Australian Government

Australian Centre for International Agricultural Research

Final report

project

Building capacity in the knowledge & adoption of Bali cattle improvement technology in South Sulawesi

project number	SMAR-2006-061
date published	31/01/2017
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approved by	
final report number	FR2017-01
ISBN	978-1-925436-96-9
published by	ACIAR GPO Box 1571 Canberra ACT 2601 Australia

Contents

Acronyms and commonly used terms

005 project	Refers to the precursor ACIAR project LPS-2004-005, Improving smallholder crop-livestock systems in eastern Indonesia
061 project	Refers to the current project SMAR-2006-061
Bappeda	Badan Perencanaan Pembangunan Daerah (regional body for planning and development)
BB	Best bet
Best bet	In this report 'best bet' refers to either the tailored project practices (agreed between farmers and researchers) or as an adjective to describe the farmers implementing the practices or the villages they belong to. The term does not refer to participants with the best chance of success (due to resources, education etc)
BPP	Balai Penyuluh Pertanian (village-based agricultural extension office) Staffed by PPLs; generally under direction of relevant Dinas or Bupati
BPTP	Balai Pengkajian Teknologi Pertanian (Assessment Institute for Agricultural Technologies)
Bupati	Governor of the Regency or Kabupaten (equivalent of Regent)
Camat	Kepala Kecamatan or sub-district head
CSIRO	Refers to CSIRO Sustainable Ecosystems (CSE is also used)
Cut & carry	Feeding strategy in which forage is cut and brought to cattle
Desa	Village
Dinas	Generally refers to Dinas Peternakan (Department of Livestock Services)
Dusun	Sub-village
HH	Households
IAT	Integrated Analysis Tool, a modelling tool for exploring scenarios
Kabupaten	Regency; next smallest administrative division from province
Kandang	Shed for housing and feeding cattle
Kecamatan	Sub-district
Kepala	Head of relevant institute or group
OGT	On Ground Team (responsible for implementation & extension)
Penyuluhan	Used here as shorthand for the Extension Office
PMT	Project Management Team (responsible for operations & coordination)
PPK	Petugas Peternakan Kecamatan (district-based livestock officer)
PPL	Penyuluh Pertanian Lapangan (village-based agricultural extension officers); office is BPP; many work closely with OGTs in relevant villages
PSC	Project Steering Committee
PST	Project Specialist Team (responsible for technical expertise & training)
SNA	Social Network Analysis
SulSel	Sulawesi Selatan (South Sulawesi)
UNHAS	Hasanuddin University, Makassar

1 Acknowledgments

Foremost, we wish to acknowledge the smallholder farmers of Gowa, Barru and Bone and to thank them for their generosity with their knowledge and expertise and for their faith in the project team.

A highlight for the Specialist Teams in Australia and Indonesia has been working alongside the On Ground Team – Adrianty, Adrian, Amir, Ancu, Dading, Dana, Elya, Ela, Ilo, Jadid, Rulis, Sri, Sudir, Suriani and Yus. Their enthusiasm, enquiring minds and good humour have made SMAR-2006-061 an incredibly rewarding project.

Sri Purtama, Ikha Maya Sofyan and Adrina from Dinas kept the project running smoothly in Indonesia; Rebecca Wright and Veronica Hannan helped hold things together in Australia. Particular thanks are given to Catherine Hanley and Peter Horne from ACIAR for their support, advice and guidance.

The Project Steering Committee was an important mechanism for keeping the project relevant to regional initiatives and targets. We thank each member for their time, support and willingness to contribute to many discussions over the course of the project.

Our MSc student Risal quietly and diligently pursued his academic endeavours and we hope he will be rewarded for his efforts.

Heartfelt thanks to Neal Dalgliesh, Tanya Jakimow and Cathy Simpson from CSIRO for providing valuable feedback and suggestions to earlier drafts of this report and to Greg Martin from IDA Economics for his timely review of forage research in eastern Indonesia

Finally, thanks to Dr Shaun Lisson and the LPS-2004-005 research team for providing a solid and successful springboard for this project.

2 Executive summary

Bali cattle are a vital component of Indonesia's crop-livestock farming systems. Their production comes predominantly from smallholder farmers on eastern islands who own 2-4 cattle per household. Improving Bali cattle productivity on these smallholdings is essential not only to the Indonesian Government's beef self sufficiency targets, but also to improving the economic development of farmers living in these poor regions.

The project built on the success of previous ACIAR projects that have identified productivity constraints in the region and developed and successfully tested simple, low risk solutions. The resulting 'Best Bet' practices – making better use of existing forages, introducing new forages, controlled mating, early weaning with preferential feeding and feed budgeting - formed the foundation of this project.

Productivity gains from uptake of best bet practices included a 50-100% increase in cattle numbers, substantial increases in forage area, improved quality of diet, estimated daily liveweight gains of an extra 200-300 g/d per animal equivalent to a value of Rp6000/d and daily labour savings of 50% to 85% of hours spent on cattle management.

The research examining the decision-making process around adoption made clear the importance of understanding resource prioritisation by farmers and the need for interventions to align with local perceptions, priorities and existing practices. The sharing of local knowledge by farmers and scientific knowledge by OGTs has been a successful outcome of the project. OGTs encourage the adoption process through provision of scientific knowledge, access to information and ongoing support and advice. Farmers drive the scale out process, providing local legitimacy, networks and proof of benefits.

In the project period, primary scale out from best bet farmers was to a minimum of 445 other farmers. On average, one best bet farmer disseminated information to over five other farmers (the highest ratio was 1:14). Key scale out networks were neighbours, family members, best bet farmers and OGTs. The rate and scope of scale out varied and were assisted by coupling information with resources (to allow knowledge to become action); supporting farmer interactions and tangible displays of the benefits of adoption; and training extension staff as a catalyst for broader scale out.

Analysis supported claims that implementation of project practices helped to improve household livelihoods through improved cattle condition increasing the value/price received for cattle, improved availability of forage and associated labour savings and freed labour invested into other income generating activities. .

Technical capacity was raised to such a level in the community that farmers felt they had the skills, knowledge and confidence to become disseminators and mentors to other farmers. The OGT is a group of well trained, and now experienced, field workers. A series of training workshops for PPLs was trialled in the three study regions. While this has resulted in the scale out of project practices, to embed capacity in local institutions will require ongoing support and appropriate human and financial resourcing.

Engagement with key regional stakeholders resulted in greater awareness of the project approach and potential, and better coordination in addressing issues. Interactions with local institutes were more productive than those with higher level institutes.

The project produced significant capacity and community impacts, with key economic (particularly labour saving and value of cattle) and social (particularly improved communication and coordination) impacts expanded by the number of farmers reached.

Recommendations for future work include: development and implementation of a training module for farmers and extension staff; a detailed livelihoods assessment to track livelihoods and other impacts after project close; and the future use of an OGT model for projects requiring regular and effective community engagement.

3 Background

In Indonesia, the demand for beef far exceeds the capacity of the domestic beef production system. As a result, the country imports 28% of its national beef consumption (Departemen Pertanian Republik Indonesia 2007).

The national economy is changing rapidly, and increased affluence is fuelling a greater demand for higher quality and quantity of beef products. This change is driving regional and national policy towards an aim for achieving self sufficiency in beef production.

Bali cattle are a vital component of the smallholder crop-livestock systems of Indonesia. Their production comes predominantly from smallholder farmers in eastern Indonesia who own 2-4 cattle per household.

Improving Bali cattle productivity on these smallholdings is essential not only to the Government's beef self sufficiency targets, but also to improving the economic development of farmers living in its poorest regions.

Smallholder farms and farmers in South Sulawesi

In 2006 there were over 1.7 million households in Sulsel, with an average household size of 4-5 people (Badan Pusat Statistik 2007). Particularly in rural areas, households can comprise family members from three generations, all of whom contribute to the operation of the household and farm (Lisson et al 2008).

The agricultural sector accounts for just under half Sulsel's workforce. On-farm labour (eg land preparation, crop management, harvesting and marketing, livestock tending) is often supplemented by off-farm activities that may be agricultural (eg assistance on other farms) or non-agricultural (eg transport, small retail business, government position).

Smallholder farms in the region are usually less than two hectares in total and comprise a mix of crop, forage, livestock and human activities (Lisson et al 2010). Farms tend to comprise an area of 'cropland' on more fertile soil close to the house and an area of 'upland' that is further away from the house, on less fertile soil.

Cropland often has access to irrigation and is used for growing annual crops – predominantly rice in the wet season and crops such as soybean, cassava and peanut in the early dry season, depending on residual soil moisture. Upland is used to grow forages, perennial crops and timber and is often a communal resource.

Cattle play a number of roles in this system, including draft labour, source of saleable capital, repository of accumulated wealth, and business enterprise, although the last, more market-oriented role is not common (Padjung and Natsir 2005).

Addressing productivity constraints

A 2005 survey on beef production in Sulsel (Padjung and Natsir 2005) found that:

- Bali cattle comprise around 90% of the cattle population in Sulsel
- 70-80% of cattle sales are for slaughter and the remainder for breeding or fattening. Cattle are shipped to other islands, particularly Kalimantan, or directly marketed to Makassar to meet urban demand for beef.
- The rate of slaughter has increased in recent years, raising concerns about the sustainability of herd quality and performance.

- Key constraints to production include quantity and quality of feed supply, particularly during the dry season, calving interval, reproductive performance, animal health, capital availability, marketing and labour.
- There has been a subsequent increase in demand from farmers for information to help address these constraints and lift production.

Lisson et al (2010) divided production constraints - as specified by smallholder farmers - into three categories. In the first category were access to capital and markets. These are constraints over which smallholder households have little influence, but which may be influenced by increased productivity over time.

The second category comprised constraints for which strategies were relatively simple and accessible, with clear benefits. These include treatment of disease and provision of stock water.

The third category included constraints associated with feed supply and breeding management. While resources to address these constraints are accessible to farmers, strategies are more difficult to develop and benefits may not be immediately obvious.

This third category has been the focus of the current suite of ACIAR projects in Sulsel. Research has centred on feed availability (improved management of existing forage species, better use of crop residues, feed budgeting), feed quality (introduction of improved forage species) and animal management (controlled mating and early weaning).

Accordingly, the practices promoted by this project (the Best Bet practices) are:

- Making better use of existing forages
- Introducing new forages
- Seasonal (controlled) mating to match feed supply and labour needs
- Early weaning and preferential feeding
- Feed budgeting and planning to meet forecast feed demands

Building on previous research

This project has as its foundations a series of successful ACIAR projects.

Prospects for improved integration of high quality forages in the crop-livestock systems of Sulawesi (Project AS2-2000-124) used a farming systems research approach to test and quantify the benefits to livestock production of introducing forages to the mixed farming systems of South and Southeast Sulawesi. The project team benchmarked relevant farming systems, worked with farmers to identify and test options to increase forage production and developed an analytical tool that integrates livestock, cropping and economic models, to be used in research, training and extension activities.

Improving smallholder crop-livestock systems in eastern Indonesia (Project LPS-2004-005) used farming systems analysis and tools, coupled with a participatory approach to identify and address production constraints. Feasible ‘best bet’ strategies were developed and trialled on-farm. Farmer feedback and monitoring data indicated that the approach was successful, with results including: quantifiable gains in forage and livestock production, labour savings and gains in household income; the intention of most farmers to continue successful strategies; and evidence of significant adoption/adaption of the livestock improvement technologies by other (non-project) farmers.

The project was completed and reviewed in July 2008. Insights applicable to the current project include:

- There are strong inter-dependencies between different parts of the farming system

- Modelling is valuable for farmer communication and screening of potential strategies. Identifying and promoting feasible and viable strategies is important
- 'Point of entry' practices should be simple and low risk
- An incremental approach is preferable, addressing forage supply and quality first
- Farmer 'champions', farmer-to-farmer interaction and regular contact are essential ingredients for project success

Understanding adoption

The current project aimed to build on the insights and outcomes of these projects by implementing successful practices into a broader range of socio-economic environments, and looking for indications of increased productivity and enhanced livelihood outcomes for smallholder farmers.

A research focus of the project was on better understanding the adoption process, particularly how farmers and communities spread information and make decisions about new agricultural practices.

Any farming activity occurs within a system, and is constrained by social (eg culture, institutions), physical (eg land) and economic (eg capital, markets) resources (Giampietro 2004). Changes to one part of the system will most likely have an impact on other parts, ie require adjustments by several elements in the system.

In largely subsistent smallholder systems, adoption of a new practice is most likely to have an effect on land and labour demands, division of labour, and input/output ratios. In this context, household decision making regarding distribution of these resources is based a range of factors such as social pressure, cultural norms, aspirations and risk perception, in addition to economic factors.

To understand farmer decision making, the project team aimed to understand:

- available social, physical and economic resources that determine the viable options for the household's activities
- household livelihood strategies (eg maximisation of cash income or maintenance of subsistence and use of cattle as contingency resource)
- household evaluation of risk

In addition, the project team aimed to build capacity and positively influence local and regional institutions associated with livestock management.

The Sulawesi project had a sister project in Lombok. *Scaling up herd management strategies in crop-livestock systems in Lombok* (Project SMAR-2006-096) aimed to implement successful livestock improvement practices into the collectively managed kandang systems of Central Lombok.

4 Objectives

The objectives of this project were:

- To improve household welfare by supporting the adoption of better husbandry and feeding practices of Bali cattle in mixed crop livestock systems in South Sulawesi
- To build local institutional and community capacity to support the uptake of improved animal husbandry and feeding management practices
- Build understanding of the socio-economic environment and the constraints and catalysts for the adoption of the project practices.

The expected project outcomes were:

- Lasting improvement to Bali cattle production
- Improved capacity in institutions and communities to support uptake of practices and knowledge
- Widely applicable approaches to adoption

5 Methodology

5.1 Location and site selection

South Sulawesi (Sulsel) is one of the 33 provinces of Indonesia. It shares Sulawesi island with North Sulawesi, Gorontalo, Central Sulawesi, West Sulawesi and Southeast Sulawesi.

There are 22 Regencies or Kabupaten in Sulsel, each led by a Bupati or local Governor (Figure 1a). Each Regency is divided into sub-districts or Kecamatan. Each Kecamatan comprises a number of villages (Desa) and sub-villages (Dusun).

Three Kabupaten were selected for project activities - Barru, Gowa and Bone. A key factor in the selection process was alignment with the provincial government's cattle development programs, including Optimisation of Cattle Movement (GOS), pure Bali cattle development program, Cattle Breeding Program in Farmer Communities (Instalasi Pembibitan Rakyat), Beef Self Sufficiency Program (PSDS) and the target of reaching a population of a million cattle by 2013.

Other selection criteria were:

- High cattle population (refer to Appendix 1 for details).
- Intention to further develop the cattle population (Barru, Bone)
- Accessibility in all weather
- Recommendation by the provincial Dinas Peternakan office
- Location of provincial government cattle development programs
- Previous engagement in the district with precursor ACIAR project (Barru, Gowa)

A village survey was conducted in each Kabupaten with the aim of selecting 12 study villages for the project (four villages in each Kabupaten).

The first step in village selection was a site visit to prospective villages. Seven villages were visited in Bone, nine villages in Barru and seven villages in Gowa. In each village, key people were interviewed, including: the Kepala Desa, Kepala Dusun, leading crop and cattle farmers, the head of the agricultural extension service and officers of livestock and crop service in the village. Information was collected about cattle and human population, climate, topography, agricultural land, cropping pattern and cattle management practices.

In Barru, the four villages chosen were Mattirowalie and Lompo Riaja in Kecamatan Barru, and Tompo and Anabanua in Kecamatan Tanete Riaja (Figure 1b). Mattirowalie is hilly, Lompo Riaja is flat and Tompo and Anabanua are flat to undulating. In terms of climate, Barru has a wet season from November to April and a dry season from May to October.

In Bone, the four villages chosen were Mattirowalie, Bune, Tappale and Laburasseng, which are all located in Kecamatan Libureng (Figure 1c). Bone's climate differs from that of regencies on the western side of the province. It has a bimodal wet season, with a 'small wet' from November to February and a 'big wet' from March to August. The terrain ranges between flat and undulating.

In Gowa, the four villages chosen were Mangempang and Bontomanai in Kecamatan Bungaya, and Pabbentengang and Maccini Baji in Kecamatan Bajeng (Figure 1d). The terrain in Bungaya is mountainous with farmers employing terracing techniques for rice production. Bajeng is a flat, lowland area. The seasons are the same as for Barru.

The farming system characteristics of the 12 villages are presented in Appendix 2.

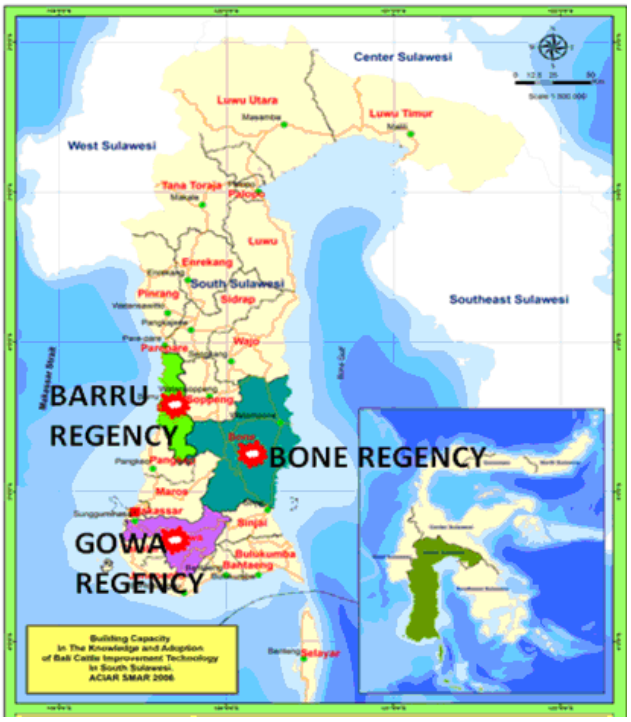

Figure 1a. Map of South Sulawesi, with three study Regencies marked in colour

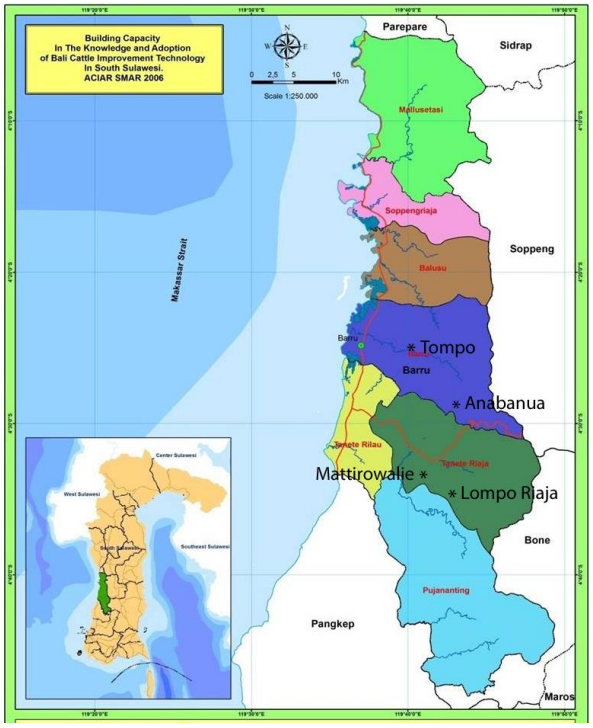

Figure 1b. Map of Barru Regency, with four study villages marked with asterisks

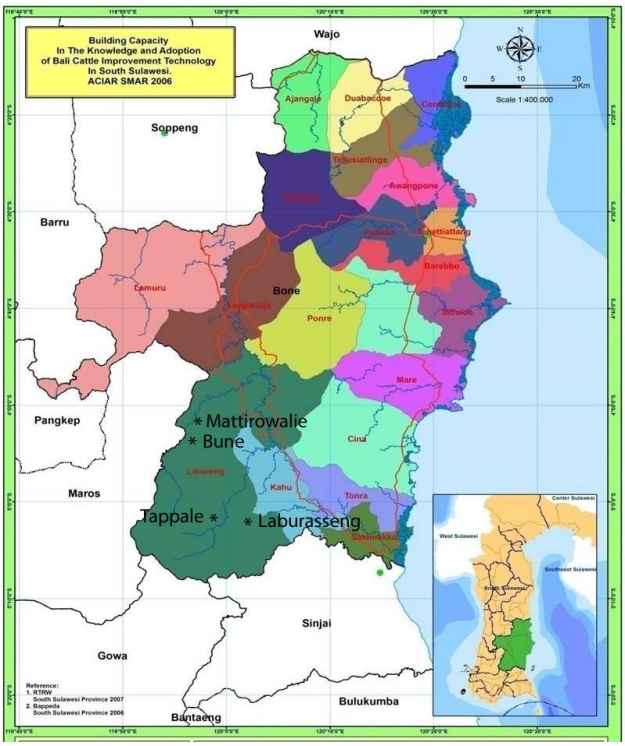

Figure 1c. Map of Bone Regency, with four study villages marked with asterisks

Figure 1d. Map of Gowa Regency, with four study villages marked with asterisks

5.2 Personnel

There were four inter-related teams and one student working on the project.

Project Specialist Team

The PST was responsible for designing and overseeing research aspects of the project and providing technical support and training to the On Ground Team. The PST was a multidisciplinary team of Indonesian and Australian researchers with specialist expertise covering animal nutrition and husbandry, agronomy, systems research, economics, cultural and social systems research and communication (refer to Table 1).

Table 1. Members of the Project Specialist Team for SMAR-2006-061, their affiliations and specialist expertise

PST member	Affiliation	Specialist expertise
Syamsu Bahar	BPTP Sulsel	Forage research
Jeff Corfield	CSIRO	Agronomy, farming systems
Dr Clemens Grunbuhel (2009-10)	CSIRO	Social research
Neil MacLeod (2007-08)	CSIRO	Resource economics
Cam McDonald	CSIRO	Livestock, farming systems
Dr Shaun Lisson	CSIRO	Farming systems
Prof Marsetyo	University Tadulako	Livestock management
Prof Asmuddin Natsir	UNHAS	Animal science and nutrition
Dr Rusnadi Padjung	UNHAS	Agronomy, farming systems
Dr Bruce Pengelly	CSIRO	Forage, farming systems
Rachmat Rachman	BPTP Sulsel	Livestock management, farming systems
Dr Muslim Salam (2009-10)	UNHAS	Social research
Monica van Wensveen	CSIRO	Communication
Liana Williams (2009-10)	CSIRO	Social research

On Ground Team

The OGT was responsible for on ground implementation of project activities including data collection, extension and engagement with farmer communities.

A position description for members of the OGT was developed by the Sulawesi and Australian teams in July 2007. An advertisement was placed in the local paper and on the UNHAS website in August 2007.

Initial selection of applicants was based on academic achievement, relevant experience and language skills and this process was helped by a team from UNHAS under the guidance of the Project Leader. A shortlist was then agreed by the selection panel.

Fifty candidates were asked to participate in a group activity (groups of around eight). Twenty-five candidates were interviewed individually and 13 were selected.

The final group was a mix of recent graduates and recruits with expertise in smallholder farming systems, and comprised skills in socio-economics, animal management, forage management and smallholder farming. All had abilities in regional languages and where possible, OGTs were placed in an area in which they were raised or had worked.

Four OGT members were based in Gowa, four were based in Bone and five were based in Barru, one with responsibility of liaison with farmers from the precursor project LPS-2004-005. Each were assigned to a specific village for the duration of the project (refer to Table 2).

A Project Officer – Ikha Maya Sofyan - was also appointed in this recruitment process.

