in cross visits to fast track the learning process.

Conclusion

Winter & Doyle (2008) emphasise the challenge in conducting development projects to increase livestock production in smallholder crop-livestock systems is to understand the systems in enough depth to ensure recommendations around practice change lead to an improved outcome for the family. This Case Study confirms that the facilitated Best Bet process leads to positive change for cattle producing households on the South-Central Coast of Vietnam and that there is significant potential to use Farmer Champions as the 'spark' to accelerate scaling out to initiate scaling up. These findings suggest Farmer Champions in South-Central Vietnam can be identified by their rapid rate of adoption and greater extent of adoption; characteristics which relate to high numbers of subsequent Scale Out Farmers. The selection of these effective Farmer Champions by extension workers is essential for successful facilitation of farmer-to-farmer learning. Key identifiers for extension workers to prioritise are: farmers who confidently apply new knowledge, are observed to experience the benefits of continually improving their practices, and generously share their knowledge and forage resources with other farmers.

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