Table 2. Members of the On Ground Team for SMAR-2006-061 and their initial areas of study

OGT member	Areas of study or expertise	Kabupaten
Rulisman	Livestock research	Barru
Nurjadid Alwi	Livestock research	Barru
Sudirman Umar	Agricultural technology	Barru
Andi Hamdana	Livestock production	Barru
Adrianty Dahlan	Livestock; socio-economics	Barru
Nurlaela	Agribusiness; socio-economics	Gowa
Ilham Hasan	Agronomy; communications	Gowa
Dading Kalbuadi	Livestock production; animal nutrition	Gowa
Sri Wahyuni	Agribusiness; socio-economics	Gowa
Suryani	Livestock production	Bone
Andi Elya Aziz	Livestock production; animal nutrition	Bone (2007-09)
Andi Syamsul Alam	Livestock production; animal nutrition	Bone (2007-08)
Adrian Hera	Socio-economics	Bone (2009-10)
Amir Sadi	Socio-economics, law	Bone (2009-10)
Yusran	Agriculture; extension	Bone (2009-10)
Ikha Maya Sofyan	Socio-economics	Project Officer

In late 2008, three OGT members left the project for government positions – one to Dinas Peternakan (Alam) and two to Penyuluhan (Suryani and Aziz). All three OGTs were from the Bone team. Three new OGTs were recruited in early 2009 – Hera, Yusran and Sadi.

Fortunately, the two OGTs with Penyuluhan maintained links with the project. Suriani is working as a PPL in the study kecamatan and the SulSel project team negotiated with the head of BPP for her to continue to support the best bet farmers in her study village. Aziz has been placed in the neighbouring kecamatan and has helped train her replacement, while transferring knowledge to the PPLs in her new kecamatan.

Project Management Team

The PMT was responsible for operations, coordination, resourcing and reporting. The composition of the PMT is given in Table 3.

Table 3. Members of the Project Management Team for SMAR-2006-061, their affiliations and roles.

PMT member	Affiliation	Position
Dr Bruce Pengelly	CSIRO	Project Leader - Australia
Dr Rusnadi Padjung	UNHAS	Project Leader - Indonesia
Rachmat Rachman	BPTP Sulsel	Project Coordinator - Indonesia
Monica van Wensveen	CSIRO	Project Coordinator - Australia
Ikha Maya Sofyan	UNHAS	Project Officer - Indonesia
Sri Purnama	UNHAS	Project Support - UNHAS

Project Steering Committee

The PSC was formed in November 2007, from heads of Dinas Peternakan at provincial and kabupaten level, and senior representatives from BPTP and UNHAS (refer to Table 4 for details). In May 2009, Bappeda Propinsi joined the committee.

There was a high turnover of members, with all Dinas representatives changing during the course of the project, due predominantly to local and provincial election processes. This led to some discontinuity, but the Project Coordinator ensured regular engagement was maintained between meetings.

In addition to the core PSC membership, invited guests attended meetings. These include representatives of SADI, Bappeda Bone, Dinas and Bappeda Takalar and members of the PST.

Table 4. Members of the Project Steering Committee for SMAR-2006-061, their affiliations and committee tenures.

PST member	Affiliation	Tenure notes
Dr Bruce Pengelly (Chair)	CSIRO	Complete period
Dr Rusnadi Padjung	UNHAS	Complete period
Arifin Daud	Kepala Dinas Peternakan Propinsi	2007-09
Murtala Ali	Kepala Dinas Peternakan Propinsi	2010

Andi Amin Manggabarani	Kepala Dinas Peternakan Barru	2007-08
Nur Salam	Kepala Dinas Peternakan Barru	2009-10
Hatta Kanna	Kepala Dinas Peternakan Gowa	2007-08
Achmad syahrir	Kepala Dinas Peternakan Gowa	2009-10
Mrs Andi Fatmawaty Amir (or her representative)	Kepala Dinas Peternakan Bone	Complete period
Dr Sahardi	Kepala BPTP Sulsel	2007-08
Dr Nasrullah	Kepala BPTP Sulsel	2009-10
Dr Dwia Aries Tina	Vice Rector UNHAS	Not able to attend due to illness
Darwin Atke	Vice Kepala Bappeda Propinsi	2009-10
Ms A Heny Mulawati	Bappeda Bone	2008-10
Rachmat Rachman	BPTP Sulsel	Complete period
Monica van Wensveen	CSIRO	Complete period

Students

The project supported one post graduate student, Muhammad Risal. Risal competed his Masters degree at UNHAS with Muslim Salam as a supervisor. His research focused on the adoption level of the project technologies and of the subsequent socio-economic impact on farmers associated with the precursor project (ACIAR project LPS-2004-005).

Risal found while potential economic benefit of adoption was high and there was evidence of changes in farmer behaviour, adoption and impact had not been fully realised. He suggested that this was due to miscommunication, reluctance to shift from food security orientation and low involvement by local government.

5.3 Project methodology

Five major project components will be reported on. *Improving productivity* (Section 5.3.1) looks at uptake of the five best bet practices and the resulting changes in productivity.

Understanding adoption (Section 5.3.2) examines how farming households make decisions about whether to adopt the best bet practices or not.

Supporting scale out (Section 5.3.3) explores the expansion of project practices, resources and information through the community.

Measuring impact (Section 5.3.4) looks across the impact chain in Figure 2 to consider the impact of adoption on productivity indicators and the impact of changes in productivity on livelihood indicators. As project activities were ongoing and the project timeframe was short, limiting the potential for significant impacts, the focus of this component was on impacts from the precursor project, 4.5 years from the start of the project and 1.5 years from the end of the project.

Building and maintaining capacity (Section 5.3.5) focuses on training to meet project objectives and community and institutional engagement to embed successful elements of the project.

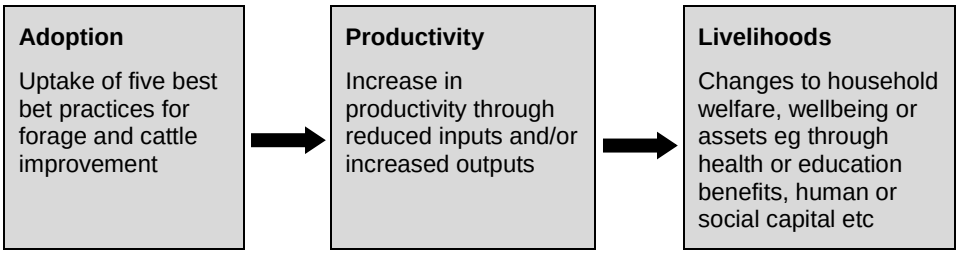

Figure 2. Assumed impact chain and aspirational targets.

In reality, there is much overlap between components. For example, training of PPL staff in study areas supported both capacity building and scale out. Similarly, investigating how farmers receive and distribute information helped the project team understand how decisions about adoption were made and also how scale out activities could be supported.

5.3.1 Improving productivity

Benchmarking surveys and best bet farmer selection

Up to 10% of households (and at least 20 households) owning cattle in each village[1] were interviewed by OGTs in the period January to May 2008. Data collected were predominantly farming systems information, demographic data and some economic (input/ output) information.

In Bone villages, 141 households were interviewed; in Barru villages, 80 households were interviewed; and in Gowa, 133 households were interviewed. There were 354 respondents in total.

To select best bet farmers, ten farmers from the benchmarking respondents were selected in each village, with input from the village head and local extension staff.

The broad objective for best bet farmer selection was to ensure the selected farmers represented both 'typical' farming system in the village and the range of individual systems, so that project results would be relevant to a wide range of farming households.

Within this objective, the main selection criteria were that farmers had resources and motivation to take up best bet options to address production constraints, or more specifically:

- Own or share cattle and were responsible for their feeding and management
- Own or have access to some land suitable for forage development
- Were willing to work with OGTs and PST members to identify, implement and manage agreed best bet options on their land, and to have access to sufficient labour to do so
- Were willing to share knowledge and forage material with other farmers, once they felt that their stocks were adequate

Inevitably, logistics and local political or social considerations were also used as criteria in choosing the final five best bet farmers in each study village (total of 60 best bet farmers).

[1] *Villages in which project activity was centred are also called best bet villages*

Best bet activity identification and implementation

Best bet activity selection largely followed the farming systems, participatory process that was developed for ACIAR project LPS-2004-005 (Lisson et al 2008). Under the guidance and training of Indonesian and Australian PST members, OGTs had prime responsibility for best bet implementation and monitoring.

There were five key steps in the process:

1. *Identification of production constraints* Workshops were held in each study village to introduce the project and to discuss constraints and opportunities for increasing productivity. Farmers identified key constraints in their farming system and the project team discussed how best bet practices might help address constraints (eg availability of feed, calving in dry season, low liveweight gain, limited knowledge exchange) and which constraints were outside the project's remit (eg disease, land ownership, capital). The Integrated Analysis Tool was used to show potential outcomes of management options.
2. *Farmer interviews* With the farmer calendars, these interviews were used to document the existing farming system. Broad areas covered in the interviews are given in Appendix 3.
3. *Development of farmer activity calendars* These calendars are used to capture forage and animal management activities throughout the year. An example appears as Appendix 4.
4. *Development of program for each best bet farmer* An individual best bet program was developed in collaboration with each best bet farmer. The program incorporated information from steps 1 and 2 to identify constraints to production and develop options based on the project's five best bet practices:
   - Making better use of existing forages
   - Introducing new forages
   - Seasonal (controlled) mating to match feed supply and labour needs
   - Early weaning and preferential feeding
   - Feed budgeting and planning to meet forecast feed demands

   A schema developed as part of OGT training appears as Figure 3 and a completed example appears as Appendix 5.
5. *On-farm application of best bet program* Tailored best bet activities were implemented by the farmer, with assistance and advice from the OGTs[2].

Review and adjustment of calendars and workplans continued throughout the project, as did provision of advice and support to farmers.

Monitoring

Livestock were monitored every two months for 12 to 14 months, during the second year of the project. Data from up to 50 animals per village were collected, including cattle weight, birth and weaning weight, reproduction data (mating, pregnancy, weaning) and mortality.

Types of forage, areas planted to forage and proportion of different forages in cattle diet were monitored monthly from September 2008 to May 2009. Existing forages that were the focus of improved management activities were elephant grass (*Pennisetum purpureum*), the tree legume Gliricidia (*Gliricidia* sepium) and native grasses.

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[2] Financial incentives were not provided to farmers to implement practices or to scale out knowledge and resources. Assistance, advice and forage material (in some cases) were provided by the project.

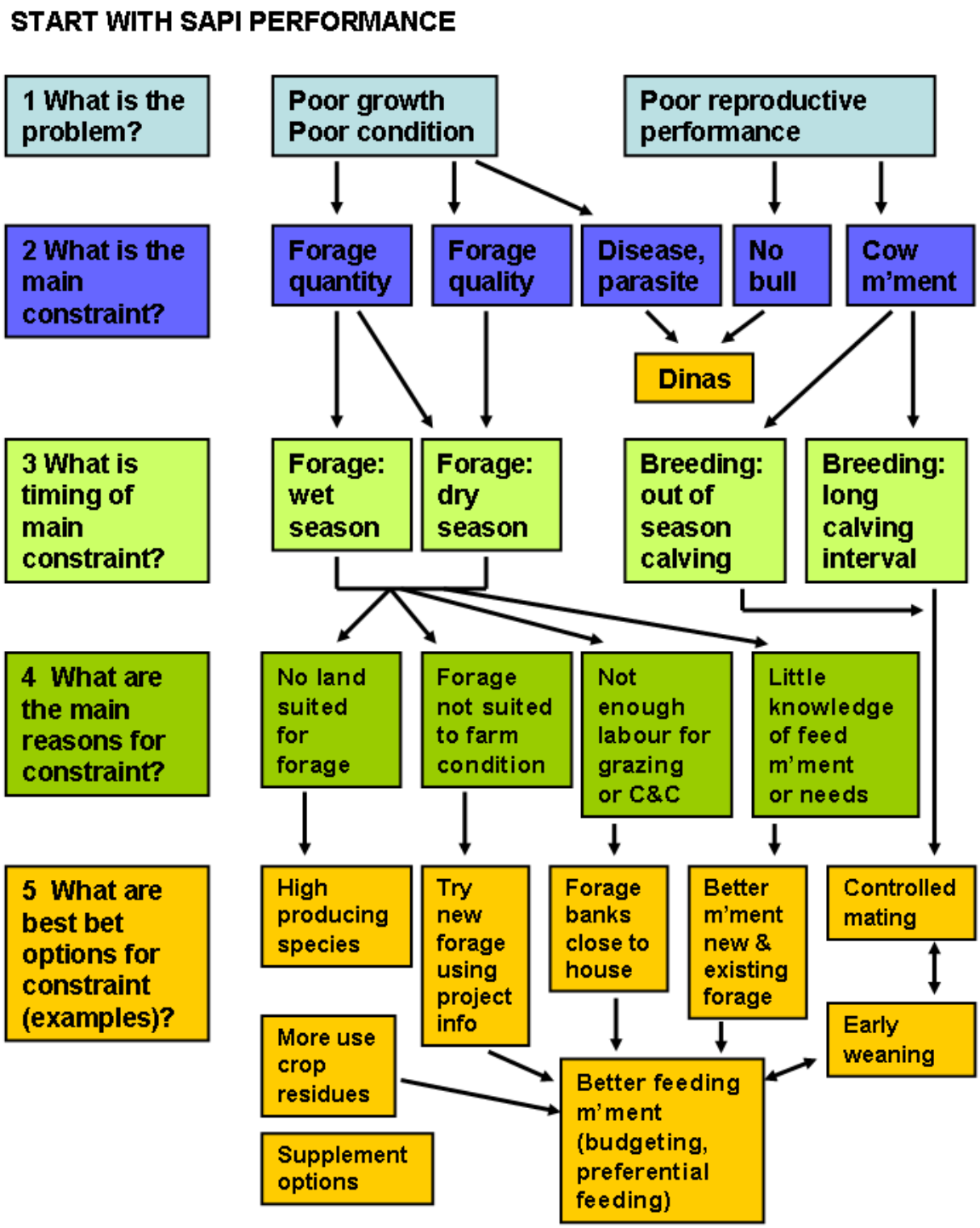
Introduced forages included grasses such as Paspalum (*Paspalum atratum cv Higane*), Mulato (*Brachiaria hybrid cv Mulato*), Panicum (*Panicum maximum* cultivars cv Simuang and cv Mombasa), Setaria (*Setaria sphacelata cv Narok*) and herbaceous legumes such as Clitoria (*Clitoria ternatea cv Milgarra*), Centrosema (*Centrosema pubescens cv Cardillo*) and Stylo (*Stylosanthes guianensis CIAT 184, Stylosanthes scabra* cv Seca and *Stylosanthes hamata* cv Verano).

Uptake of best bet practices was monitored through regular interactions between OGTs and farmers.

Eleven group discussion sessions were conducted in the four best bet villages of each study regency in June 2010, with two villages in Gowa (Pabbentengang and Maccini Baji) combined. The sessions were conducted to discuss and record the farmer's perspectives about the project, particularly significant biophysical, economic or social outcomes.

A majority of best bet farmers and at least some scale out farmers were present at each session, along with relevant OGTs and on occasions, village officials. Appendix 6 gives details of these sessions.

Figure 3. Best bet identification schema developed as an OGT training tool (Note that sapi is an Indonesian word for cow)



5.3.2 Understanding adoption

One of the key research aims of this project has been to understand processes of household decision making and information dissemination as a means to better understand adoption.

To understand the household decision making processes that determine whether or not adoption takes place, detailed 'adoption' and 'non-adoption' narratives were developed. These provided insights into the livelihood strategies of households as well as the steps in the decision making process. Narratives were developed from in-depth interviews that explored what factors were considered in the steps of deciding whether or not to introduce the suggested practices, as well as other influential factors

To ensure ease of comparison across locations and contexts, interviews were loosely structured according to Geertz' (1975) and, more specifically, along the analytical framework described in Section 7.2 (see Figure 4).

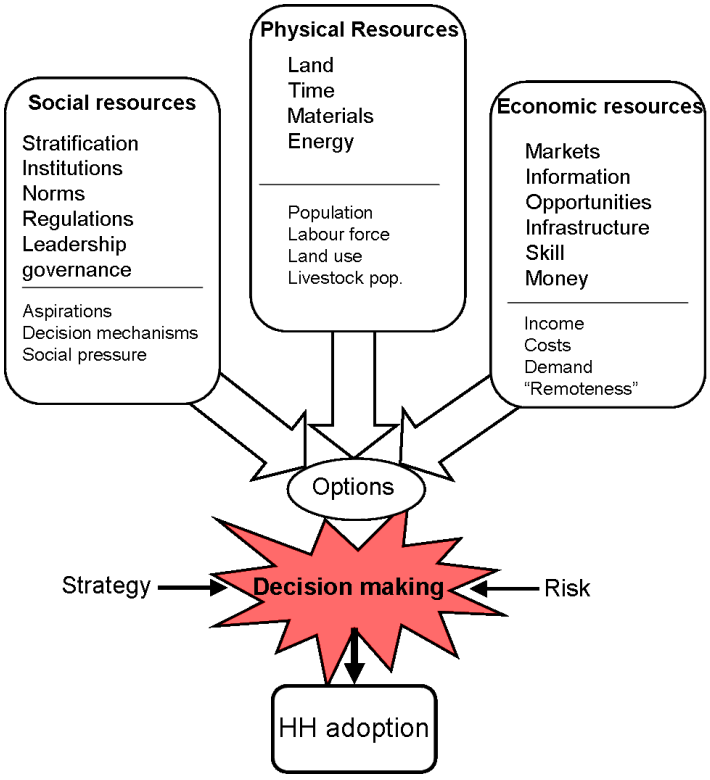


Figure 4. Household decisions are framed by available resources, livelihood strategy and perceptions of risk.

The decision to adopt new practices does not occur in isolation of social relationships. While knowledge of practices is necessary for adoption to occur, it is assumed that households do not consider this information in isolation.

Rather, there is a process of (formal or informal) exchange with other actors or institutions such as neighbours, village heads, religious leaders, government agencies – all of whom feed into the decision making process.

Indeed, for development interventions to be successful, more attention needs to be paid to accessing and building links with existing networks (Mahanty 2002).

Social Network Analysis (SNA) was used in this research to analyse the spread of information and explore influential actors and institutions as part of the decision making process.

In this case, SNA was used to examine how knowledge about the practices spread between households and communities as well as information about what type of households, relationships or institutions were critical for promoting adoption. Data collection focused on capturing:

1. Interactions and influence between households and institutions (eg Who do households go to for advice and information?)
2. The spread of information (eg If households are using any of the new practices, how did they find out about them and who have they discussed them with?)
3. The spread of associated resources

The networks were constructed by using data extracted from narrative interviews, and visualised using Netdraw 2.097 (Borgatti, 2002). In most cases, the interviews for decision analysis and networks were conducted simultaneously. While this served a pragmatic purpose, it also meant the information provided in the networks could be supplemented with narrative information.

The sampling strategy for each is shown in Table 5. In addition to interviewing those farmers who had been directly involved with the project (best bets and their scale outs), approximately eight farmers in each village were interviewed who had either not heard of the project or who had decided not to adopt the practices. This was done in order to compare responses between households with different levels of exposure and awareness.

There was no deliberate strategy in terms of interviewing equal numbers of men and women, as the focus was on household rather than individual perspectives. As a result there was a strong bias towards male respondents. This is largely because the interviewee was generally the head of the household, which is traditionally a male role in this society.

Interview narratives suggested a reasonable level of consultation between men and women in the household. However, it was not possible (in the scope of these interviews) to study more closely how or whether decisions and impacts of adoption were viewed differently by men and women in a household.

Table 5. Sample size and stratification for narrative interviews

	Targeted sample		**Random sample**	**Maximum total**
Per village	2 best bet farmers; least and most successful in each village	Max of 8 (n_1) scale out farmers or contacts of Best Best farmers	n_1 random sample of households	≤ 18
Project total	24	≤ 96	≤ 96	≤ 216

The two methods - decision and network analysis - allowed the project team to observe the broader institutional and social context (eg culture, social norms) as well as individual perceptions, judgements and emotional aspects of processing information within the community. Hence, the results not only contain a formal analysis of relations between actors but also reveal the process of evaluating risks and adapting livelihood strategies as the household environment is changed through project intervention.

Interviews were conducted by the OGTs after intensive training on social research methods by PST members. OGTs summarised the interviews and completed Social Network Analysis tables. Data analysis was coordinated by the Australian PST, in close collaboration and consultation with the OGTs.

5.3.3 Supporting scale out

For the purposes of the project, scale out is defined as expansion of project practices, resources and/or information that is a starting point for adoption.

The model proposed in the project outline was that each best bet farmer might disseminate information and resources to five other farmers (or households).

For each village, five best bet farmers were selected, so the target number of Scale Out farmers per village was 25. With four villages per Regency, the target number of Scale Out farmers for each Regency was 100 over the course of the project (refer to Figure 5).

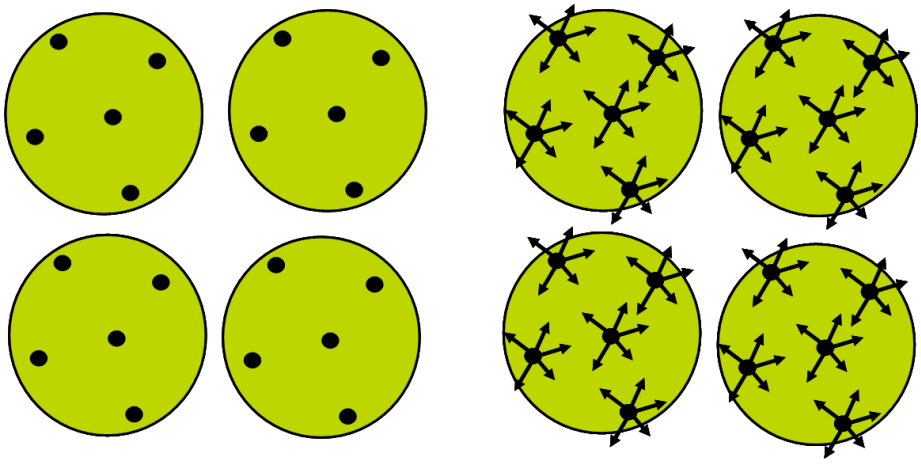


Figure 5. Model of best bet farmer scale out within a study regency. Five best bet farmers in each of four villages scale out practices and information to five additional farmers, with a target of 100 farmers per regency.

Because of the high importance placed by best bet and other farmers on securing adequate feed, forage is considered the starting point for the adoption process in this region. Therefore, the indicator used to represent tangible scale out in the project was the presence of forage - either new varieties or existing varieties in new or expanded areas.

Scale out was recorded by best bet farmers (by recording visits, discussions and supply of forage to other farmers and thus collecting information on primary scale out) and OGTs (by recording evidence of new forage as an indicator of primary and possibly secondary scale out).

The role of 'champion farmers' and the importance of farmer-to-farmer interactions in adoption and scale out were strongly emphasised in the final report of the precursor project LPS-2004-005. With this in mind, the primary focus for on-ground scale out in this project was on supporting farmer interactions, particularly through field visits, best bet activity sites[3] and farmer field days (refer to Table 6).

The project team felt that the availability of forage material was essential for successful scale out. To this end, project nurseries were established (or maintained) in each regency to provide source material for smaller village or farmer nurseries. The nurseries were maintained by the project team and local farmers or extension staff.

In addition, a schedule was developed in 2009 for training of PPLs in the project study areas. The decision was based on the project team's aspiration to accelerate scale out by reaching more farmers through PPLs and their respective farmers and farmer groups.

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[3] The use of the terms 'demonstration sites' and 'best bet plots' in this section is descriptive. It should be noted that significant value is invested in these activity sites through their development as part of the best bet process, involving collaboration between the project team and farmers to arrive at agreed actions that were tailored and integrated into each best bet farmer's system. When considering expansion of project information and resources, these plots provided a visible display of project activities and benefits and provided a catalyst for farmer interaction.

In Bone, the target area was Kecamatan Libureng; in Barru, were Kecamatan Barru and Kecamatan Tanete Riaja; in Gowa, were Kecamatan Bungaya and Kecamatan Bajeng.

Although the project team felt that OGTs could play a significant role in formal training sessions, it was agreed that they initially play a supporting role, to encourage more equal partnerships with PPLs and to establish an informal mentoring network.

The training was coordinated by Syamsu Bahar and Rachmat Rachman and details of the content, timing and participation appear as Appendix 6.

Table 6. Project activities to support scale out in three project Regencies

Scale out activity	Bone	Barru	Gowa
BB farmer visit to established 005 farmer in Barru	May 08	Jun 08	Jul 08
Best bet activity sites established on farmer land	May 08	Oct 08	Oct 08
Forage nursery established	Hafied land Bune June 08	Mahmud land Lompo Tengah Oct 07	Dinas Gowa land Oct 08
Farmer field day - local farmers visit BB farmers	Mar 09	-	-
External farmers and farmer groups visit BB farmers	-	Nov 09 – Jan 10	-
Workshop in non-project villages using photos and sketches	-	-	Nov 09 – Jan 10
PPL training	Jun 09	Nov 09	Nov 09

5.3.4 Measuring impact

The focus in this section is on analysis of data collected from best bet farmers from the precursor project (005 project). In particular, the project team aimed to trace impact from adoption of project practices through changes in productivity to changes in livelihoods.

As the 005 project began 4.5 years earlier, it was felt that revisiting participating farmers would provide an opportunity to follow this impact chain. In addition, discussions with 005 project farmers were conducted 1.5 years after the end of the project, thus reducing the effect of ongoing project team activities.

Forty-one farmers participated in the 005 project with activity conducted at four sites in eastern Indonesia (refer to Lisson et al 2008 for details):

- SPA village in Sumbawa, NTB
- Mertak village in southern Lombok, NTB
- Lompo Tengah, Pattappa and Harapan villages in Barru Regency, Sulsel
- Lemoa and Manyampa villages in the Manuju subdistrict of Gowa Regency, Sulsel.

As part of the current project, farmer interviews were conducted in October 2009 with 30 out of 41 Best Bet farmers from the 005 project. Interviews were conducted by members of the Indonesian and Australian teams in all previous project sites except for SPA.

Results of October 2009 interviews were compared against information from 005 start up interviews (March 2005) and exit interviews (February 2008). This enabled analysis of changes since the project had officially ceased as well as cross checking previously gathered information.

To compare progress in the current project with the 005 project, information was gathered from farmers during group discussions in best bet villages in June 2010. Appendix 6 gives details of these sessions.

5.3.5 Building and maintaining capacity

In this component, the project team focussed on three key activities: training and capacity building for OGTs, knowledge transfer with farmers and institutional engagement.

OGT capacity

In the first and second years of the project, a series of theoretical and practical training sessions were conducted by Indonesian and Australian PST members. These sessions focussed on equipping OGTs with knowledge and skills needed for their role in the project. Table 7 gives details of training topics.

Local PPLs or PPKs from the project's study villages were invited to most training sessions. This was viewed as a useful training, team building and capacity building exercise.

Table 7. 'Formal' OGT training activities conducted by PST members in 2007-09

Training sessions in 2007-08	Training sessions in 2009
'Basic training', including team dynamics, engagement techniques and understanding rural communities Forage training, including monitoring, quality, sampling, nursery establishment and maintenance Introduction to the Integrated Analysis Tool Introduction to social survey techniques Cattle and forage monitoring	Capturing and presenting qualitative data Social research training, including decision making narratives and social networks Feed budgeting and animal nutrition Bokasi making and rice straw fermentation

When possible, formal training sessions were held in a central location, with the three OGT groups together. When this was not possible, training was conducted in each Kabupaten. In addition, informal training, problem solving and planning was conducted by PST members during the second and third years of the project.

All training activities were evaluated by the OGT in May 2008 and May 2009. Capacity building across the whole project was reviewed and evaluated by the OGT and PST in May 2010.

Community capacity

There were no formal training activities for farmers or communities during the project. Skills and knowledge were transferred in a number of ways, primary amongst them were:

- Working alongside OGT members
- Engaging with PST members
- Interacting with best bet and other farmers

In May 2010, OGTs and PSTs were asked for their views on significant changes to farmer skills and knowledge as a result of participating in the project.

In June 2010, farmers from each village were asked to assess the project and detail any attributable changes to capacity.

Institutional engagement

The focus of the Sulsel team's institutional engagement strategy was three-fold:

1. To support provincial government policy on cattle development
2. To work closely with district Dinas to influence local policy and embed successful elements of the project
3. To use local networks as a catalyst for scale out of project practices.

A list of stakeholders targeted for engagement and the reasons for engagement are given in Table 8.

A cornerstone of the strategy was the Project Steering Committee, in which key regional players with common interests interacted on a regular basis. At their first meeting, the role of the PSC was agreed to be to provide overall guidance and advice on the direction and relevance of the project.

Meetings comprised an update on project progress, followed by discussion on the relevance to regional initiatives and suggestions for additional or synergistic activities. The PSC met formally in November 2007, July 08, October 08, May 09, October 09 and June 10 and a summary of minutes appear as Appendix 7.

Other activities and communication were strategic (eg farmer field days, training workshops), responsive (eg requested briefings) or serendipitous (eg invitations to visit communities outside the study Kabupaten).

In May 2010, Sulawesi PST members completed an exercise looking at how the project had influenced the nominated institutes and their policies and initiatives since the start of the project.

In addition, PSC members were asked to provide input on the success and relevance of the project for their respective institutions and to suggest areas of future work.

Table 8. Institutes and groups with whom engagement was sought by the project team on the issue of increasing livestock productivity in South Sulawesi.

Level of influence	Institute or group	Reason for engagement
Province	Dinas Peternakan	Custodian of provincial livestock policy; oversight of Dinas actvities at district level
	Bappeda*	Provincial planning and funding across all sectors
Project Kabupaten (Gowa, Barru, Bone)	Dinas Peternakan	Implement provincial livestock policy; engage with farmers on technical livestock matters
	Bupati Offices**	Responsible for Dinas activities at district level
Project Kecamatan	BPP Office	Engage with farmers on agricultural issues; potential custodians of knowledge and skills post-project; potential catalysts for further scale out
	Kepala Desa Kepala Kecamatan	Awareness and support of project practices; availability of communal land for nurseries and demonstration plots
Other Kabupaten	Dinas Peternakan	Opportunities for synergistic activities, training or shared information or resources; possible future scale out
	Bupati Office	Opportunities for synergistic activities, training or shared information or resources; possible future scale out

* Formal engagement with Bappeda began in 2009, once benefits of the project started to become evident.
** The need to engage formally with Bupatis in study kabupaten was discussed by the PSC, but not realised in the life of the project

6 Achievements against activities and outputs/milestones

Objective 1: To establish project teams and facilities

no.	activity	outputs/ milestones	completion date	comments
1.1	Develop selection criteria and panel for OGTs	Selection criteria completed and panel formed	Aug 07	Position description was developed by the Sulawesi and Australian teams. An advertisement was placed in the local paper and on the UNHAS website in Aug 07.
1.2	Select and appoint OGTs	OGTs selected	Nov 07	Initial selection was based on academic achievement, relevant experience and language skills. A shortlist was agreed on by the selection panel. Fifty candidates participated in a group activity; twenty-five were interviewed individually and 13 were selected in Nov 07. Three OGTs left the project for government positions in 2008 – 3 new OGTs were recruited in early 2009.
1.3	Prepare OGT training resources	Project training resources completed	Ongoing *Proposed Dec 07*	Development of training material was ongoing throughout project. A body of reference material (including handouts and presentations) was developed to support OGT training activities. This resource was refined for use in PPL training in 2009. Further refinement and consolidation is planned as part of project extension activities.
1.4	Conduct training in project basics at UNHAS; conduct specific field training in situ	OGTs completed basic training	Dec 08 Additional training ongoing, with focus in years 1 & 2	Training in project basics completed. Formal and informal training and mentoring ongoing throughout project Training topics include: forage training, introduction to farm systems models, social survey techniques, capturing and presenting qualitative data, cattle and forage monitoring, feed budgeting and animal nutrition (see Sections 5.3 and 7.5 for more details).
1.5	Establish 3 field offices and central office in Makassar	Project offices established and functional	Ongoing *Proposed Feb 08*	Two central offices were established in early 2008 – one at BPTP and one at UNHAS. OGT basecamps (accommodation and office) were established in early 2008 but there were many changes to location and facilities due to issues with security, distance from study sites, mobile coverage in particular. Computers were reconditioned and virus protection updated in year 2.

Objective 2: To develop, implement and monitor 'Best Bet' options with farmers

no.	activity	outputs/ milestones	completion date	comments
2.1	Establish selection criteria for project regencies & villages; build relations	Sites selected; village and kecamatan heads engaged	Jan 08 Engagement ongoing	Study village selection completed Jan 08. Selection criteria included: high cattle population; intention to further develop cattle population; all-weather accessibility; location of provincial government cattle programs; recommendation by the provincial Dinas Peternakan office. Engagement with village heads, farmers and sub-district heads by PST and OGTs ongoing throughout the project.
2.2	Benchmark study villages by interview and measurement	Data collected and collated	Feb-Sep 08	Benchmarking (farm system and basic socio-economic data) of 12 study villages completed in three regencies Around 10% of households owning cattle were interviewed in each village as part of the benchmarking exercise (141 in Bone; 80 in Barru; 133 in Gowa).
2.3	Hold Best bet workshops in villages to identify constraints and options	Best bet options finalised for study villages	Oct-Nov 08	Best bet workshops completed in Bone in May 08, in Barru in June 08 and in Gowa in August 08.
2.4	Identify Best bet options with individual farmers; design on-farm trials & monitoring procedures	Best bet options finalised; trial sites and designs finalised; monitoring methods finalised	Apr-Dec08 Monitoring and support ongoing *Proposed Nov-Dec 08*	Best bet process (tailoring strategies to production constraints and landholdings) with individual farmers completed in Bone in Apr 08 and Barru and Gowa in October-November 08. Support and monitoring of on-farm trials by OGTs ongoing throughout project. In June 10, all BB farmers were practising 3 of the 5 practices (better use of existing forages, use of introduced forages and feed budgeting). BB farmers in 8 villages had adopted controlled mating; BB farmers in 4 villages had partially adopted. Farmers suggest that adoption is hampered by lack of bulls. BB farmers in 7 villages had partially adopted early weaning and preferential feeding; 4 villages had not adopted and 1 had fully adopted. Refer to Section 7.1 for details.

Objective 3: To support, monitor and evaluate scale-out process

no.	activity	outputs/ milestones	completion date	comments
3.1	Identify appropriate extension methods for scale-out from best-bet farmers	Design of extension program completed	Strategy developed Jun 08 *Proposed Jul-Dec 07*	Primary focus for on-ground scale-out of best-bet practices was on supporting farmer-to-farmer interactions. Project activities supporting these interactions include: • farmer visits to established best-bet farmers (May 08, Jun 08, Jul 08) • farmer field days (Mar 09) • external visits to BB farmers (Jun 09, Dec 09) • support for farmer 'champions' in each district • maintaining and distributing a good source of forage material from district nurseries (Gowa, Bone and Barru nurseries) In addition, training of PPLs was conducted in Bone (Jun 09), Gowa (Nov 09) and Barru (Nov 09) as a catalyst for broader scale out. Development of communication resources (handouts, posters etc)
3.2	Train OGTs in theory and application of extension methods	Formal training in extension methods completed	Incomplete *Proposed Dec 07-Feb 08*	This activity was not pursued. The decision was made in May 2008 and was ratified by the RPM.
3.3	OGTs implement extension methods to achieve scale-out	Scale-out to 300 farmers	Jul 08-Jun10 *Proposed Mar 09-Jul 10*	OGTs and best-bet farmers recorded and mapped scale-out in the three regencies; GPS points were taken for most known scale out. In June 2010, known scale-out was 232 in Bone (aprox 1 best bet farmer: 11 scale out farmers); 108 in Barru (1:5) and 105 in Gowa (1: 5). Refer to Section 7.4 for details.
3.4	Evaluate adoption & attitudes to technology	Evaluation plan developed; cyclic evaluation conducted throughout project	Dec 08-Jun10 *Proposed Mar 09-Jul 10*	Social research framework developed in Dec 08 with a focus on decision making about adoption and social network analyses. Research guidelines created and translated in Feb-Mar 09; OGT training in Jun 09; interviews and data collection Jul-Nov 09; collation and analysis of data Jan-Jun10. Evaluation of project by OGTs, PST, PSC and farmers in May and June 10. Refer to Sections 7.3, 7.5 and 8 for details.

Objective 4: To build institutional and community capacity to support adoption

no.	activity	outputs/ milestones	completion date	comments
4.1	Identify appropriate methods for institutional capacity building (ICB)	Design of ICB program completed	Strategy developed Jan 08 *Proposed Jul-Dec 07*	Key elements of ICB activities include: • establishment and regular meetings of Project Steering Committee, comprising senior representatives of key regional and local institutions • regular interactions with key Dinas staff at provincial, regency and district levels • PPL training in three regencies (see Objective 3.1) • provision for a number of PPLs to attend training and joint Project Coordination Meetings (with Lombok team)
4.2	Train OGTs in theory & application of ICB methods	Formal training completed	Incomplete *Proposed Dec 07-Feb 08*	This activity was not pursued. The decision was made in May 08 and was ratified by the RPM.
4.3	Implement ICB methods	Capacity sustainably established in target agencies	Jan 08-Jun10 *Proposed Aug 08–Jul 10*	• Project Steering Committee met in Nov 07, Jul 08, Oct 08, May 09 and Oct 09. • Interactions with Dinas staff resulted in enhanced cooperation and communication, changes to local policy in the area of forages and delivery of training to selected farmer groups • PPLs trained in 3 regencies, in addition to attending selected OGT training and Project Coordination Meetings. Evaluation of ICB undertaken in May 10. Refer to Section 7.5 for details.

7 Key results and discussion

7.1 Improving productivity

Summary

A specific aim of the project was to initiate and support the adoption of better feeding and herd management of Bali cattle in mixed crop livestock systems in Sulsel. This section reports on the uptake of the five best bet practices and resulting productivity gains.

Productivity gains from uptake of best bet practices included a 50-100% increase in cattle numbers, a three- to four-fold increase in cattle carrying capacity due to substantial increases in forage area and improved quality of diet, resulting in daily liveweight gains of around 200gms per animal.

Farming households spent from 50% to 85% less time collecting forages as a result of the introduction of new forages, better management of existing forages and importantly, the location of new forage banks closer to the farmer's house.

In all villages except one, farmers felt cattle price had increased. All increases were attributed to elevated market price, and nine of eleven felt that better cattle condition had also contributed.

Uptake of best bet practices

The project engaged with smallholder households in the regencies of Barru, Bone and Gowa, promoting five practices to improve feeding and management of Bali cattle:

- Making better use of existing forages
- Introducing new forages
- Seasonal (controlled) mating to match feed supply and labour needs
- Early weaning and preferential feeding
- Feed budgeting and planning to meet forecast feed demands

All best bet farmers and many scale out farmers in each village are practising better use of existing forage (mainly elephant grass and Gliricidia) and have introduced new forages (Paspalum, Mulato, Panicum) (refer to Table 9).

The biggest uptake of new forage technologies has been in villages already practising cut and carry feeding, as farmers quickly see how new forage banks closer to households lead to substantial labour savings and forage security.

Most farmers are now practising controlled mating. This is mostly by farmers taking cows to any available bull in the village upon detecting oestrus. While not ideal, this is a significant improvement over the previous system of completely uncontrolled mating on communally grazed croplands each dry season.

In Lompo Riaja and Tompo in Barru, many animals are still tether grazed and hence often mate with passing cattle, resulting in lower uptake of the practice in those villages. Similarly, in the mountainous villages of Mangempang and Bontomanai in Gowa, the rugged terrain makes taking cows to a bull a difficult and time consuming activity.

In addition, Barru and Bone farmers often keep males for fattening whereas Gowa farmers sell males at a young age, so there are few bulls for controlled mating.

Early weaning has been a more challenging concept for farmers to embrace. Many cannot see any advantage as benefits (eg reduced calving intervals) are not immediate. Indeed, at the time, the practice appears diadvantageous as the calf is unhappy and the farmer must preferentially feed it. Despite this, at least one best bet farmer in most study villages (and the majority of best bet farmers in some) had tried early weaning within the project period, with good results for both cows and calves.

Feed budgeting is also a harder practice for many farmers to adopt. However, in each village some farmers are conserving forage (mostly peanut and rice straw) for feeding in the dry season and are preferentially feeding tree legume in the dry season.

In Bone, uptake of residue conservation is low as there is little storage, few peanut crops and little need for stored forage because of their much shorter dry season.

Table 9. Uptake by best bet farmers in project villages of five project strategies to improve feeding and management of Bali cattle. Green is full uptake; blue is partial uptake; grey is no uptake.

Regency/ village	Better use existing forage	Introduction of new forage	Controlled mating	Early weaning / preferential feeding	Feed budgeting
Barru					
Mattirowalie					
Anabanua					
Lompo Riaja					
Tompo					
Gowa					
Pabbentengang					
Maccini Baji					
Mangempang					
Bontomanai					
Bone					
Laburasseng					
Mattirowalie					
Bune					
Tappale					

Indicators of productivity change

The key indicators of improvements in productivity used in the project are shown in Figure 6. All have improved across the three regencies.

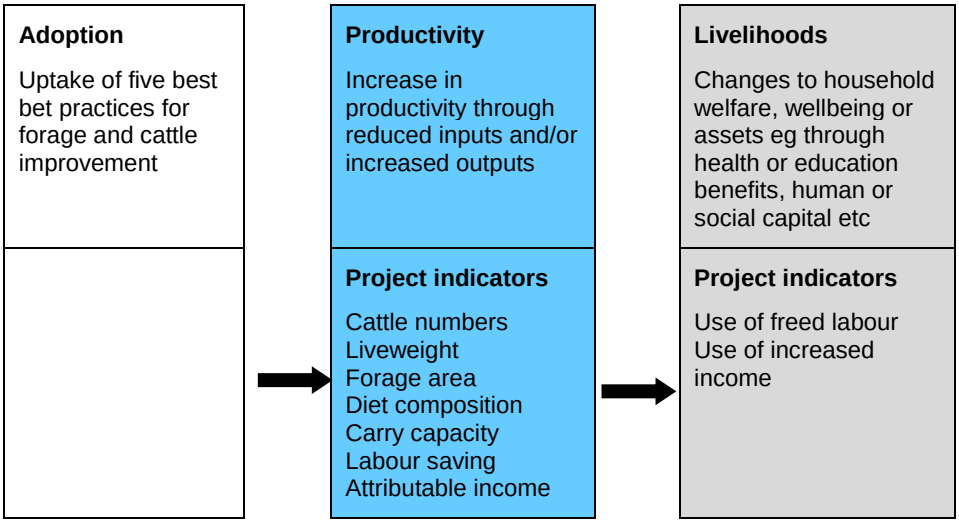


Figure 6. Assumed impact chain, aspirational targets and indicators for impact assessment

Cattle numbers

Cattle numbers increased by 50-100% in each regency, with the biggest increase in Barru (Table 10). Anecdotal evidence from OGT and PST members suggests that higher calving rates as a result of controlled mating, and lower mortality rates have contributed to the increased numbers.

In addition, there are reports from the project team that the increased availability of feed has given some farmers (particularly in Barru and Bone) confidence to switch from a predominantly fattening enterprise to a breeding enterprise.

Mortality rates averaged approximately one per village which represents <1% of the cattle numbers. This compares favourably with an overall rate of 3-5% in the NTB region (Talib et al 2003).

Table 10. Average number of cattle kept by each farmer in 2007-08 and 2009-10, and the average number of cattle each farmer sold over the two year period.

Regency/ village	2007-08	2009-10	Number sold
Barru			
Tompo	5	12	5
Anabanua	5	12	3
Mattirowalie	4	6	3
Lompo Riaja	5	10	4
Bone			
Mattirowalie	5	10	5
Laburasseng	7	6	NK[1]

Bune	7	8	2
Tappale	4	6	NK
Gowa			
Maccinibaji	5	6	NK
Pabbentengang	4	5	NK
Bontomanai	4	7	3
Mangempang	3	5	4

[1]NK = not known

Area planted to forage

There has been a considerable increase in the area planted to elephant grass and to new forages, particularly Paspalum and Mulato.

Initially most best bet farmers had some elephant grass, with the average area ranging from 0.01ha in Gowa up to 0.78ha in Lompo Riaja, Barru (Table 11).

Some of the new forages have replaced elephant grass plantings and one farmer replaced some cropping area, but most new forages have been planted in backyard areas or in upland areas that were previously growing predominantly native grasses or weeds.

The areas planted to new forages ranged from 0.23 ha to 0.65 ha for the five best bet farmers in Barru and 0.7 ha to 1.54 ha in Bone (Figure 7). The area of elephant grass also increased in most villages.

Values for Gowa are not known. There is anecdotal evidence of a slower growth rate in this region, compared to Barru and Bone, due to sandier soil and hence greater evaporation in the dry season.

Table 11. Average area (ha) of planted forage (elephant grass) in upland and backyards in each village at beginning of project, and percentage of farmers growing forage in each area. Areas are the average of 20 to 40 farmers.

Regency/ village	Upland area	% farmers	Backyard area	% farmers
Barru				
Tompo	0.09	20	0	0
Anabanua	0.30	65	0	0
Mattirowalie	0.17	60	0.02	15
Lompo Riaja	0.39	75	0.01	35
Bone				
Mattirowalie	0.23	42	0.05	17
Laburasseng	0.07	35	0	0

Bune	0.07	15	0.002	5
Tappale	0.15	50	0	0
Gowa				
Maccinibaji	0.01	5	0.001	5
Pabbentengang	0.01	6	0	0
Bontomanai	0.20	90	0.002	3
Mangempang	0.10	3	0.002	3

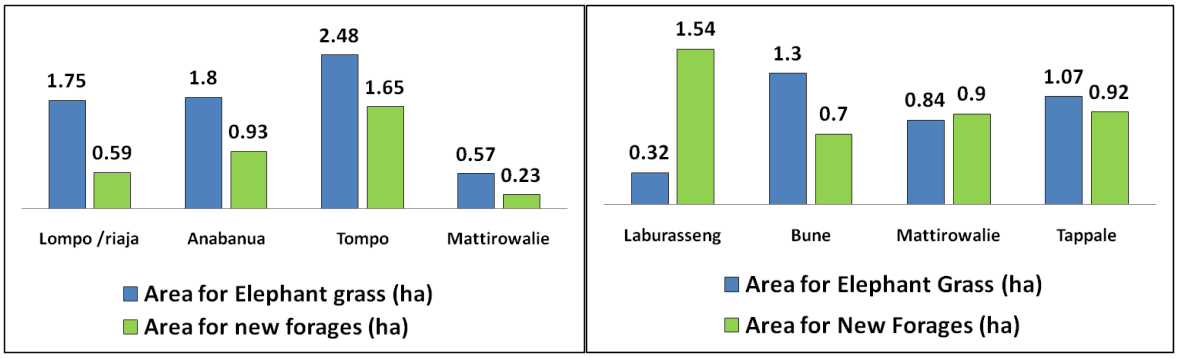


Figure 7. Area of elephant grass and new forages for each of the four villages in Barru (left) and Bone regencies in 2009. The values are the total area for five best-bet farmers in each village.

Cattle carrying capacity

The planting of new forages and the better management of elephant grass has substantially increased the carrying capacity of the best bet farms in each village.

Most farmers now cut their grasses at regular intervals (every 30-40 days for elephant grass, every 15-20 days for new grasses). This increased the total production per annum, and also increased the proportion of leaf harvested.

In Barru regency, initial carrying capacity from forages produced on-farm ranged from 0.2 animals per farmer at Mattirowale up to nearly 1 animal per farmer at Tompo. With the introduction of new grasses this has increased to 0.8 to 4 respectively (Figure 8).

In Bone the carrying capacity has increased similarly from approximately 0.5 animals per farmer up to 1.7 to 1.9. Figures from Gowa are not known.

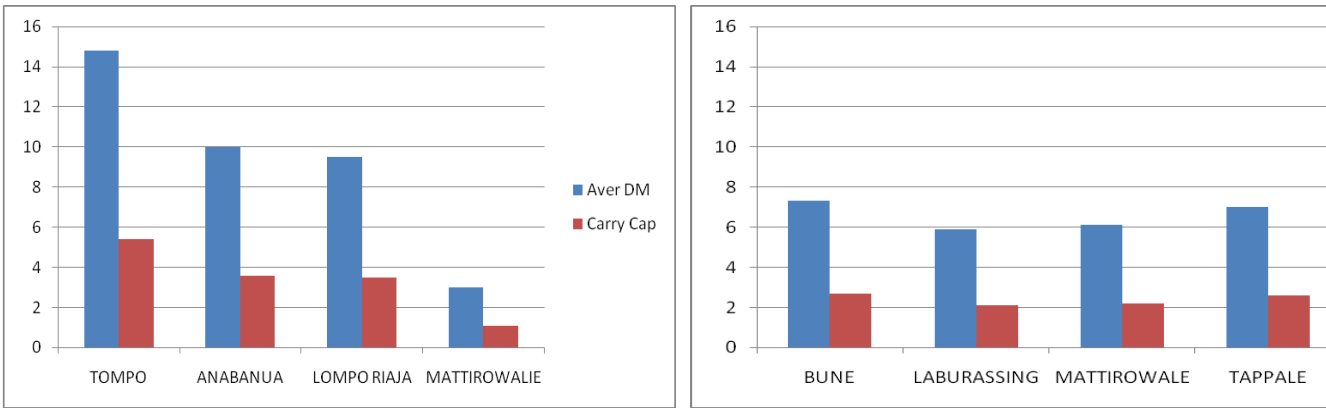
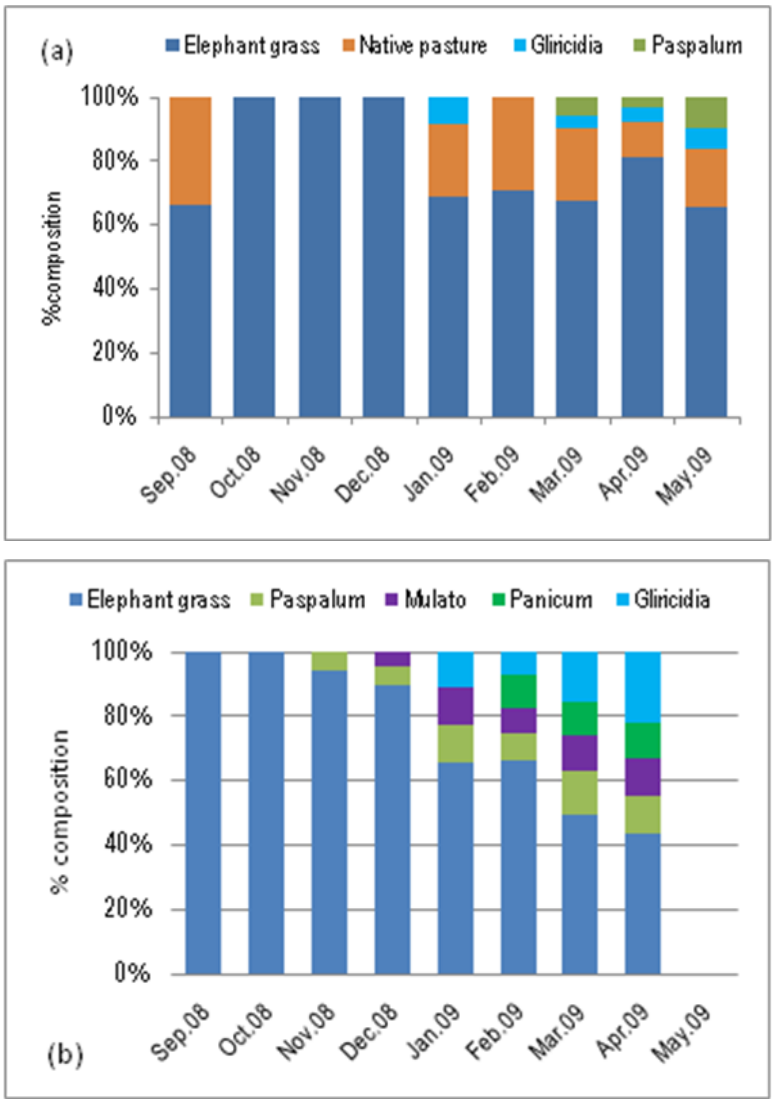


Figure 8. Dry matter production from planted forages (tonnes/BB farmer land/year; blue bar) and estimated carrying capacity per best bet farmer (head of cattle/BB farmer/year; red bar) in each village in Barru (left) and Bone regencies. Note that dry matter production does not take into account crop residues, tree legumes, native grasses etc, which all contribute to carrying capacity.

Diet quality and liveweight gain

As pastures became established farmers increased the amounts of the new forages and Gliricidia in the cut & carry fed to animals, and decreased the amounts of maize straw, etc. (Figure 9). This trend continued through 2009-10.



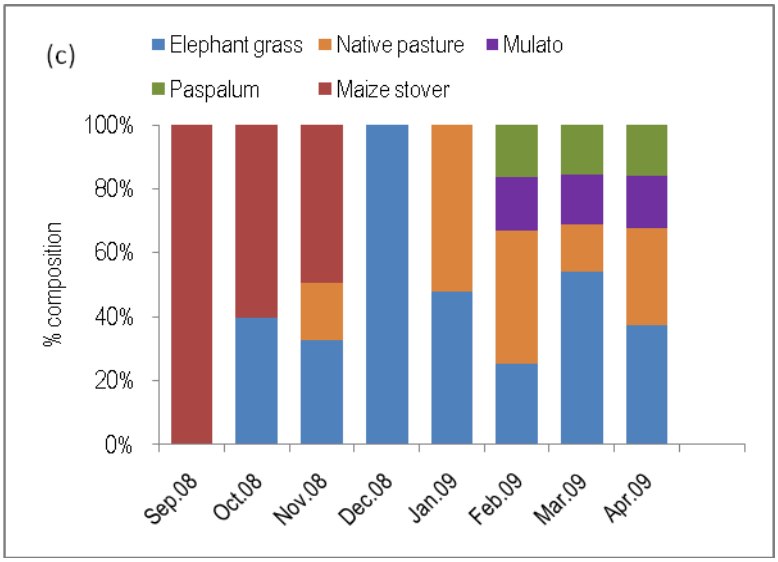


Figure 9. Examples of the proportion (%) of different forages in cut & carry diets fed to animals for a representative farmer in Barru (a), Bone (b) and Gowa (c) through 2008-09.

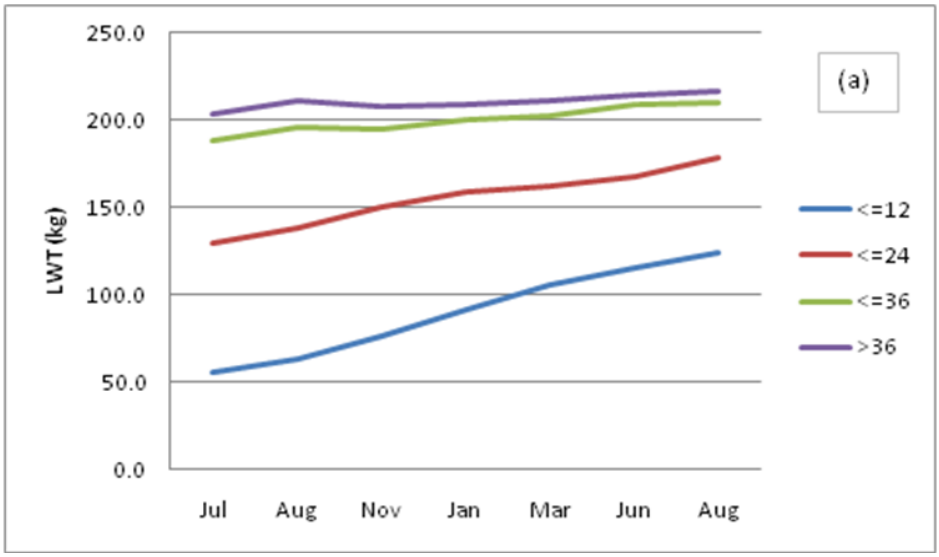
The better cutting regimes for elephant grass (provided increased proportions of leaf), along with the leafier new grass species and some legume, have led to an improvement in diet quality for cattle. Although animals are often tethered for grazing close to the house, the majority of their feed throughout the year is supplied by cut and carry.

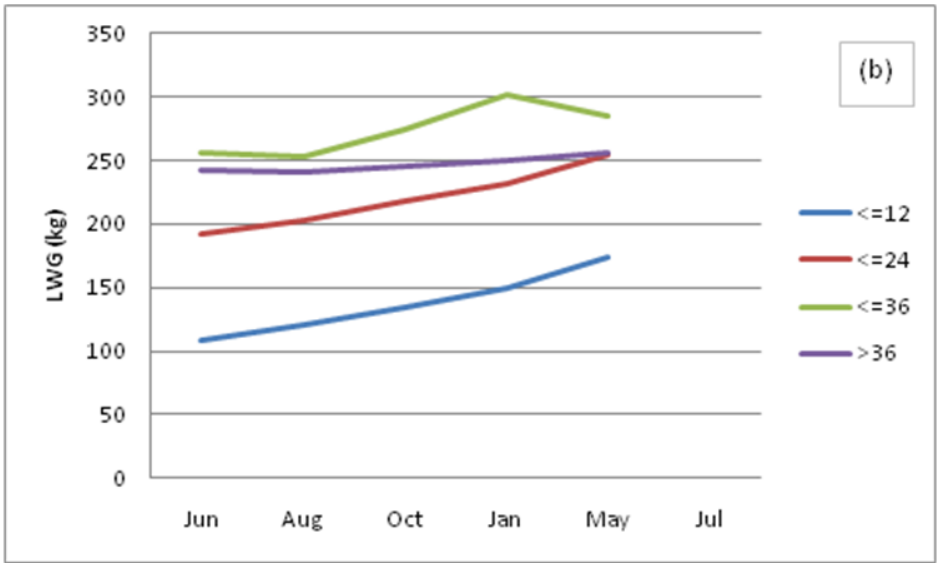
Even in the first year of the project, this quality was reflected in the animal performance. In Bone regency, the wet season begins mid-year and new forages were established at this time. In Barru and Gowa, new forages were not established until December 2008 or later.

Animal liveweight was monitored in the first year after forage establishment and these figures showed a better performance from animals in Bone, with liveweight gains of 190-200gms/day for young animals, compared to 80-130gms/day in Gowa, with Barru in between (Figure 10).

Animal liveweight was not measured in the subsequent year, hence progressive improvement cannot be shown. However, the previous ACIAR project showed well fed animals gaining 300-400gms/day (Lisson et al 2008), and there is no reason that well fed animals in this project would have gained any less.

This would represent an increase in beef production of 200-300gms/day per animal, which, based on current prices, would amount to around Rp6000 per animal per day increase in value over that being achieved at the beginning of the project.





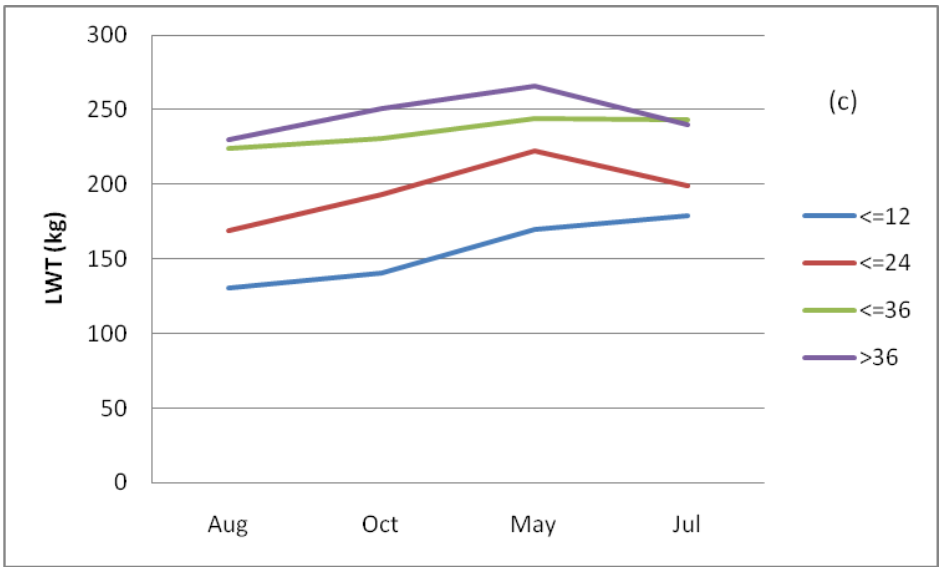


Figure 10. Liveweight change of animals up to 12 months of age at the beginning of the monitoring period, 13-24 months, 25-36 months, and animals older than 36 months, for (a) Barru, (b) Bone and (c) Gowa regencies.

Labour and income

In group discussions in June 2010, farmers were asked to estimate the number of hours spent each day collecting forage, before and after interaction with the project. Detailed notes appear as Appendix 6.

The summary provided in Table 12, suggests labour saving in all villages has resulted from the introduction of new forages, better management of existing forages and importantly, the location of new forage banks closer to the farmer's house.

Farming households reduced time spent collecting forages by between 50% and 85% (refer to Table 12). Savings were higher in villages already practising cut and carry feeding and less marked in villages using tethered grazing.

Freed labour was mostly reinvested in crop production (for which higher crop yields had been reported in many villages, primarily due to more weeding) or used for non-farm work such as construction or in Gowa, brick making.

Table 12. Daily estimates from farmers of labour used for forage collection before and after project, and main uses of freed labour.

Regency/ village	Labour before project (hours/day)	Labour after project (hours/day)	Use of freed labour
Barru			
Tompo	4-6	1-2	WC, OFW
Anabanua	3-5	0.5-1	CW, CF
Mattirowalie	1	0.25	WC, OFW
Lompo Riaja	1-6	0.25-2	CW
Bone			
Mattirowalie	5-6	0.5-1	CW, OFW
Laburasseng	5-6	0.5-1	CW, OFW, OW
Bune	4-5	1	CW, OFW
Tappale	1-2	0.5-1	n/a (little saving)
Gowa			
Maccinibaji	3-4	1-2	CW, BM, R
Pabbentengang	3-4	1-2	CW, BM
Bontomanai	5	0.5-1	CW, OW
Mangempang	4-5	1	CW, OFW, OW

WC-weeding crop; OFW-off-farm work CF-conserving forage; CW-cropping work; BM-brick making; R-rest

In the same discussions, farmers were asked to comment on changes to cattle prices and household income over the course of the project (Table 13). Sale prices (and actual income) were not recorded due to the confounding nature of the current cattle market. Instead, farmers were asked for perceived trends and sources of attribution.

In all villages except one, farmers felt cattle price had increased. All increases were attributed to elevated market price, and nine of eleven felt that better cattle condition had also contributed.

Ten of the villages perceived an increase in household income and most attributed the rise to cattle. Additional reasons included rice sales and off-farm work. The most common uses for increased income were:

- House building or renovations
- Motorbike or other vehicle purchase
- Education
- Purchase of cattle or land
- Haj travel or wedding

Table 13. Farmer perception and attribution of changes in cattle price and household income at the end of the project.

Regency/ village	Cattle price	Reason for price change	Household income	Reason for income change	Use of increased income
Barru					
Tompo	Increase	AC, MP[1]	Increase	Cattle	House, MB[2], education, wedding, lending
Anabanua	Increase	AC, MP	Increase	Cattle, rice	House, MB, education, cattle, tractor
Mattirowalie	Increase	AC, MP	Increase	Cattle	House, MB, computer
Lompo Riaja	Increase	MP	Increase	Cattle	House, education, wedding
Bone					
Mattirowalie	Increase	AC, MP	Increase	Cattle	House, MB, Haj
Laburasseng	Same	n/a	Unsure	n/a	n/a
Bune	Increase	AC, MP	Increase	Unsure	MB, Haj, cattle
Tappale	Increase	MP	Unsure	n/a	n/a
Gowa					
Maccinibaji	Increase	AC, MP	Increase	Cattle, rice, bricks	House, MB, education, cattle, land
Pabbentengang	Increase	AC, MP	Increase	Cattle, rice, bricks	House, MB, education, cattle, land
Bontomanai	Increase	AC, MP	Increase	Cattle	House, Haj, education
Mangempang	Increase	AC, MP	Increase	Cattle, OFW	House, vehicle, land

1 AC-animal condition; MP-market prices
2 MB-motorbike

7.2 Understanding adoption

Summary

This section provides an overview of the household decision making context, in terms of a household's physical, economic and social resources, how they are perceived and prioritised by those interviewed as well as risk, information transfer and how these factors influence adoption.

In order to effect changes to a farming system, it is imperative to understand how farmers view and prioritise their resource 'portfolio' and how this prioritisation forms their decisions. While this alone does not necessitate change, it does help ensure interventions align with local perceptions and priorities. In many cases, the choice not to adopt is not absolute and is revisited as household circumstances change or farmers are exposed to new options.

The sharing of local knowledge by farmers and scientific knowledge by OGTs has been a complementary and successful outcome of this project. OGTs encourage the adoption process through provision of scientific or 'expert' knowledge, access to information and ongoing support and advice. Farmers drive the scale out process, providing local legitimacy, networks and proof of benefits.

It is less risky or confronting to experiment with interventions that are not far removed from existing practices. Demonstration of benefits (not just new resources) is a powerful catalyst for scale out while 'long term' access to information and advice builds confidence and longevity.

Research framework

Resources available to the farmer determine viable options or choices. Resources may include land size and cattle ownership, as well as non-material resources such as labour, access to markets and information. Only options perceived by the farmer may be considered as genuine options as non-perceived options (ie those seen by others but not by the farmer) are effectively not viable.

In choosing between viable options, there is an assumption that the farmer does not select according to free will, ie devoid of a social and cultural context (Koppel 1985). Rather, the selection criteria for decision making are based on the farmer's economic priorities (maximisation of income or maintaining the household's subsistence) as well as his or her evaluation of the social and economic risks involved (see Figure 4).

This research framework guided analysis of household perceptions and decisions relating to use and adaptation of practices promoted by the project. A challenge in this analysis has been the ambiguity regarding what constitutes adoption, and how to accurately identify when it has occurred.

Defining adoption

The project team devised a working definition of adoption relevant to practices encouraged as part of the broader project. Adoption is considered to have occurred when:

a) A household is using one or more of the five best bet practices

b) There has been a shift in the livelihood strategy of the household, ie cattle production has increased in importance compared to other parts of the farming system

However, adopting practices is an insufficient measure for the purpose of the study. For adoption to be considered to have occurred there must also be qualitative change in the farming system. The mere presence of introduced forage species on a property, for

example, would not in itself signify adoption without an accompanying change in how forage is managed and used.

'Adoption' is not a single decision but a series of decisions, actions, evaluations and adjustments that evolve and respond to changing information and experiences (Koppel 1985, Feder et al 1985). By identifying qualitative shifts in allocation of activities within the farming system, the project team attempted to distinguish between trialling of practices (which may be temporary) and adoption where there is a decided, longer-term shift in activities. The decision involves a re-allocation of the household's resources and economic portfolio – both to adopt a new practice and in response to the outcomes and results of adoption.

If more emphasis – ie more resources, more inputs – is placed on cattle production, it follows that it is not merely treated as an add-on to the economic portfolio but a more central component. In this case an accompanying shift from subsistence to a higher level of market integration is expected. Such a shift may also include farmers who previously had no cattle at all but are encouraged by seeing the success of participating best bet farmers to plant their own forages or buy or share cattle to add cattle production to their farming system for income generation.

As follow-on effects, farmers may also decide to grow forages to sell, or to provide feed (on a share farm basis) to other farmers for raising cattle, or to provide planting material (cuttings and/or seed) to sell to other farmers. Such small business opportunities have been taken up in Thailand, Cambodia and Vietnam and will likely occur in Indonesia if scale out succeeds and encourages a market for planting material.

The project team looked for shifts in livelihood strategies that would identify or indicate adoption. New practices may change the resource base for the household, which in turn, would lead to shifts in viable options. The household may then decide to change its livelihood strategy, eg from subsistence-oriented to market-oriented. It is through these shifts that we can detect whether adoption is occurring. Obviously, measuring these shifts will be difficult. As an indicator, the importance of cattle vis-à-vis other elements of the farming system (eg crops, poultry, etc) is used.

Household decision making

The overview presented in this section is based primarily on 216 farmer interviews and discussions with OGTs as experts. In presenting findings from these semi-structured interviews, we have focused on recurring themes – both within and across villages – that help to identify broader lessons or highlight significant points of interest.

It should be noted that interviews were conducted in mid 2009, which was relatively early in terms of on-ground involvement with farmers (less than six months after the first wet season for best bet farmers in Barru and Gowa, and 12 months for Bone). While this was appropriate for the aim of the adoption research, data presented here should not be interpreted as a final point.

Land, cattle and off-farm activities

Land ownership and farming systems of the interviewees vary slightly across the three regions and 12 villages, based on land availability and irrigation. Most households interviewed were able to secure two harvests of rice and additional crops such as maize and/or vegetables. Some households, particularly in Anabanua village in Barru were limited by lack of irrigation and were able to secure only one harvest of rice and one crop of peanuts each year. Households in this village felt particularly limited in terms of their farming system.

> *The main source of family livelihood comes from agricultural activities and cattle farming. Rice is planted once a year and rotated with peanut in May, after that*

> *there is no other farming activity that can be done due to water shortage (dry season). Therefore, there is no potential innovation that can be done with the existing farming system.*
>
> *Barru Farmer 39, Anabanua*[4]

Almost all households interviewed owned both cattle and land. The average area of land held by interviewed households across the three regions was 1.51ha. The largest average household land ownership was in Bone (1.9 ha), while the smallest was in Gowa (1.3 ha). Land ownership usually occurs in multiple holdings and locations (mosaic land use).

Almost all households interviewed held cattle (98%) and almost all had access to farm land (99%).[5] Those without land or cattle were from Gowa, which had off-farm and non-farm employment opportunities due to its proximity to an urban hub. Those farmers with cattle but without land also held jobs as scavengers at the local waste site, where they were able to let their cattle graze and were confident their condition was as good as (or better) than other cattle.

Those without cattle had either sold their cattle (for weddings or expensive purchases) or decided not to raise them at that time for health or security reasons. For many farmers interviewed, cattle serve the dual purpose of wealth saving, as well as draught (tilling fields). Where machinery has replaced animal power, there was obviously a bigger focus on cattle as wealth saving.

Cattle are not part of the regular income stream of the farming household. They contribute to income generation, but are a form of wealth saving and tend to be sold for particular events or purposes, rather than providing a guaranteed income at regaular intervals.

When cattle are sold, income is used for three purposes:

- savings for major investments (agricultural inputs, vehicles house improvements)
- savings for exceptional expenses (health costs, dowry payments, Haj travel)
- daily expenses (usually in exceptional circumstances, or if there is money left over after other purposes have been fulfilled).

Many households engage in off-farm or non-farm activities to contribute to income generation. As a rule, rice and vegetables are grown for self-consumption. If irrigation infrastructure is available and more than a single harvest can be achieved, surplus production is sold.

In the case of additional non- or off-farm activities, income generated was most often used for paying daily expenses (additional foods, commodities, taxes). In this case, income from cattle was most often used for savings (see first and second points above) due to the irregular nature of the income stream. At certain times of the year, cattle prices rise (eg during religious celebrations when demand is greater). When possible, farmers try to plan the sale of their cattle according to the fluctuating market price, although this is not always possible (eg if emergency expenses are needed).

Adding cattle to the farming household's income portfolio provides the opportunity to pay for major items by selling animals when needed. This provides cash liquidity when required, whereas income from cropping is seasonally dependent and surplus cash after

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[4] Quotes are taken from interviewers' (OGT) summaries. For information on data generation, see Section 5.3.2. It should be noted that issues associated with interpretation may exist.

[5] Note that this refers only to those households that were interviewed. Due to the nature of the research question and subsequent sampling strategy, this is unlikely to be representative of the broader situation.

purchase of cropping inputs is variable and potentially low, depending on market price. Holding cattle is seen as an activity that complements rice farming in order to provide access to cash.

Rice production played a more prominent role than keeping cattle in virtually all households. Even though many farmers talked about increasing their herd size, few have done that at the expense of rice production. For example, selling land to buy cattle did not occur to any respondent, and while some households interviewed were prepared to replace cash crops like cocoa or maize with forage, only one was planning to substitute rice production. This was an elderly man who felt the labour involved in rice production was getting too much for him.

Some farmers indicated they would also like to enter into share cropping arrangements so they could focus on their cattle, but at the same time be able to keep their connection to land and maintain rice production and food security.

In essence, while many farmers aspire to increasing cattle as a proportion of their farming system, meeting household food requirements through rice production was usually a priority, with many farmers feeling cattle was a good complement to rice production.

> *If he has capital, he plans to buy more land. He also prefers to combine agriculture with cattle raising as the ideal farming system.*
>
> *Barru farmer 42, Anabanua*

> *They consider cattle as a very valuable asset. According to [the farmer], cattle is as precious as rice field. …He prioritises the land use for rice and dry season crops to meet family life expenses. According to him, the ACIAR project is very good to ensure the sustainability of farmers' livelihood as well as the improvement of cattle condition. However, the adoption itself is limited by the lack of land available. He does not want to change the current use of land from rice farming to forage production because it will risk the family food security*
>
> *Gowa farmer 30, Maccini Baji*

While many farmers were aspiring to buy land to grow forage and increase their population of cattle, there seemed to be criteria to meet before this became an option. First, that households have adequate land for rice production and forage area would not decrease the rice production area; and second that they had enough land to fulfil the social practice of leaving land to their children as inheritance. Farmers with sufficient land area to fulfil these needs (or who had no children), or who had limited available labour to work extra land were able to focus on cattle and herd production. To the farmers interviewed, cattle take secondary importance after acquiring sufficient land.

The main exception to this was in Gowa, where problems with cattle theft meant farmers felt land was a safer investment. In addition, some felt the value of investing in land was greater:

> *He prefers to use his available land to grow rice and dry season crops because the results are profitable (rice can be sold for cash). He claims that replacing rice with grass is very risky, because the grass can be stolen or raising cattle under intensive system may increase the risk for it to be stolen. Therefore, he prefers to maintain his rice farming and to raise his cattle in traditional system.*
>
> *Gowa farmer 19, Maccini Baji*

> *If he has adequate saving, he plans to buy more land instead of increase his investment in cattle or other activities. The preference is taken because of availability of land, which is becoming very rare nowadays, while cattle can be bought at any time if he has money*.

Gowa farmer 63, Bontomanai

Labour

The task of looking after cattle was shared between men, women and in some cases children. When feed became scarce, it was generally men who travelled longer distances to find and bring back forage. Time investment for rearing cattle included this search for feed, and also moving or tethering cattle to grazing and watering locations during the day and bringing them back to the house each night.

In many cases, planting forage banks nearer to houses had not been considered. For those households who were able to do this, they perceived significant saving of time and labour in relation to these activities. The use of introduced forage – both nearer to the home, and with lighter biomass – also meant women could take more of a role in this activity (or that it would take them less time or would be easier if they already did).

Cattle management strategies

Many households interviewed kept bulls in pens or kandangs for fattening, while cows are left to graze on harvested rice fields or public lands. In some cases farmers own land dedicated as grazing lands. This is particularly common in Bone, perhaps due to higher land ownership or availability. For those farmers who were interested in early weaning and controlled mating, the lack of kandang infrastructure (and lack of labour, time or money to build it) was often perceived as a key constraint.

Although many farmers held mature bulls, these were often not perceived as available for mating or enabling the adoption of controlled mating practices. This was particularly the case in Barru and Gowa. The role of bulls for fattening and sale was predominant, and although both mature and younger bulls were available, the preference was for cows to graze and (opportunistically) mate with grazing bulls[6]. This was largely due to concerns the bull would lose weight and therefore value if used for mating. Households in Bone did not share this perception perhaps due to more experience raising cattle, and generally higher numbers of cattle owned.

While many farmers still maintain this belief, some indicate changing perceptions:

> *[The] Other obstacle [to adoption] is the difficulty to find quality bull because farmers usually sell their bull because the price is high. Because of that he has to go to the neighbouring village to find bull for his cattle during the mating period. Now, he started to solve these problems… He also decides to keep his bull for mating purpose and will sell the bull after three years old*.
>
> *Gowa Farmer 26, Maccini Baji*

Forage resources

Feed shortages were a common experience in Gowa and Barru, and this was a constraint to cattle production. In Barru, this was predominantly in the dry season when natural grasses became scarce. In Gowa feed shortages were also felt during the wet season, when grazing of rice paddies is no longer possible. This proved to be a strong incentive for adoption of forage practices in both areas[7].

In contrast, households in Bone that lacked experience of feed shortages were less inclined to put effort into development of new forage – even though the results with different types (or better management of existing) was likely to have been better.

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[6] The role of cows and bulls was also different. Bulls tended to be fattened for sale; cows were kept for labour, calf production and wealth accumulation. By law, productive cows cannot be sold to an abbatoir.

[7] In Gowa in particular, this incentive for adoption occurs within the context of land and time constraints (and so does not always translate into implementation).

Many households had existing knowledge relating to cultivation of elephant grass for forage and pre-existing forage banks. OGTs felt this familiarity with cultivating forage was a reason why some farmers were willing to try new types of forage.

At the time of the interviews, there was a shortage of cuttings available for planting of new forages due to the dry season and associated difficulties best bet farmers had establishing their forage. This often delayed adoption, particularly in Tompo and Pabbentengang (Figure 11).

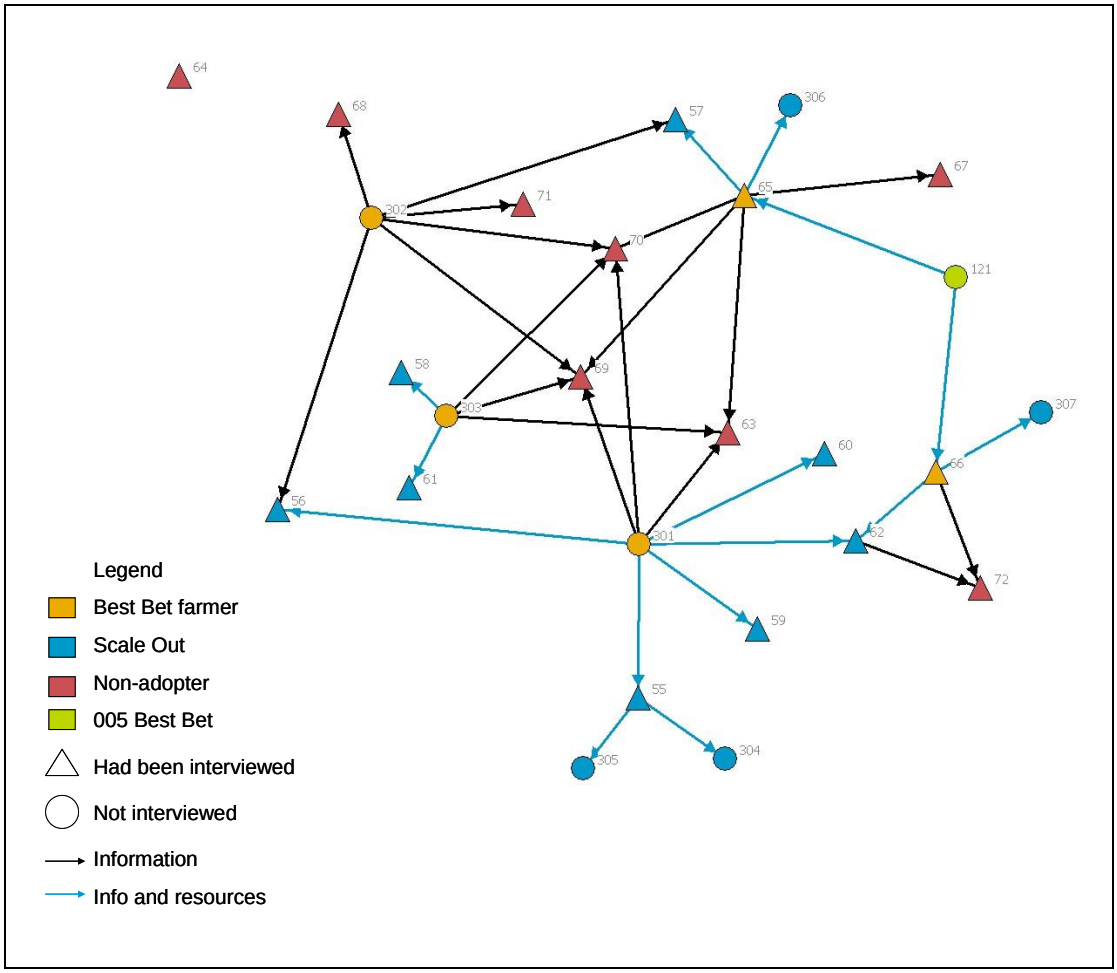

Figure 11. Spread of information and resources, Tompo village, Barru

Linking resources and adoption

The network shown in Figure 11 highlights the link between resource provision and adoption. In this network, blue lines indicate that information and resources had been received or provided to actors, while black lines indicate only information has been provided. There is no occurrence in which resources were passed on without information. However, where information is passed on without resources, adoption does not occur.

For example, in the case of production of new forage varieties, clearly adoption is not possible without provision of new seeds or cuttings. However, no external resource is needed for a household to adopt better management of existing forages, so it makes sense to closely examine what barriers may exist other than lack of physical resources.

Discussion with OGTs revealed farmers were often more interested in practices that are associated with new resources – ie there was often more interest in the introduction of

new forages (that require resource provision) than in better management of existing forage.

In this network, of the eight people who had not adopted any practices:

- five planned to plant new forages at the commencement of the wet season;
- one was very busy but was considering planting new forages once she had seen the results of other farmers;
- two had no plans (of which one states he had no time)

It is not clear from the networks why better management of existing forage is not adopted where there are limitations on new forage seeds or cuttings. Based on more recent adoption data (see Section 7.1) it appears that better management of existing forage is adopted at a later stage.

Risk

Overall, the practices in themselves were not seen as risky by the farmers interviewed, particularly where they built on existing knowledge.

However the most commonly stated perception of risk was that early weaning would threaten animal health, causing the calf to lose weight and causing distress to cow and calf. Consultation with OGTs and observation of other farmers often encouraged a trial of the practice and a change in perception.

A small number of farmers were concerned that forage production near their homes would attract rats, or that forage seeds would be eaten by chickens, resulting in failed production. These farmers were typically part of the 'random' sample, and had less information support from the best bet farmers and OGTs.

These are detailed snapshots and insights based on interviews with a sample of farmers – adopters and non-adopters, with different levels of exposure to the project. Insights from this sample, expert opinion of the OGT and field observation suggests the following key points:

- Even practices perceived as low input require at least initial shifts in resource allocation (eg initial labour investment) that may deter households
- Often farmers can see the benefits of adoption but are unable or unwilling to implement changes due to household's available resources and priorities for resource distribution
- Practices that build on existing or local knowledge or that follow similar principles and values are perceived as less risky and easier to adopt. For example, introduction of new forages required less change for farmers with existing stands of elephant grass, than for farmers who relied on free grazing or cut and carry from communal lands and for whom cultivation of any forage is a new activity.
- Practices that involve introduction of new resources (eg new varieties of forage or provision of a bull) generate more interest, but are likely to be successful only if they are accompanied by access to these resources. For example, forage introduction was far more successful than controlled mating due to negative perceptions around bull availability (ie the farmer's own bulls were not perceived as an option for mating and there was no perceived possibility for one to be provided).

- Demonstration of benefits and shared experience through farmer to farmer interaction is essential to disprove concerns over practice outcomes. However, if it is essential to get the 'entire' message out, this is best supported by either OGTs or other institutional figures (eg PPLs) who are better placed to do so. Best bet farmers primarily shared information relating to new forage, and less frequently shared the entire project package.

7.3 Supporting scale out

Summary

This section explores the expansion of project practices, resources and information through the community, that is a starting point for adoption.

In the shortened project period, primary scale out from best bet farmers was recorded as 445. On average, one best bet farmer disseminated information to over five other farmers in even the harshest seasonal and topographical conditions (the highest ratio was 1:14). Key scale out networks were neighbours, family members, best bet farmers and OGTs.

The rate and scope of scale out varied and were assisted by coupling information with resources (to allow knowledge to become action); supporting farmer interactions and tangible displays of the benefits of adoption; and training extension staff as a catalyst for broader scale out.

Scale out across regencies

Primary scale out from best bet farmers was recorded at 445 in April 2010, although this is likely to be an underestimate as not all visits or interactions were recorded by best bet farmers or OGTs.

In terms of within village and beyond village scale out numbers, Bone regency scored more highly than Barru or Gowa. This is also true of the ratio of scale out farmers influenced by best bet farmers (refer to Table 14).

This is not unexpected. Landholding and herd size in Bone are higher than in other regencies and Bone has more rainfall (courtesy of its bimodal wet season) and therefore fewer limitations on cropping or forage resources. In addition, project activities started earlier in Bone than Gowa or Barru, allowing the project team to work with farmers for an additional six months and an additional wet season.

Barru villages had the benefit of having successful best bet farmers from the precursor project (LPS-2004-005) in their midst, as well as an established forage nursery. However, best bet activities in the current project did not begin until the start October 08, meaning recorded scale out resulted from only two wet seasons. Scale out was further hampered by a late start to the 2009-10 wet season that delayed or affected scale out forage plantings.

This was also the case for Gowa, with on-ground best bet activities starting in October-November 08. Gowa villages faced additional challenges throughout the project. The two mountain villages (Bontomanai and Mangempang) had little available land that was suitable for forages and a particularly harsh 2009 dry season further impeded forage development. In addition, the terrain in the upland villages made farmer-to-farmer interactions more challenging.

By contrast, the two lowland villages (Maccini Baji and Pabbentengang) were relatively resource rich, with many households deriving significant income from other activities such as brick making, vegetable growing and trading. Farmers in these villages were thus less responsive to improved forage and cattle production options.

Despite less than ideal conditions for scale out, results indicate that it was possible to achieve the project target of 1 best bet farmer: 5 scale out farmers in both Barru and Gowa. Indeed, results from Tompo in Barru (1: 9) and Bontomanai in Gowa (1: 10.4) suggest credible dissemination despite these challenges.

Table 14. Summary of known scale out of at least one project practice in each study village

Village/ Regency	Known scale out within village[1,2]	Proportion of village[3] (# HH in village[4])	Known scale out beyond village[1]	Total known scale out	BBF:SOF ratio
Bone					
Laburasseng	60	13.9% (433)	8	68	1: 13.6
Tappale	43	10% (428)	29	72	1: 14.4
Mattirowalie	35	9.3% (377)	30	65	1:13
Bune	19	4.4% (430)	8	27	1:5.4
Bone total	**157**	**9.4% (1668)**	**75**	**232**	**1: 11.6**
Barru					
Tompo	25	4.7% (530)	20	45	1: 9
Anabanua	23	4.5% (507)	5	28	1: 5.6
Lompo Riaja	17	1.6% (1095)	3	20	1: 4
Mattirowalie	14	1.8% (783)	1	15	1: 3
Barru total	**79**	**2.7% (2915)**	**29**	**108**	**1: 5.4**
Gowa					
Bontomanai	48	5.1% (942)	4	52	1: 10.4
Mangempang	30	5.8% (517)	3	33	1: 6.6
Maccini Baji	5	0.5% (953)	10	15	1: 3
Pabbentenan	5	0.5% (1029)	0	5	1: 1
Gowa total	**88**	**2.6% (3441)**	**17**	**105**	**1: 5.3**

1 These figures are likely to be underestimates as not all scale out activity was recorded
2. During interviews in June 10, farmers suggested that uptake in best bet sub-villages was always higher than other sub-villages in the village complex, with estimates of between 10% and 90% uptake and an average of 50% across all study sites.
3 These figures include many households that do not keep cattle; proportions of cattle keeping households are likely to be much higher.
4 Figures for household numbers from Badan Pusat Statistik (2008).

Social networks

Key networks for the spread of information were neighbours, family members, best bet farmers and OGTs, although the roles of each differed.

Best bet farmers were key to providing proof (in addition to information and resources) that the best bet practices yielded positive results. A key strategy for many scale outs (and some best bets) was to wait and see how other farmers went before trialling practices themselves.

> *He started the adoption of the best bet technology by observing the progress of [a Best Bet farmer 301, Anabanua] and receiving grass seeds from him to be planted on his land. He decides to adopt the technology after witnessing the use of the forage as feed material.*
>
> *Barru Farmer 45, Anabanua*

The social network analysis (see Section 5.3.2 for details of methodology) indicated that best bet farmers with highly visible and accessible fields[8] (eg along roadsides or in high land use areas) facilitated farmer to farmer interactions and hence scale out. While events were also important for the spread of information, often it was the simple act of farmers 'passing by' a best bet farmer in the field that sparked discussion and information exchange.

While the project's emphasis on farmer to farmer communication has proven very successful in supporting dissemination and scale out, there is evidence in the social network analysis that best bet farmers do not always pass on all information relating to improved management practices. Best bet farmers in this project have tended to act as information gatekeepers; having gained skills and knowledge, they have been selective about what information they relay to fellow farmers, focusing on information regarding the use of new forage.

This could reflect the process of adoption encouraged by the project (forage first; easy entry points) or the farmer's reluctance to pass on information until they are confident of the outcomes. Over time, as experience with other practices builds, more information may follow.

Other farmers (not best bets) readily passed on information for the practices they had successfully implemented, particularly to neighbours and family. Again, this information was primarily about forage. OGT observations suggested that family connections were paramount, and when resources were limited, they would be shared with family before other farmers.

OGTs provide 'expert' knowledge, supporting scale out farmers in addition to best bet farmers. Organisation of events such as weighing activities at the mosque and farmer field days at the homes of best bet farmers raised the profile of the project. The combination of OGTs, with 'expert' knowledge, and best bets with 'farmer legitimacy' has proven very beneficial in supporting scale out.

In the case of Tappale in Bone, proximity to best bets and OGT support appears to have a strong influence on the extent of uptake and scale out (Figure 12).

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[8] It should be noted that visibility of best bet activities was not a key criterion for site or best bet farmer selection. The prime consideration was matching available resources to productivity constraints. An aim was often to establish good forage banks as close as possible to the house to save labour and improve forage management. Because of this, forage banks were often highly visible.

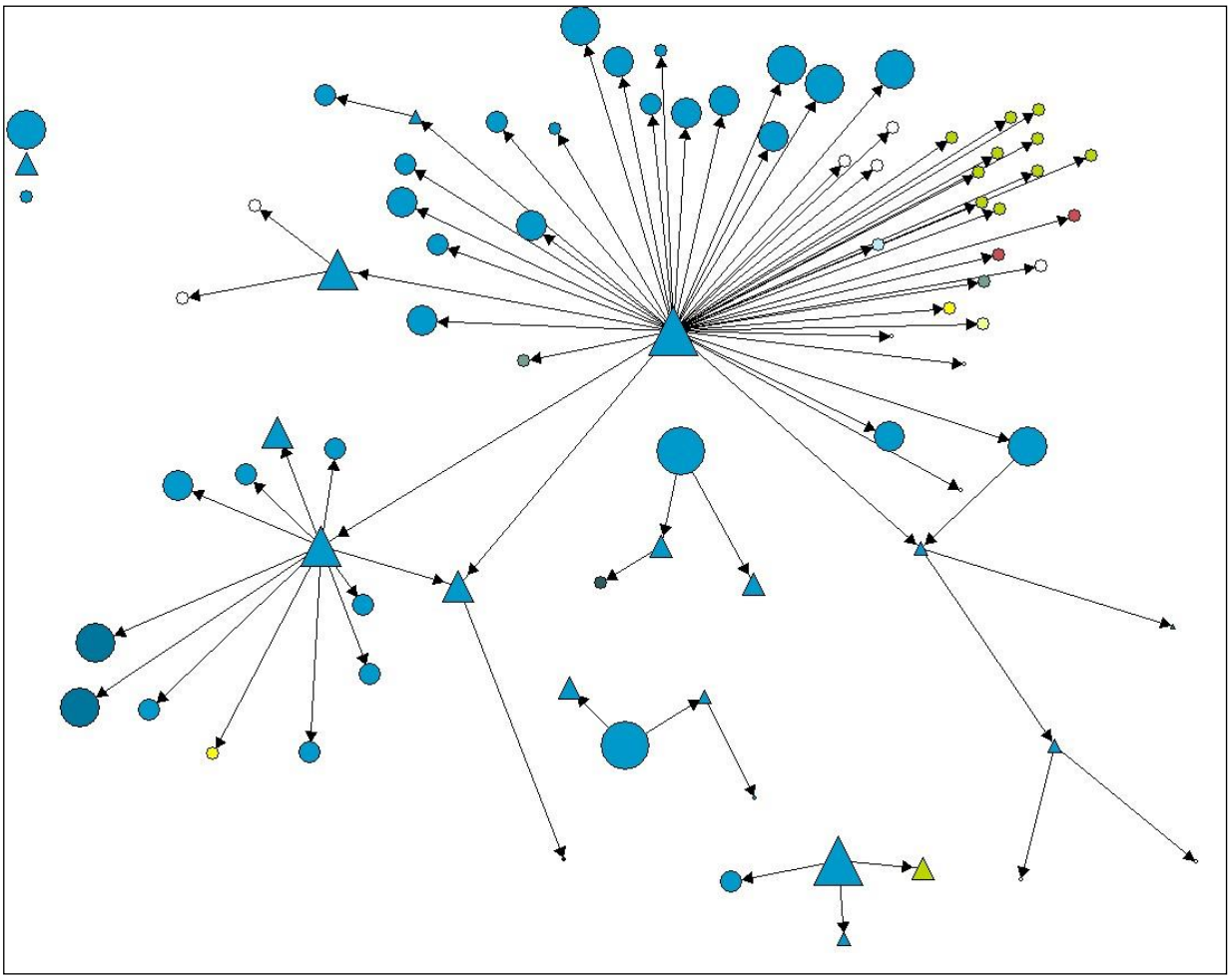

Figure 12. Adoption of practices by village. The size of the node indicates how many practices have been adopted. The colour indicates nodes from the same village. Arrows in this figure denote the transfer of information. Triangles denote the individual was interviewed, circles denote their name was mentioned in an interview, however they were not spoken to for the purpose of the network.

In Figure 12, the farmer (or node) with the large number of connections hosted a field day at his farm. While this is likely to have assisted the distribution of information to different villages, many of the farmers from different villages have lower rates of adoption (indicated by the small node size).

For those farmers from different villages who are recorded as scale outs, almost all have adopted the use of new forage varieties – no other practices. It is unclear whether this constitutes meaningful adoption, whether it is a starting point with planned expansion into other practices, or an end point in itself. What is clear is that households within the same village as the best bet farmer have implemented a higher number of practices. It is not possible to directly attribute this to proximity to best bet farmers (and OGTs). However it is logical to assume that proximity to direct support – in terms of information and resources – assists scale out farmers to gain better knowledge of the practices and seek help if they have difficulty in implementation.

This indicates that while information events, such as field days, can be highly effective in disseminating information to a great number of farmers, long-term information support and follow-up is needed for a greater number of farmers to eventually adopt practices.

Temporal factors

It was not expected that scale out would be constant over the course of the project, but would vary in response to key events. Two examples are discussed – onset of wet season and farmer events.

Figure 13a shows the number of scale out farmers who became active in Tompo village during the course of the project. Although the dataset is limited, there is a clear pattern that suggests that interest in project practices, culminating in scale out activity starts in the October to December period and peaks in the January to March period, which aligns with wet season rainfall.

Scale out was recorded by the project team in terms of farmers planting new forage or expanding existing forage into new areas, as this was seen as a tangible gauge that project information and resources had been received. The peaks indicate that farmers were putting knowledge into action – although farmers may have received knowledge prior to planting, requisite forage resource, time and labour was only available during the wet season.

Figure 13b shows the number of scale out farmers in Mattirowalie village in Bone. There is no clearly discernible pattern and this may relate to the fact that rainfall (and soil water) are not as limited in Bone as is in the other two regencies. However, it should be noted that the July-September 09 period (with no new scale out) corresponds to the Bone dry season and that the 2009 dry season started early and hence was longer than usual.

A farmer field day was held in Kecamatan Libureng in Bone in late February 09. This was attended by over 200 farmers, PPLs, community leaders and government officials. Formal presentations were followed by tours of best bet activities (visit to forage plots, kandangs etc) and discussions between farmers.

Due to the success of the field day, it is surprising that there was not a corresponding peak in scale out. It is felt that these figures under-represent the impact of the field day in that many farmers who attended may already have been recorded as scale out farmers. In this case, the field day may have served as reinforcement of knowledge and provided an opportunity for farmers to embed or deepen their understanding through interactions with other farmers and the project team[9]. Also, many farmers were from other villages in the kecamatan and may not have been detected in subsequent recording of scale out.

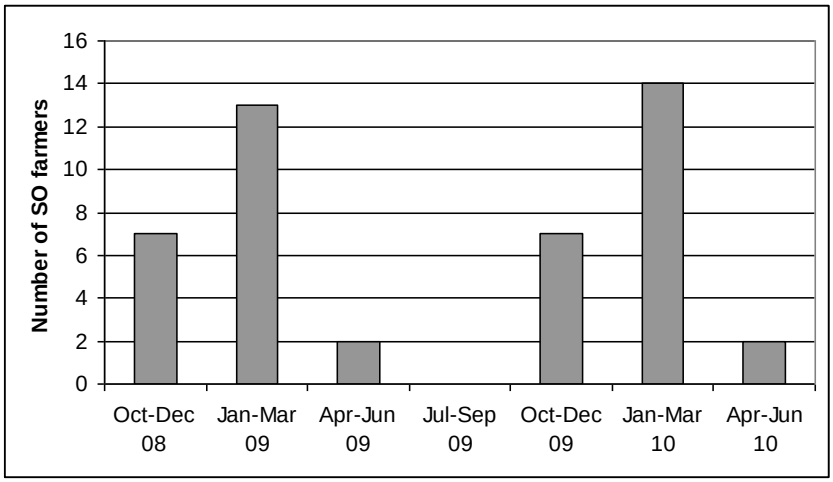

Fig 13a. Number of new scale out farmers in Tompo village, Barru from Oct 08 to Jun 10

[9] This should not detract from the value of events such as field days for awareness raising and community and institutional engagement

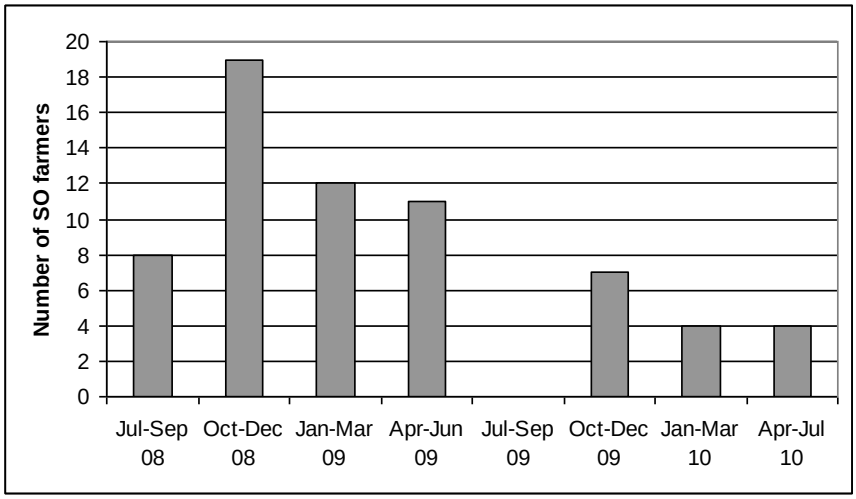

Fig 13b. Number of new scale out farmers in Mattirowalie village, Bone from June 08 to July 10

PPLs as catalysts

Training of PPLs was conducted in Bone in June 09 (16 PPLs), Gowa in November 09 (29 PPLs and PPKs) and Barru in November 09 (24 PPLs) as a potential catalyst for broader scale out (refer to Appendix 8 for further information).

Although it is too early to see definitive outcomes of this activity, there are encouraging signs. After training in Bone, the 16 PPLs began negotiations with their respective village heads to locate a suitable site for a forage nursery in each village, ahead of the 2009-10 wet season. As a result, ten new nurseries have been established and are being used as a source of forage material for village farmers, and a starting point for PPLs to disseminate information.

Similarly, there are new village nurseries being established in Barru, but not yet in Gowa.

As a result, broader scale out is starting to be observed. Figure 14a shows scale out in Bone (post-training) expanding beyond the four study villages (in green) to 12 of the remaining 16 villages in Kecamatan Libureng. Figure 14b shows that project information has reached 15 of the remaining 26 kecamatan in Bone Regency, although the quality, quantity and sustainability of this broad level scale out has not been analysed. Appendix 9 shows intra-regency scale out for Barru and Gowa.

At an even broader level, it is known that forages have been transferred and established in other regencies, including Pinrang, Bulukumba, Bantaeng and Palopo, and other provinces, including central Sulawesi and south-east Sulawesi.

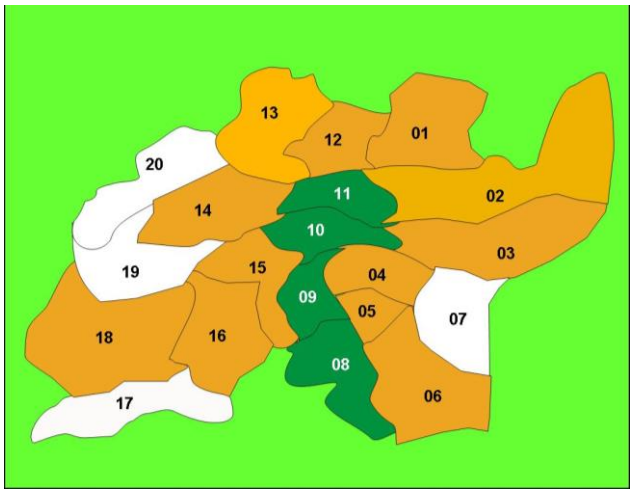

Figure 14a. Map of Kecamatan Libureng in Bone with study villages marked in green (Tappale, Laburasseng, Mattirowalie and Bune in ascending order) and villages with known scale out (post PPL training) marked in orange.

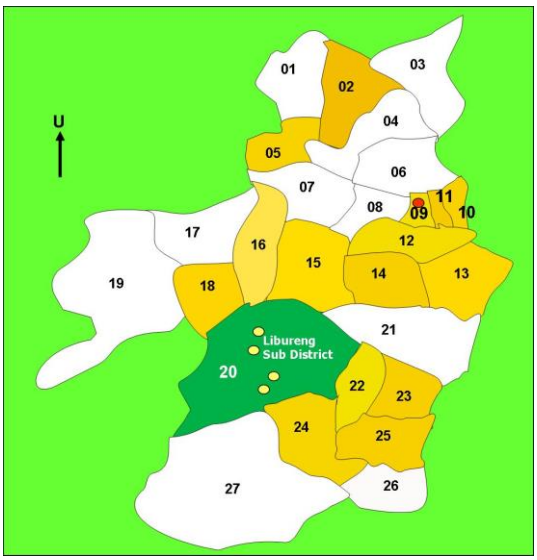

Figure 14b. Map of Bone Regency, with Kecamatan Libureng marked in green and other kecamatan with known scale out (post PPL training) marked in yellow.

7.4 Measuring impact

Summary

This section looks at how adoption affects productivity and in turn, farmer livelihoods. Using a longer term dataset (4.5 years from the start of the project) from the precursor project, it was possible to identify significant impacts beyond the usual project length and to focus on changes since the end of the project influence (1.5 years after project close).

Analysis supported claims that implementation of project practices helped to improve household livelihoods through improved cattle condition increasing the value/price received for cattle, improved availability of forage and associated labour savings and freed labour invested into other income generating activities.

There are already strong indications that similar benefits are being experienced by best bet and other households who have adopted practices in the current project. In terms of impacts beyond the life of the project, we could expect labour savings to increase an additional 10% on original figures (even without further best bet uptake), more farmers to confirm that cattle condition and growth improved as a result of uptake, and the value of cattle, and hence the potential income from cattle, to remain stable.

Levels of analysis

There is an implicit assumption behind these projects that adoption of best bet practices will have a positive impact on productivity, which in turn will have a positive impact on livelihoods (Figure 15).

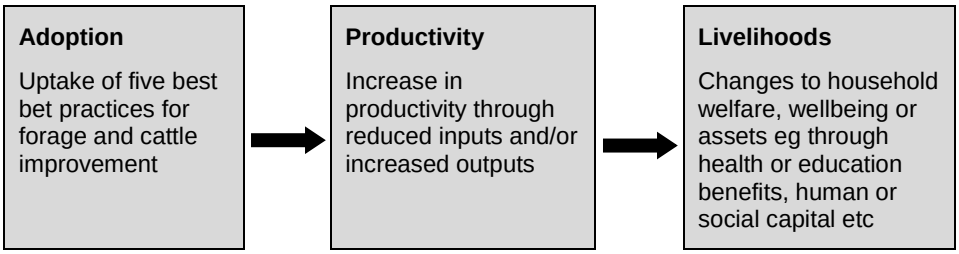

Figure 15. Assumed impact chain and aspirational targets.

To test this assumption, two levels of analysis are needed:

1. Impact of adoption on productivity
   How have on-farm conditions changed as a result of adopting one or more of the best bet practices eg cattle condition, availability and security of feed supplies, flow on impacts in terms of crop production. Has there been an increase in net income? What other changes to the farming system (distribution of time use or labour) have occurred?
2. Impact of changed productivity on livelihoods
   This acknowledges that an increase in income is not the 'end goal' or necessarily the only benefit from adoption. More important than income *per se,* is what increased income (or decreased labour investment) enables the household to do in addition to activities already performed. This could be investment into education, health care infrastructure or more extensive changes to the farming system.

7.4.1 005 project – analysis of impact

This section presents a summary of impacts from the 005 project activities in Lombok and South Sulawesi. The focus here is on how best bet practices have persisted or been adapted since the cessation of the 005 project, and what sort of impacts can be seen as a result of practice change *in the absence* of project staff and support.

While impacts during the life of the project are important, the real test of a project is the legacy it leaves after the incentives for people to participate are gone. Results presented and discussed here are a summary only. For the information, refer to Lisson and Corfield (2010) and Lisson et al (2008).

Adoption and adaptation of best bet practices

Of the 30 farmers interviewed, all were still using a combination of Best Bet practices identified in the original project (Figure 16). The highest rates of adoption or continued application were related to the introduction of new forage and better use of existing forages. There was a varied rate of adoption in terms of the cattle management strategies, which are more resource dependent. For example, adoption of controlled mating practices was limited by the absence of a bull for mating, while early weaning and preferential feeding rely on adequate forage resources and available kandang for separation.[10]

Farmers have also continued to discuss and adapt original project recommendations. In many cases, farmers have chosen to adopt practices that were not identified in the

[10] *Research into adoption as part of 061 suggests farmer perception of risk to calf and cow from early weaning deters adoption in some cases.*

original workshop as options for their farming system.[11] In addition, seven out of nine farmers in Mertak are using maize and cassava crops to supplement cattle feed – reportedly due to an increase in confidence based on their experience with the project. There is also evidence this adaptation has been taken up by scale out farmers.

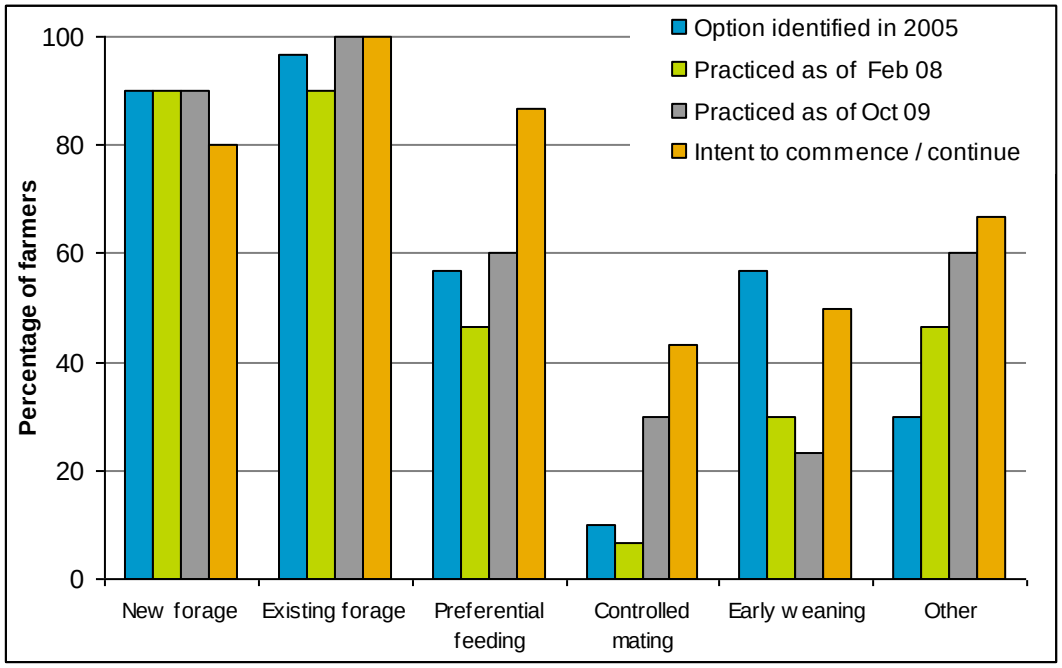

Figure 16. Percentage of farmers using identified practices. Each farmer may be practicing more than one activity associated with these categories. Practices in the 'other' category include housing cattle in kandangs and utilising water capture for stock.

Biophysical indicators of productivity

There were substantial gains in the use of forage banks in all sites, especially in upland areas. At the start of project, best bet farmers had on average less then 0.03ha of improved herbaceous forages. This increased to 0.11ha by February 08 and up to 0.4ha on average by October 09.

Tree legume establishment increased in upland areas, typically as a living fence for stock exclusion around the forage banks. Average on-farm *Gliricidia* row length increased from under 10m at the start of the project to over 120m by October 09.

Virtually all farmers felt that cattle growth rate and condition had improved as a result of the project (27 of 30 farmers confirmed improved growth rate in October 09, compared to 15 in February 08; 29 of 30 considered condition had improved in October 09, compared to 21 in February 08).

Changes in income

While the goal of the project was to increase beef production through improved nutrition, condition and reproduction, there was also an expectation of increases in cattle sale price and subsequent increases in household income.

[11] *Expected based on experience in SPA / previous projects.*

It is important to note that increases in income are difficult to capture due to the large number of factors that influence income (eg fluctuating market prices, multiple sources of income etc). In the absence of detailed information on market prices and household income, the project team used farmers' perception of changes to their income (as a result of the project) as a proxy indicator.

At the cessation of the 005 project, at least 30% of farmers interviewed had perceived an increase in their income as a result of the project (Figure 17). While this is significant in such a short period of time, due to the fluctuations mentioned above, the majority of farmers were uncertain about what had contributed to the perceived income increase.

When asked about perceived changes in income in the subsequent 20 months since the project finished, the responses were less certain. In Gowa, 12.5% of farmers were confident of an increase. In contrast all farmers in south Lombok were uncertain.

Levels of uncertainty regarding the source of income increases can be attributed to a range of factors such as:

- An increase in household assets (through an increase in the number of cattle kept and/or better cattle condition) may not yet have translated into increased income if no cattle have been sold in the time period;[12]
- A plateau of income increases since the cessation of the project/initial increases (ie fewer farmers have experienced further increase in income since 2009);
- Fluctuations or changes in cattle sale price make it difficult to compare income over time; and
- An increase in income from other sources such as increased crop yields or opportunities for non-farm work.

Farmers stated increased income was used or invested in the following areas:

- Farm improvements (4)
- Purchase of cattle (2)
- Forage development (2)
- Home improvement (1)
- Food (1)

[12] The sporadic, needs-based nature of cattle sales means cattle sales may not contribute anything to household income for a year or two if farmers don't need the money or if the age profile of his cattle is not conducive to selling.

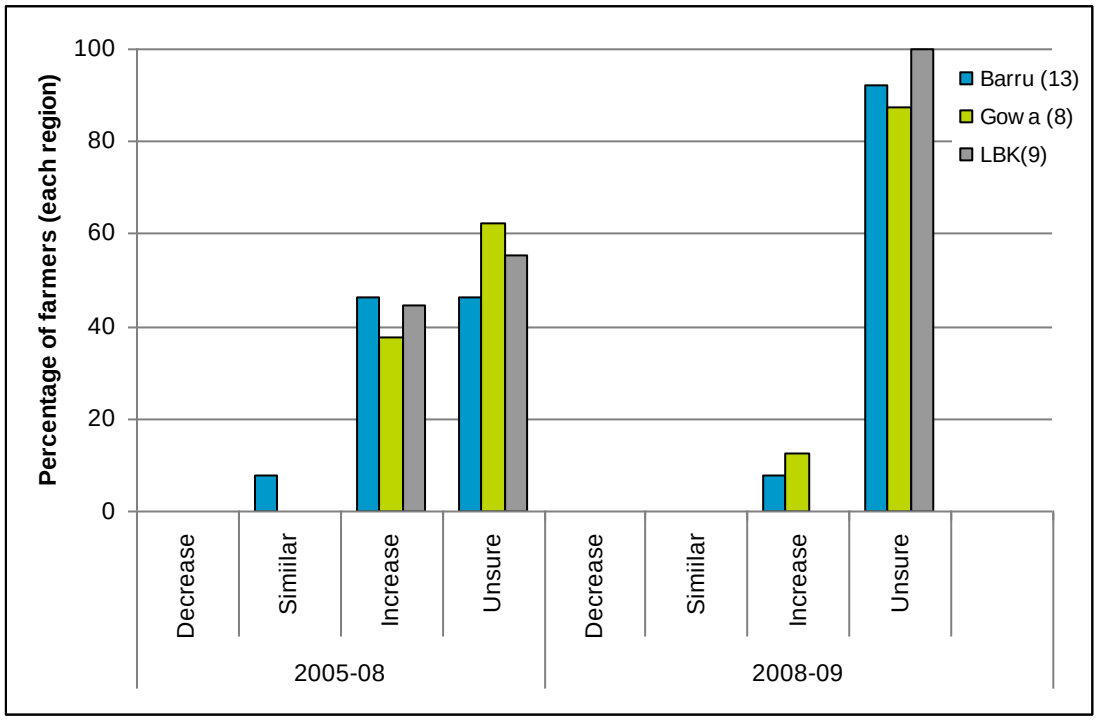

Figure 17. Perception of change in income as a result of the project. Comparison from project start to finish (2005-2008) and since project finish (2008-2009). Percentages refer to the percentage of farmers in each region. (LBK=Lombok)

Changes in labour

Introduction of forage practices was expected to reduce labour demands related to cut and carry forage collection. Table 15 shows a decrease in average hours spent on cattle and forage management from 4.7 hours at the beginning of the project, to 1.9 hours in October 09 – around a 40% reduction in labour.

Table 15. Average hours each day spent by farmers on cattle/forage management activities

Location	Average hours/day spent in forage and cattle work		
	March 2005	February 2008	October 2009
Barru	4.3	2.5	2.0
Gowa	4.3	2.3	1.6
Lombok	5.5	2.6	2.1
All	4.7	2.4	1.9

There was a continued trend of labour saving from the end of the project to October 09, from 2.4 hours to 1.9 hours per day - equating to an additional 10% reduction on the original labour figure.

In Lombok, most farmers reinvested spare time into activities relating to improving their farm or off-farm work. In Barru there was a range of responses including: rest, crops and off-farm activity. Farmers in Gowa were less certain in regard to how freed labour was used, but over 20% of farmers invested labour in cropping activities.

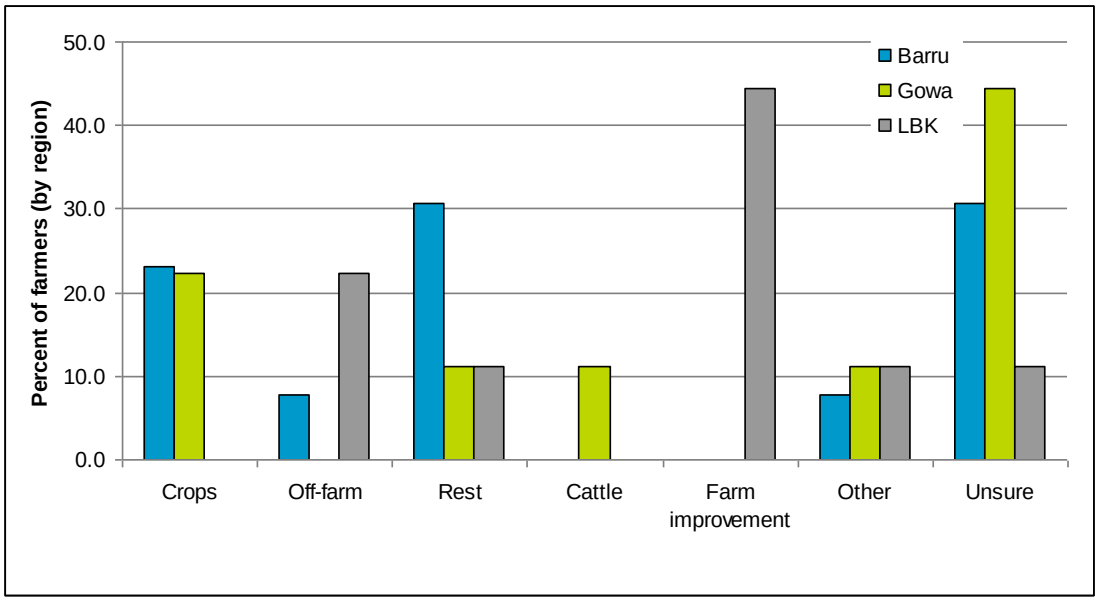

Figure 18. Use of freed labour, at October 09. Figure shows the number of farmers in each region and the activities freed labour has been reinvested in. Note that there may be more than one activity per farmer.

Box 1. Case study: Farmer 1, Harapan Village, Barru

At the beginning of the project, this farmer grew 2 rice crops on 1ha of bunded terraces, plus peanut or maize. He had 11 cattle, 2.5ha of upland land and 0.5ha of elephant grass. The size of both his landholdings and his herd put him above average in terms of resources and assets in comparison to other Harapan households.

He was initially slow to adopt all recommended best bet options. Only after observing the success of his neighbour, another best bet farmer, did this farmer decide to plant a small area of new grasses and legumes in his upland elephant grass area.

In the three years since this decision, the farmer has largely abandoned his upland maize production in favour of perennial forage production. He decided to buy 0.5 ha of upland specifically to expand the area of forage production. He also invested nearly Rp300,000 in fertiliser and land preparation for expanded forage production – around 40% of what he normally spends on crop production. This has been complemented by his decision to abandon free grazing for his cattle – with plans to build a substantial kandang later this year to assist in his current practices of preferential feeding, early weaning and controlled mating.

With forage production in his upland field, the farmer saves about 3 hours each day looking after his cattle. Even though he has increased the area of forage, the labour saving has persisted. He uses the free time to spend with his grandchildren or rest.

He now plans to have up to 20 head of cattle including 10 cows, which he intends to support by further development and expansion of his upland forage banks.

This farmer highlights that adoption may not be immediate, even for relatively resource rich (and therefore low risk) farmers, and that delays in adoption do not necessarily indicate it will not occur. Reasons for delayed adoption vary but may suggest wanting to see proof of outcomes, resolving other labour commitments and so on. Despite this farmer's delayed start in comparison to others, he has made significant shifts in his farming system – preferring to expand forage production area at the expense of (non-rice) food production.

Box 2. Case study: Farmer 2, Lompo Tengah Village, Barru

At the beginning of the project, this farmer had 0.17ha of lowland and 0.25ha of upland (most of which was share farmed). He had 3 cattle and 0.01ha of land for elephant grass. Compared to other best bet farmers, this farmer had fewer resources.

For the 3 years of the project, he struggled to successfully implement the recommended practices – largely due to disagreements over the use of shared upland areas. Once this was resolved (after the completion of the project), and with the support of other former best bet farmers, the farmer established a forage bank of 0.2ha, where he grew elephant grass and Gliricidia.

He has now largely stopped free grazing and practices cut and carry forage collection, feeds his cattle in his backyard and kandang and practices controlled mating (a bull is available from his neighbour). He has been able to increase his herd size to five.

By October 2009 the farmer reduced his average time spent shifting cattle and gathering forage from 3.5 to 1.5 hours/day due to development of his forage bank and switch to a cut and carry forage system.

This farmer provides an example of how the activities introduced by the project may persist without outside support, through farmer to farmer communication. While he had been involved in the project while it was active, his endeavours were largely unsuccessful due to land ownership and control issues. However once these were resolved, he was able to develop forage banks with the support (information, advice, resources) of former best bet farmers.

The broader impacts on this farmer's farming system are difficult to discern at this stage. He has been able to sell a bull for a price that he believes was above average for the age and class of the animal, and has also expanded his area of lowland share-cropping.

Box 3. Case study: Farmer 3, Mertak village, Central Lombok

Drought and the subsequent lack of forage for cattle during the dry season are major challenges in Mertak – to the point that many farmers regularly purchase truckloads of poor quality rice straw to supplement local feed supplies.

This farmer represents a fairly typical farmer in Mertak, with 1ha of lowland (mix of irrigated and rainfed) and 0.25ha of upland for rainfed cropping and cattle grazing. He had 5 cows at the beginning of the project, which were tether grazed year round.

This farmer was an enthusiastic best bet farmer: he quickly established small forage banks which he progressively expanded and built a kandang. He embraced the use of tree legumes, an existing resource on his land and in the common land around the village as an additional feed source. With the increased feed resources, he was able to survive the dry season without buying rice straw. He was able to sell some of his cattle for increased prices, re-investing the money into infrastructure (dam for irrigation and a new house).

Since the end of the project, the farmer has shifted some of his land use away from cash cropping towards animal production by growing a source of cattle feed. He believes it is more cost effective than trucking in rice straw through the dry, and less risky than investing in cash crops.

Although this farmer provides an exciting example of adoption and adaptation, he has since taken a position as a village extension officer. While this provides an excellent opportunity for the farmer to further share information on practices with other farmers (not to mention additional income), it is interesting to note that his son, who has taken over cattle management, has ceased the practices of early weaning and controlled mating.

7.4.2 005 project impacts and current project trajectory

Analysis of available 005 data supports claims that implementation of project practices helped to improve household livelihoods through improved cattle condition increasing the value/price received for cattle, improved availability of forage and associated labour savings and freed labour invested into other income generating activities.

There are already strong indications that similar benefits are being experienced by best bet and other households who have adopted practices in the current (061) project – these are outlined in Section 7.1.

Significantly, due to the activities of the OGTs and the continued engagement of 005 champion farmers, the number of farmers adopting practices and gaining benefits is far greater in the current project.

In terms of impacts beyond the life of the project, general insights from data collected after the 005 project finished (October 09) include:

- Uptake of new forage and existing forage practices remained stable[13], preferential feeding remained stable, controlled mating increased and early weaning decreased.

[13] *While the number of best bet farmers adopting forage activities remained stable, each farmer may have increased his forage activity or area.*

- Despite no further uptake, labour savings increased an additional 10% on original figures.
- More farmers confirmed that cattle condition and growth improved as a result of uptake of project practices.
- Ignoring market influences, the value of cattle, and hence the potential income from cattle, has remained stable.

Given similarities in farming systems and interventions of the two projects, it is reasonable to expect that further productivity and livelihoods impacts are likely to eventuate for best bet farmers in the current project. This will be the subject of further study in a planned project extension.

7.4.3. Indicators for sustainability of project practices

Due to seasonal and regional fluctuations and variations in external influences, it is difficult to predict whether the project will have a sustained influence in participating communities.

Based on observations and feedback in this project, a set of indicators was developed to indicate potentially sustainable adoption at the community or village level. Although their relative importance differs in different situations, the indicators listed below are considered to be consistently important across all study villages.

The relative importance of each criterion differs between villages, hence no differential weighting has been placed on individual indicators. However a 'Y' rating in five or more categories probably indicates that the practices were well embedded into the village farming system, and hence likely to continue, expand and be sustainable in the longer term (subject to external influences such as changes in market, climate and government policy).

Potential activities and/or changes selected for use as indicators of sustainable adoption of best bet practices:

1. Labour saving with secondary benefits (off-farm work, better crop yields)
2. Increased household income
3. Increased cattle numbers
4. Change in crop/livestock balance - replacing crop land with forages
5. Managing forages as crops (eg fertilising regularly, renting land for forages etc)
6. Changing selling practices (keepers to producers); selling at a price rather than by necessity
7. Understanding of forage use and management (eg forage quality, implementing cutting practices, use of tree legumes in the dry season etc)
8. Understanding of benefits of controlled mating, early weaning, preferential feeding
9. Active farmer group, and/or active village leader/communicator,
10. Practices becoming part of government policy in the district and/or scaling out to other villages or subdistricts.

Table 16 gives a summary of project sustainability indicators for each village, based on June 2010 focus group discussions with farmers.

Y indicates that most best bet and scale out farmers at the group discussions were practising or achieving the indicator (or there is a clear indication with respect to policy response).

O indicates that only only one or two farmers are practising, there is some interest in the topic, there is a small indication of local policy response or there is a change at village level only.

Villages with five or more Y rankings have relevant boxes shaded.

Table 16. Summary of key sustainability indicators for each village, based on June 2010 focus group discussions and project team experience.

	Indicator									
Village	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Barru										
Tompo	Y	Y	Y		Y		Y	O	Y	Y
Mattirowalie	O	Y	Y		O	O	O	O		
Anabanua	Y	Y	Y	Y	Y	O	Y	O	Y	
Lompo Riaja	O	Y	Y		O		O			
Gowa										
Pabbentengang	Y	Y		O	Y		O	O		
Maccini Baji	Y	Y	O	O	Y		O	O		
Bontomanai	Y	Y	Y		Y		O	O	O	O
Mangempang	Y	Y	Y	O	Y		O	O	O	O
Bone										
Laburasseng	Y	Y	Y	O	Y	O	Y	Y	Y	
Mattirowalie	Y	Y	Y	O	Y	O	Y	O	Y	
Bune	Y	Y	O		Y	O	O			O
Tappale	O	O	O	O	Y		O	Y	O	

The indicator tables suggest that the villages of Tompo and Anabanua in Barru and Laburasseng and Mattirowale in Bone are likely to continue project practices. These villages have already embedded practices into their farming systems and therefore show promise to persist into the future.

This does not suggest that other villages will not continue with practices they have already adopted, or not uptake other practices in the future. For example, farmers in Mattirowalie and Lompo Riaja in Barru have increased cattle numbers and household income and are starting to improve forage management and change the way they view forages as a resource. If these changes result in labour saving, there is strong likelihood that farmers will continue practices.

Assessment of indicators 7 and 8 is largely subjective as it is difficult to gauge the level of understanding about a practice. However, as most farmers had changed forage cutting practices (shorter intervals between cutting, producing more biomass), all villages were rated as having at least partial uptake of indicator seven. Similarly, most villages rated as having at least partial uptake for indicator eight as most farmers were taking their cows to a specific bull rather than relying on opportunistic mating.

7.5 Building and maintaining capacity

Summary

In this component, the project team focused on capacity activities with three key groups: the On Ground Teams, the farming community and regional stakeholders.

Building a suite of relevant technical skills was of prime importance to OGTs throughout the project. However as the project progressed, advanced abilities in problem solving and community engagement became as important as on-ground capability.

Farming communities stated that engagement with the project had increased their skills and knowledge – in some cases, to the extent that they were confident to continue and expand practices after project closure. The project rated well in comparison to other similar projects, due in large part to OGT support, the targeted and practical approach and the focus on information rather than seed or money.

Engagement with key regional stakeholders has resulted in greater awareness of the project approach and potential and better coordination in addressing issues of mutual concern. In general interactions with local institutes have been more productive than interactions with higher level institutes.

7.5.1 OGT capacity

Throughout the project, the PST conducted both formal training sessions (refer to Table 7 for details) and informal mentoring and planning sessions on a range of topics. Both types of training were deemed to be essential to the success of the project.

Moreover, it was the intention of the project team to equip the OGT (and participating PPLs) with a highly transferable suite of knowledge, skills and contacts that would be valuable beyond the scope of the project and would potentially provide a capacity foundation for relevant agricultural bodies in South Sulawesi.

Evaluation by OGTs of their formal training in May 2008 suggested that content of the sessions was the most favourable aspect and timing was the aspect needing most improvement. The OGT felt that forage training, social survey techniques and IAT training would help them most in their project work and that engagement techniques and forage training would be of most benefit post-project.

In May 2009, a capacity evaluation exercise revealed that OGTs found training in social research, animal health, feed management and animal husbandry as the most useful training to help them in their project work. The more technical training around forage and animal husbandry were deemed to be of most benefit to their farming communities.

They nominated knowledge (particularly about animal science), application of knowledge and dealing with communities as the most useful experiences and skills learned for their careers beyond the project.

In May 2010, OGT capacity was again evaluated, but as a reflection over the duration of the project. Table 17 shows the most cited responses to skills and knowledge gained as a direct result of project involvement, and most commonly cited use of the gained skill.

Table 17. Sulawesi and Lombok OGT reflections on key skills and knowledge gained during the project.

Skills or knowledge gained	Predominant use of gained skill
Improved farm management skills	Forage management, feeding management, good husbandry practices, animal health
Enhanced engagement, negotiation and communication skills	Building close relationship with farmers through continuous communication
Better understanding of social characteristics through social mapping and social benchmarking	Understanding farmer livelihoods and local culture
Ability to understand and analyse problems; to have a more focused and organised frame of thinking	Helping farmers solve problems in the field
Team work and networking	Learning from farmers; sharing and applying knowledge and experience

Clearly, the OGT felt that technical training in forage, husbandry and animal management skills were of primary importance to achieving project goals - this is reflected in their evaluations for years one and two.

As the project progressed, sound technical skills remained important for on-ground activities and project objectives, but problem solving and engagement gained prominence as transferable and useful skills.

In May 2010, members of the PST were asked for their perspectives on how the capacity of the OGT had grown over the course of the project. Their responses mirrored those of the OGT, in that technical knowledge and skills had been advanced (particularly in the areas of cattle management, forage and animal nutrition, data collection and integrated farming) and that these skills were important for completing the project. It was felt that capacity in these areas had been built primarily through training sessions and materials and interactions with PST members – both in Indonesia and Australian.

In addition, PST respondents suggested that the capacity of OGTs to communicate and work with farmers had increased, as well as their ability to apply knowledge and solve problems in the field. This was attributed to interactions with farmers (particularly champion farmers), Dinas officers, village heads, PST members and the project team (including OGTs) from the sister project in Lombok.

Three other important points arose from the evaluation:

- Training is successful only if the trainees are receptive and enthusiastic. In general, this was the case with most training activities.
- The OGT can perform in an optimal way only if they are adequately resourced.
- OGTs develop and use knowledge and skills at different paces and in different ways. Self-motivation is also a factor that can influence results.

In summary, the training and interactions brought about by project activities have provided an excellent foundation for OGTs as knowledge brokers, with OGTs as both keepers and effective deliverers of highly relevant information and expertise.

According to the PST, improvements that could have been made to capacity building activities include: more regular reporting and interactions between OGT and PST; a manual for project operations; a reward system for OGT performance; more timely and

targeted training at the start of the project; and earlier provision of resources such as internet access and suitable accommodation. In addition, it was felt that the isolation of the three OGT groups from each other made interactions, training and support more challenging for both the PST and the OGT.

7.5.2 Community capacity

Primary avenues for transfer of knowledge and skills between the project team and farmers were working alongside OGT members, engaging with PST members and interacting with best bet and other farmers. Each of these groups was asked to provide feedback on changes to farmer capacity as a result of participation in the project.

Farmer feedback

In June 2010, best bet and Scale Out farmers from each village were asked (as a group discussion) to assess the project and detail any attributable changes to knowledge and skills. A summary of these discussions appears in Appendix 10.

By comparison to their experiences with previous projects, farmers consistently gave the response that this project was better, and generally much better. A number of villages suggested that the project had increased their skills, knowledge and confidence, rather than just providing seed or money.

> *"Other projects just provide seed and then walk away"*
> *Barru farmer, Anabanua*
>
> *"The project increased skills - government projects rely on provision of money"*
> *Barru farmer, Mattirowalie*

There appeared to be two key reasons for this favourable view. The first was the ongoing assistance and support provided by the OGTs. Many groups commented that OGTs were significantly more accessible and responsive than PPLs and that communication between OGT and farmers was good.

> *"The project is about increasing knowledge. The OGT model is good because it increases farmer access to information"*
> *Bone farmer, Mattirowalie*

The second reason was the targeted and practical approach of the project.

> *"We are happy with the project because it addressed what we needed to know and provided ongoing assistance"*
> *Barru farmer, Mattirowalie*
>
> *"The project gave us the means [forage] and practical knowledge for us to increase our income rapidly"*
> *Bone farmer, Mattirowalie*
>
> *"The project has focus – forages and cattle management – that is easy for farmers to understand and see potential"*
> *Bone farmer, Tappale*

As a result of project participation, many village groups felt they had the confidence to continue and expand the forage and cattle practices once the OGTs depart. In addition, best bet and scale out farmers felt comfortable teaching and providing assistance to other farmers.

> *"We [BB and SO farmers] now have the knowledge and experience to help other farmers and to spread the new practices"*
> *Gowa farmer, Bontomanai*

Another outcome of using built capacity is the formation of new farmer groups (comprised of best bet and scale out farmers) in three study villages in Bone. Their focus is on acquiring cows from Dinas schemes for the group rather than for individual farmers and on selection and acquisition of quality bulls. In addition, farmers in several Gowa villages stated their intention to form a farmer group with a business orientation.

Project team feedback

In May 2010, OGTs and PSTs were asked for their views on significant changes to community capacity as a result of participating in the project. A summary of responses appears as Appendix 11.

Responses from PST and OGT members fell into two categories. The first comprised transfer of technical skills and requisite knowledge associated with project practices, eg forage management, animal nutrition and health, early weaning, breeding management, forage conservation and feed budgeting.

The second category suggested the emergence of deeper understanding of causal links between changed practices and increased productivity. Examples include early weaning resulting in calf growth, preferential feeding of pregnant cows resulting in increased birth weight and the use of crop residues addressing feed shortages.

7.5.3 Institutional capacity

The Sulawesi project team maintained regular contact with their nominated stakeholders and institutions, with a focus on provincial, district and sub-district livestock officials. A number of vehicles were used to catalyse engagement and their success and effect are discussed.

Project Steering Committee

The PSC was an important mechanism for discussion on the direction and relevance of the project to regional and institutional activities. Meetings were also a catalyst for senior representatives of key institutions to interact and discuss common challenges. Minutes of the PSC meetings appear as Appendix 7 and membership is detailed in Table 4.

There were six topics that featured strongly in PSC discussions.

1. Importance of PPLs The PSC urged PPLs and extension staff in each regency to become involved in project activities and to develop collaborative links with OGTs. They were enthusiastic for increased training and mentoring by OGT and PST members.

2. Expansion of project activities On a number of occasions, members of the PSC suggested that adoption, dissemination and time to impact were too slow. They advocated expansion of project activities to include neighbouring kecamatan and kabupaten. There was much discussion around the balance between rapid expansion and sustainability.

3. Communication between stakeholders Members of the PSC were keen to keep up to date with the progress of the project and to identify and explore areas of mutual interest. There were concerns raised that information reach not only senior provincial officials, but also institutional representatives at kabupaten level.

4. Alignment with provincial productivity targets The PSC noted that project outcomes were aligned with the provincial government's target of one million cattle by 2013. In

particular, it was noted that Barru and Bone populations are seen as central breeding stock for Sulsel. According to the PSC, the areas in which the project can make the greatest contribution to this initiative are forage development, animal husbandry and training.

5. Identifying areas of potential collaboration Areas of possible future collaboration were suggested by various PSC members. For example, Dinas' eight provincial forage centres were offered as possible sources of forage material and training; the formation of a working group (Bappeda, Dinas, project team, OGTs and farmers) for each kabupaten was considered, to encourage a district approach; the development of a 'pilot breeding centre' was discussed as a teaching facility for farmers and as a means of furthering research and strengthening institutional and community networks.

6. Engaging with Bupatis It was agreed that meetings should be sought with relevant Bupatis (Gowa, Barru, Bone) to introduce project practices, success and potential benefits, with a view to influencing district livestock policy. It was further agreed that the team should comprise Dinas, Bappeda and the project team.

When asked in May 2010 for areas of future activity, PSC responses featured:

- Using project study sites in Bone, Gowa and Barru as learning centres for communities throughout Sulsel
- Providing training and resources to PPLs to ensure knowledge transfer and information dissemination
- Better use of local resources as animal feed, including fresh forage and crop residue such as cacao pulp and palm oil residue
- Greater promotion of project outcomes, via provincial level seminar (hosted by Bappeda and Dinas) and media exposure at local, regional and national levels
- Developing policy recommendations in order to garner wider support and adoption at provincial and kabupaten levels.

Project influence

As stated, the Sulsel team's aims with its institutional engagement activities were:

1. To support provincial government policy on cattle development
2. To work closely with district Dinas to influence local policy and embed successful elements of the project
3. To use local networks as a catalyst for scale out of project practices.

Regular engagement with Dinas has led to a greater awareness of the project approach and achievements and has also led to better coordination between Dinas and the project team to jointly address issues of concern. However, as detailed in Table 18, project influence has been greater at local level than at higher levels.

There are a number of important points to consider on review of the institutional engagement activities of the project.

Forage most influential The most significant influence of the project at provincial, district and sub-district level has been around introduction and management of forages. As stated by the PST and PSC, there are many groups working on other aspects of livestock production, but the project team is the only one working on forage.

From an institutional perspective, allocation of land for forage nurseries by Dinas supports farmers through access to forage material while supporting provincial cattle development initiatives through uptake of an approach that has successfully improved productivity.

Provision of PPL training by the project team transferred skills and knowledge while supporting dissemination of project practices through local extension networks.

On-farm demonstration of benefits Farmer sites demonstrating 'best practice' were as valuable to extension staff as they were to farmers. Being able to view the positive outcomes of adoption and to interact with successful farmers often sparked the interest of extension staff or strengthened support. These sites were also vital for training activities and for engagement of PSC members.

High level institutional influence Despite the team's efforts, impact and influence of the project at high levels was limited. Political changes and natural attrition led to many changes in upper management of institutions related to the project. While this is inevitable, it was necessary for the project team to invest heavily in relationship building and briefings on project activities.

In review, the project team felt that engagement with Bupatis at an early stage of the project may have been influential, particularly as the project focus was on scaling out practices rather than testing them. However, it was necessary to test and demonstrate the methodology for scaling out prior to proactive engagement with Bupatis.

It is interesting to note that interest in the project from other Kabupatens (amongst them Pinrang, Takalar, Bulukumbu and Baentang) originated not only from Dinas but also from the respective Bupati's office. As a result, the project team developed a recommended process for expanding the project practices to new regions - see Box 5.

Local influence The project has enjoyed very successful collaborations at local level. A good example is in Kecamatan Libureng in Bone where the project benefited from engagement, support and oversight by key local stakeholders: Kepala BPP, Kepala Kecamatan and respective Kepalas Desa (see Box 4 for details).

This highlights the importance of investing in stakeholder engagement at all levels if the aim is credible and sustainable adoption and scale out.

Working relationships In regions where OGTs and PPLs found synergies on livestock issues, outcomes were mutually beneficial. For example, the strong working relationship between BPP staff and OGTs in Barru provided benefits to both groups. BPP staff have much experience and respect in the region and OGTs bring knowledge and new approaches to common challenges. The partnership brought access to farmers, 'respect by association' and mentoring for OGTs and access to new techniques, knowledge and training for PPLs.

Table 18. Institutes and groups with whom engagement was sought by the project team for increasing livestock productivity in South Sulawesi.

Level of influence	Institute or group	Reason for engagement	Examples of project influence
Province	Dinas Peternakan	Custodian of provincial livestock policy; oversight of Dinas actvities at district level	Kepala Dinas declares all Kabupaten to have forage nurseries Project delivers training to FGs who are candidates to receive support. Regular interaction with other PSC members
	Bappeda	Provincial planning and funding across all sectors	Regular interaction with other PSC members
Project Kabupaten (Gowa, Barru, Bone)	Dinas Peternakan	Implement provincial livestock policy; engage with farmers on technical livestock matters	Dinas Gowa provides land for forage nursery Dinas Barru plans for nurseries for all villages in 2011 Bull supplied to project villages in Barru, Gowa Dinas Barru makes policy that FGs must visit project study sites before they are eligible to receive support Regular interaction with other PSC members
	Bupati Offices	Responsible for Dinas activities at district level	No significant influence so far
Project Kecamatan	BPP Office	Engage with farmers on agricultural issues; potential custodians of knowledge and skills post-project; potential catalysts for further scale out	Training of PPLs from study kecamatans in Gowa, Barru and Bone Successful field days hosted by BPP
	Kepala Desa Kepala Kecamatan	Awareness and support of project practices; availability of communal land for nurseries and demonstration plots	Camat Libureng (Bone) declares all villages to have forage nurseries Successful field days supported by Kepalas Desa and Kecamatan
Other Kabupaten	Dinas Peternakan Bupati Office	Opportunities for synergistic activities, training or shared information or resources; possible future scale out	Engagement with groups from Takalar, Pinrang, Bulukumbu, Baentang; future training opportunities discussed

Box 4. Case study of Kecamatan Libureng

In Libureng sub-district of Bone, a number of institutional and community factors aligned, resulting in enhanced adoption and information flow through the community.

- Despite a high turnover, the Bone OGT were well regarded practitioners and effective communicators in their respective communities. In particular, farmers commented that OGTs increased their access to information and delivered practical, focussed advice.
- The Kepala BPP of Libureng was a strong supporter of the project approach and worked closely with the project team to implement practices and create opportunities for engagement with key stakeholders.
- Due to the interest from the BPP office, a training schedule was developed and implemented for all PPLs in the sub-district. Of the 16 PPLs that attended the training, ten have already created forage nurseries in their respective villages.
- The Kepala Kecamatan (himself a cattle farmer) became an advocate for the project following a sub-district farmer field day. He subsequently decreed that all villages in the sub-district would develop forage nurseries.
- Best bet farmers were active and willing to experiment with most practices – farmer to farmer interactions with established best bet farmers in Barru boosted confidence. Once the benefits became obvious, many farmers in the villages became scale out farmers, with strong advocates amongst them.
- Dissemination of information and resources was helped by visible and accessible Best Best farmer plots, a highly successful farmer field day and a long wet season (November to July) for growing forage.

Box 5. Expanding project approach to new regions

Feedback from the PSC indicated they would like the scale out of project practices and benefits to occur more rapidly. In response, the project team developed suggested guidelines to support expansion of the project approach to new regions.

- If there are many kecamatans in the new region, create smaller groups (4-5 kecamatans)
- Make regular meetings with the Kepala Kecamatan and Kepala BPP of each kecamatan to discuss the project approach, practices and progress
- Select several villages in one kecamatan of each kecamatan group with an active village leader and good potential for increasing forage production and cattle numbers
- Develop an agreed implementation plan with the village head, and training plan with Dinas or Penyulahan head.
- Implement training program for local PPLs in all five project practices, including details of introduction, benefits and management
- Organise collection of forages from existing regions (Barru, Bone, Gowa) to start a central kecamatan forage nursery from which material can be supplied to villages.
- Both PPLs and farmers need ongoing support; PPLs from the project team and farmers from the PPLs

In each village:

- Each PPL will establish a forage nursery in their own village
- Select a few active farmers in each village who are enthusiastic to participate; focus information transfer on these farmers initially and let other farmers follow their lead once benefits can be demonstrated
- Encourage PPLs to form good relationships and trust with the selected farmers,
- Take selected farmers to visit successful farmers in existing regions (Barru, Bone, Gowa)

At the earliest convenience and at regular intervals, try to organise an audience with the respective Bupati and head of Dinas to discuss activities and progress. Ideally, aim for their in-principle and policy support and financial commitment over several years. It is better to support one village for three years than three villages for one year.

8 Impacts

8.1 Scientific impacts – now and in 5 years

The scientific methods used were not exclusive to this project but are an affirmation of the approach developed over the series of ACIAR projects on livestock improvement in Sulawesi. Continued academic exposure through publications and conferences is expected to yield an interest in the approach and changes in the scientific practices of other research groups.

The most significant science impact to arise from the project will be the dissemination of the project principles and practices through regional university curricula, thus influencing the next generation of agricultural researchers, extension staff and academics. Not only are students exposed to the participatory philosophy and farming systems approach behind the project, but they are able to visit and interact with farmers for whom there have been benefits from adoption of practices.

Already, aspects of the project have been incorporated into teaching programs at Hasanuddin University in Makassar (Natsir and Padjung) and the University of Tadulako in Palu (Marsetyo) by PST members. Lecture topics include forage agronomy, production and use, and project data and the Integrated Analysis Tool are used as teaching tools and material.

In addition, UNHAS students regularly visit project sites as part of pasture and forage management units. This has proven useful for students as a) UNHAS has no forage collection facilities or nurseries, and b) students have an opportunity to interact with farmers and understand the outcomes and benefits of changed practices.

8.2 Capacity impacts – now and in 5 years

The project has built knowledge and skills in two key groups – the On Ground Team and the farming community.

The OGTs are a group of well trained, and now experienced, field workers – a fact that has been noted and acknowledged by the Project Steering Committee. The inclusion of OGTs as the interface between researchers and farmers has been a cornerstone of information delivery in this project. They have sound technical skills, proficiency in identifying and solving problems and expertise in community engagement. In areas where PPLs have been trained as part of the project, many have acted as mentors and advisors to PPLs.

Despite this, future employment for the OGTs is not assured. Three of the original OGTs have been employed by local Dinas or extension offices, two others will continue in the project extension and for the remainder, employment is uncertain.

In their feedback at the end of the project, farmers consistently stated that their knowledge, skills and confidence had increased as a result of project participation and interactions with the project team, particularly the OGTs. Subsequently, many village groups felt able to continue project practices into the future and to teach and provide assistance to other farmers.

The capacity impacts of the project on these two groups in five years are unclear. A major step between capacity built and capacity realised rests with local Dinas and extension offices and their respective Bupatis. The success of the OGT model for extension lies in their knowledge and accessibility and also in the fact that they were adequately trained and resourced to meet project objectives.

To replicate this in Dinas or Penyulahan requires significant increases in resources – both human (through training) and financial (through incentives, provision of equipment or remuneration). It is promising to note 1) that there are indications of increased productivity and scale out in areas where PPL training has been conducted by the project team; and 2) that interest from non-project Regencies has come from the offices of both Bupatis and Dinas.

In the case of farmers, although they are ready to become information disseminators, the project's social research suggests that the 'expert knowledge' and accessible advice provided by OGTs - or their PPL equivalents - is still in demand.

In a project where demonstrating benefits is a key to adoption, an important legacy of the project is the case study of Kecamatan Libureng in Bone. When local institutional, project and community factors aligned, the result was enhanced adoption, productivity and evidence of livelihoods benefits. It should also be noted that Bone was the one Regency without previous ACIAR project experience.

8.3 Community impacts – now and in 5 years

8.3.1 Economic impacts

At a household level, there are two key economic impacts emerging as a result of adoption of project practices.

Firstly, time saved by establishing and managing forage banks close to home both reduced a key production input and increased utility, enabling the farmer to reallocate labour into crop production or non-farm work. Project data suggest daily savings of between one and four hours with an average of around three hours for best bet farmers in the study villages. Those farmers who have reinvested freed labour into on-farm or off-farm work suggest that this has already resulted in increased crop yields or increased income from other work.

Secondly, with improved cattle condition and growth, the value of the farmer's assets has increased as a result of adopting forage and breeding practices. Project data suggest that increases in liveweight of 200-300gms per animal per day are achievable, which is equivalent to a daily increase in value of around Rp6000 per animal per day at current prices. Martin (2010) supports this with an estimate of annual cash gain of over Rp2 million per animal.

An added benefit of increased condition is that in many villages, traders and middle men are now seeking out farmers with consistently improved cattle and hence, better meat yield per animal. In this way, farmers are becoming the price setters rather than the price takers.

Thus far, assessment of economic impacts has been mostly to best bet farmers and primary scale out farmers. As discussed, significant gains can be achieved after two wet seasons. If the trends from the 005 project are repeated in the current project, additional labour saving and increased income can be expected in each adopting household over the next one to two years.

However, in five years the economic impact of significance is likely to be in the number of farmers who are enjoying these benefits. After just over two years, over 500 farmers in the study regions have adopted at least the project's forage practices. In Martin's recent impact assessment of forage research (Martin 2010), he estimates that 5% adoption (equivalent to 11 000 farmers) could be achieved by 2023.

Further, with extension such as has been provided by this project, he estimates that this figure could be achieved by 2018 (and 16%, or 34 000 farmers, could be achieved by 2023).

8.3.2 Social impacts

In order to understand and document some of the social impacts of the project on individuals and communities, the project team led group discussions in the study villages in June 2010. A summary of responses appears as Appendix 12[14].

The clearest impact arising from these discussions was improved communication and cooperation within the community.

Initial concerns of jealousy between best bet and other farmers or of inequitable distribution of resources has been allayed through community confirmation that there is less conflict over existing resources (particularly land) and increased sharing of new resources (particularly new forages) as a result of project interaction.

The establishment of easily accessible forage banks close to farmers' houses has saved labour and improved forage management. Most communities stated that this has allowed them to help each other with animal care in cases of farmer illness or absence. In some villages, the proximity of forage to household has also helped reduce cattle and forage theft.

Many farmers indicated that they had more free time for family and social activities. In addition, more family members were able to share the cattle maintenance duties and this was deemed a positive benefit not only by the farmers but also by the rest of the family. In some instances, the reduced workload has enabled women to keep their own cattle.

Other stated social outcomes include the development of friendly competition and pride amongst cattle farmers, activation or re-activation of farmer groups devoted to cattle production and enhanced status for villages associated with the project.

In the next five years, distribution of resources and information, and hence equity of benefits is expected to continue. Thus far, results have shown that benefits of adopting the project practices are achievable for most farmers. Because the practices are simple and generally accessible, local leaders have commented that "there is no impediment to all farmers following the example of best bet farmers".

While this does not acknowledge impediments to adoption, it does suggest the enthusiasm and support of local leaders for the project, and suggests that there is potential for benefits to continue in the absence of formal project activities.

8.3.3 Environmental impacts

Where possible and practicable, the project team promoted cost effective practices that could lead to greater sustainability in farm resources. In five years, those practices that have also resulted in productivity benefits are likely to be embedded in day to day farm management.

There is anecdotal evidence of increased adoption of organic practices such as collection and use of cow manure as a fertiliser, either directly applied to forage and crops, or as bokasi. While not a key best bet practice, the use of organic fertiliser has been widely promoted and demonstrated to study communities by the PST and OGTs.

Similarly, there has been increased promotion by Dinas of Biogas systems, which collect and store methane gas from livestock, for use in household cooking. Although this is not a project activity, trials in several villages involve some of the best bet farmers.

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[14] It is acknowledged that the group discussions conducted at the end of the project did not include all members of the study villages and are therefore representative of a subset of farmers.

Demonstration of best bet practices to interested farmers invariably includes demonstration of the Biogas system and the two initiatives often become linked.

There is a possibility in upland sites (particularly in Gowa) that increased livestock numbers may lead to changes to soil structure and increased likelihood of erosion. In these hilly landscapes, the project team avoided planting on very steep slopes, encouraged the use of tree legumes and the replacement of upland seasonal crops with forage cover to help stabilise the soil. Where possible, the project team also supported the work of PPK staff in trying to reduce land clearing in vulnerable areas.

In addition, effort was made by the project team to establish and promote local forage species where possible (that is, forages that are already available in the region, such as native grasses and legumes) and to provide awareness of species that may tend towards weediness, toxicity or other environmental or health problems. In some instances, weedy species such as Lantana were replaced by other species such as Gliricidia. In most cases, introduced forages were highly unlikely to become weedy as regular cutting gave plants little opportunity to set seed. For this reason, perennials were favoured over annuals.

8.4 Communication and dissemination activities

As key objectives of the project were dissemination of information and engagement with institutional and community stakeholders, many communication activities have already been discussed. Highlights and additional activities follow.

Conferences and seminars

The project was represented at a range of conferences and workshops including:

- International Grasslands Congress/International Rangelands Congress – Hohhot China, July 2008
- Thirteenth Animal Science Congress – Hanoi, Vietnam, September 2008
- National Seminar on beef cattle development to support national beef self sufficiency program – Palu, Indonesia, November 2008.
- International seminar on sustainable management and utilization of forage-based feed resources for small-scale livestock farmers in the Asian-Pacific region – Lembang, West Java, August 2009. Organised by Indonesian Centre for Animal Research and Development, Indonesian Research Institute for Animal Production and Food and Fertilizer Technology Centre for the Asian-Pacific Region, Taiwan.
- National Seminar on smallholder Bali cattle production - Mataram, Lombok, October 2009.
- Fifth Viennese Conference on Southeast Asian Studies – Vienna, Austria, May 2010.

Project Coordination Meetings

Instead of annual meetings in Australia, the project team agreed to hold joint meetings between the Sulawesi, Lombok and Australian teams in Indonesia. These Project Coordination Meetings were opportunities to review progress and plans, exchange ideas and information and to form networks for the future. They were attended by PST, OGT, PSC and selected PPLs.

Three joint meetings were held: the first in Makassar (South Sulawesi) in July 2008; the second in Sengiggi (Lombok) in June 2009 and the third in Sanur (Bali) in May 2010.

Institutional stakeholder engagement

Institutional engagement was sought with Dinas Peternakan and Bappeda at multiple levels, BPP offices in study regencies and sub-district and village leaders. This was achieved through a range of activities, including Project Steering Committee meetings, training initiatives, project work, regular informal discussions and project events.

See Section 7.5 for further details.

Farmer engagement

The nature of the project necessitated daily interactions between farmers and OGTs, and regular but less frequent visits from PST members. Specific project activities to support farmer to farmer interactions and scale out include farmer visits, farmer field days, on-farm workshops and the establishment of best bet activities that also display project activities and benefits to the community.

See Section 7.3 for further details

Promotional activities

Six editions of a project newsletter were produced and distributed to relevant institutions in South Sulawesi and Lombok (July 2008, October 08, January 09, April 09, July 09 and November 09).

A project website (www.smar061-sulsel.com) was developed and managed by the Indonesian Project Coordinator.

Project displays and handouts were produced by the project team for use in training and farmer events.

Media interactions included: A trip by freelance journalist Gio Braidotti, resulting in feature story for ACIAR's Partners magazine (*Enabling more secure livelihoods in uncertain times*; March-June 2009); coverage by Sophie Morris from the Australian Financial Review; and prime-time appearances on Fajar TV's nightly news program (across the province) covering the Bone farmer field day in February 09.

9 Conclusions and recommendations

9.1 Conclusions

The project team made a range of successful research, community and institutional advances. In terms of addressing the project objectives:

Welfare and security has improved in households that have adopted at least one of the project practices. In the project's shortened timeframe, almost all 60 best bet households enjoyed increased productivity – expressed ultimately as labour saving and enhanced value of cattle assets – and some livelihood benefits – predominantly expressed as re-allocation of freed labour into income-generating activities and investment in capital items.

Significantly, some benefit was felt by at least 450 other farmers in the study regions as a result of information and resource dissemination and subsequent adoption of practices. With ongoing support, there is potential for sustainable and wider scale out in the next five years.

There are improvements to Bali cattle production in the project regions (higher numbers and better condition) and indications that farmers will continue or expand practices supporting increased production. In some cases, there are indications that local governance will support active farmers.

Technical capacity was raised to such a level in the community that farmers feel they have the skills, knowledge and confidence to become disseminators and mentors to other farmers. The On-Ground Team is a group of well trained, and now experienced, field workers. Their 'expert knowledge' and accessible advice successfully complemented the local knowledge, legitimacy and networks provided by the farming community.

A series of training workshops for PPLs was trialled in the three study regions. While this has resulted in the scale out of project practices, to embed capacity in local institutions will require ongoing support and appropriate human and financial resourcing.

The learnings from the project about the adoption process are many. Those that are widely applicable include the following.

- The starting point for credible scale out and impact are practices that have already been proven to be beneficial and that are relatively low risk, inexpensive and not far removed from existing practices.
- However, even practices perceived as low input require at least initial shifts in resource allocation that may deter households. In addition, if the focus of research (in this case, cattle) is not a key priority in the livelihood portfolio, there is little incentive to change the farming system.
- It is imperative to know how farmers view and prioritise their resource 'portfolio' and to align interventions accordingly.
- The choice not to adopt is not absolute and can be revisited as household circumstances change.
- Demonstrating the benefits of adopting (not just demonstration of new resources or practices) is a powerful tool to show potential, encourage farmers to experiment and to allay concerns about practices and their outcomes.
- Demonstrating benefits is also a good foundation for discussions with local government, institutional and community leaders.

- Key networks for dissemination are neighbours and family members. Key sources of information, advice and reassurance are farmers who have already adopted and extension staff. Supporting farmer-to-farmer interactions and providing ongoing accessible advice are essential.
- With practices that are temporally limited (such as rainfall-limited forage production), it is important to couple information with resources to allow knowledge to become action.
- It is difficult to demonstrate the real impact of adoption in three years. Development of a set of indicators for impact and sustainability can be useful for predicting ongoing success.
- A targeted, practical approach to information dissemination is favoured by farmers, with a focus on benefits, ongoing assistance and good communication.

9.2 Recommendations

Recommendations for the future activities from this project

- There is general agreement that while the original three year project timeframe is adequate for assessing changes in farm practices and productivity, it is insufficient to gauge what effect these changes have on farmer livelihoods. A detailed livelihoods assessment of a subset of best bet and scale out farmers is recommended, with a focus on tracking social outcomes and impacts.
- To address steering committee suggestions to expand project activities to other districts and regencies; and to embed project principles into relevant institutional offices, it is recommended that an integrated cattle management training module be developed that is suitable for farmers and PPLs. Training would be implemented as farmer field schools, with a focus on 12 villages in Barru and Bone. The training would be delivered by a team comprised of BPTP staff and OGTs, with prior advice and input sought from local government officers

General recommendations for similar research

For research in which scale out and impact realisation are the intended outcomes:

- It is essential to plan and invest appropriately in scale out activities, mechanisms and personnel. Very rarely will sustainable scale out simply flow from experimental research.
- The project model of employing and training young graduates was instrumental in providing ongoing support and confidence to farmers. Due to resourcing and other commitments, it is unlikely that the success of the project would have been achieved using existing extension staff. The OGT model is recommended for projects requiring regular and effective community engagement.
- It is important to engage early and often with people and offices responsible for resourcing at the intended scale of impact. In this project, increased engagement with Bupatis – who currently control resources and institutional directions at regency level - from the study regencies may have resulted in enhanced institutional support and policy influence.
- Success, scale out and impact are the results of a series of well planned research projects brought together over a decade. This research has been shaped by: long term commitment from ACIAR, Indonesian agencies and CSIRO; a participatory approach to engagement; a focus on understanding the system and its pressure points; commitment to building and realising critical capacity; and the inclusion of dedicated coordination effort, particularly for monitoring and evaluation.

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11 Appendices

11.1 Appendix 1

Ruminant population information of South Sulawesi (2006 figures).

	Kabupaten	Cattle	Dairy cattle	Buffalo	Goats/ Sheep	Horses
1	Selayar	8.287	0	772	76,982	3.313
2	Bulukumba	65.179	0	5.492	28,909	25.260
3	Bantaeng	26.998	0	884	21,876	9.117
4	Jeneponto	19.458	0	11.341	69,186	21.954
5	Takalar	26.094	0	4.101	20,413	1.300
6	**Gowa**	**55.000**	0	2.400	17,415	8.000
7	Sinjai	41.761	501	1.892	20,266	1.662
8	Maros	25.294	0	4.081	10,178	4.336
9	Pangkep	20.327	0	9.582	28,383	5.038
10	**Barru**	**39.406**	0	1.248	2,855	2.075
11	**Bone**	**139.533**	0	5.987	8,771	9.709
12	Soppeng	16.955	0	63	7,141	4.228
13	Wajo	30.414	0	6.808	10,355	6.029
14	Sidrap	29.978	0	1.302	9,681	1.183
15	Pinrang	38.011	0	4.509	15,054	2.723
16	Enrekang	38.202	1.342	3.413	53,892	2.366
17	Luwu	12.433	0	5.989	9,010	668
18	Tanah Toraja	7.142	0	51.238	9,088	3.621
19	Luwu Utara	14.101	0	5.788	5,617	1.755
20	Luwu Timur	7.927	0	1.611	5,452	15
21	Makassar	1.967	0	527	6,758	29
22	Pare-Pare	1.897	0	150	6,617	89
23	Palopo	1.213	0	784	2,094	8
Total		668.577	1.867	129.962	445993	114.482

11.2 Appendix 2

Farming system and population information for twelve study villages, in three study regencies.

1. Kabupaten Bone

Village name	Laburaseng	Tappale	Mattirowalie	Bune
Area (sq km)	10.25	9.46	16.23	24.00
Cattle density (head/ sq km)	91,3	102,0	58,7	34,1
Human density (people/ sq km)	79	368	90	70
Number of households	238	507	377	447
Agricultural land (ha)	1 147	1 032	708	2 400
- Rainfed	80.0	30.0	120.0	1,458.0
- Irrigated	572.0	706.0	0.0	0.0
- Dry land	495.0	296.0	588.0	942.0

2. Kabupaten Barru

Village name	Anabanua	Tompo	Mattirowalie	Lompo Riaja
Area (sq km)	20.00	34.86	26.59	13.23
Cattle density (head/ sq km)	31.6	28.6	97.6	64.6
Human density (people/ sq km)	89.55	54.56	109	188
Number of households	403	428	650	614
Agricultural land (ha)	2 000	1 085.8	2 659	3 167.1
'- Rainfed	215.0	108.2	220.2	368.0
'- Irrigated	100.0	252.6	**0.0**	**0.0**
'- Dry land	1685.0	725.0	2438.8	1709.1

3. Kabupaten Gowa

Village name	Mangempang	Bontomanai	Pa'bentengan	Maccini Baji
Area (sq km)	9.3	20.0	8.9	5.3
Cattle density (head/sq km)	78.9	48.2	116.9	75.4
Human density (people/ sq km)	188.7	168.9	465	727
Number of households	517	942	1079	850
Agricultural land (ha)	246	948.7	740.6	670.4
- Rainfed	109	174.7	258.6	89.3
- Irrigated	0	0	0	174.7
- Dry land	137	743.4	260.5	290.9
- Backyard	0	30.6	221.5	115.6

11.3 Appendix 3

Suggested topics for best bet farmer benchmarking interviews

These topics were used in conjunction with best bet farmer calendars during initial farmer interviews to capture existing farming system information and to help identify constraints and opportunities. Suggested questions fell into the following categories:

1. Farmer's existing land holdings
   Location, category (lowland cropland, upland, backyard etc), number of parcels and area of each parcel.
2. Main seasonal cropping system
   Crops grown in each season and management details eg when planted and harvested, for lowland (rainfed and irrigated) upland and backyard, approximate yield of each crop and use of crop ie sale, own consumption etc.
3. Number and classes of cattle owned or managed by farmer
   Cows, bulls, calves under 7 months, young males and females under 2 years.
4. Main source of cattle feed for each season
   Free or tethered grazing, cut and carry and location of forage source eg lowland crop residue, upland grazing, backyard grazing or cut and carry etc.
5. Main types of forage used for grazing and cut and carry for each season
   Native grasses and weeds, crop residues, tree legumes, rice straw or legume crop straw (peanuts, mung beans).
6. Type of supplements fed to cattle (if any)
7. Seasonal household labour demands
   Record farmer's busiest periods for cropping cattle management etc and also any current labour constraints to expanding forage or cattle production.
8. Farmer's household structure
   Number of family members, including age, sex and contribution to current farm activities.
9. Does the farmer (or family members) do any off farm work to supplement income?
10. Farmer's own ambitions to change his cattle and forage activities
    Type of activity, location and size farm area involved, plus any indication of replacement of existing cropping or livestock activities.
11. Farmer's own expectations of participation in this project
    What does the farmer hope to gain from the project?
12. Farmer's commitment to participate in the project
    Does the farmer have the interest and resources (land, cattle, labour) to implement and manage the selected best bet activities?.

11.4 Appendix 4

Examples of best bet farm calendars

1. Best bet farmer froom Anabanua village in Barru. Yellow boxes refer to information about the existing farm system. Green boxes refer to suggested best bet changes.

VILLAGE		: ANABANUA												
OGT		Hamdana												
FARMER NAME : TAMUDDIN - BEST BET OPTIONS - updated Nov 2008 - Mar 2009														
Type Land	Land (Ha)	Activity	J	F	M	A	M	J	J	A	S	O	N	D
Ricefield	1.05 ha and 0.5 ha rent	Food crop	rice (1.55ha)				Rice and peanut (0.20 ha)							
		Grazing					Free Grazing of croplands							
		Cut and Carry	Setaria & mulato in small dyke											
Dry land	0.05 ha(2 land)	Food crop												
		Grazing	Tethered grazing					Free Grazing croplands						
		Cut and Carry	Improve Elephant grass cutting management (0.05 ha) + Gliricidia around fence											
Backyard	0.01	Food crop												
		Cut and Carry	Plant Elephant grass, Paspalum, setaria and mulatto (0.1 ha) + Gliricidia around fence and small dyke Nov 2008 Gliricidia fences right around area. Clitoria and Centro along fences											
Breeding (mate, calving, Weaning)			Early weaning						Calving			Mating		
Conserved crop residues										conserve crop residue				
Period of use			feed peanut hay and rice straw											
Labour use			land prepare plant paddy			paddy harvest/ soil process				paddy & peanut harvest				Land prepare

2. Best bet farmer from Mattirowalie village in Bone.

REGENCY		BONE		VILLAGE		Mattirowalie								
OGT		Suryani		FARMER NAME :		NURDIN								
TYPE LAND	Land (Ha)	Type Plants	DES	JAN	FEB	MRT	APR	MEI	JUNI	JULI	AGST	SEPT	OKT	NOV
Ricefield 1	.5HA	Food Crop	Rice 2 (just in irrigated ricefield)					Rice 1 (annual rice plant full ricefield)						
		Grazing												
		Cut and Carry												
Ricefield 2	1 Ha	Food Crop	Peanut				Rice 1 (annual rice plant full ricefield)							Preparation
		Grazing												
		Cut and Carry												
Dry Land	2 Ha	Food Crop	Dry Land with some cocoa + some rambutan trees + banana + elephant grass (0.30 ha) and cattle grazing of fenced land											
		Grazing	Improve elephant grass quality with fertilizer + Gliricidia fences											
		Cut and Carry	Plant Elephant grass + Gliricidia + New Forage (Paspalum, Mulato)+ feed Gliricidia 20% and grass 80%											
Backyard	0.1 Ha	Food Crop	Semi permanent kandang with biogas operation											
		Cut and Carry	Plant paspalum, elephant grass and Gliricidia, carry to kandang											
Livestock Breeding Reproduce				Early weaning + preferentially feed cow				Calving		Mating				
Collect and Saving Agriculture residu/Cut and carry														
Period of use														
Labour use			process and harvest peanut + paddy					process			harvest			

3. Best bet farmer from Bontomanai village in Gowa

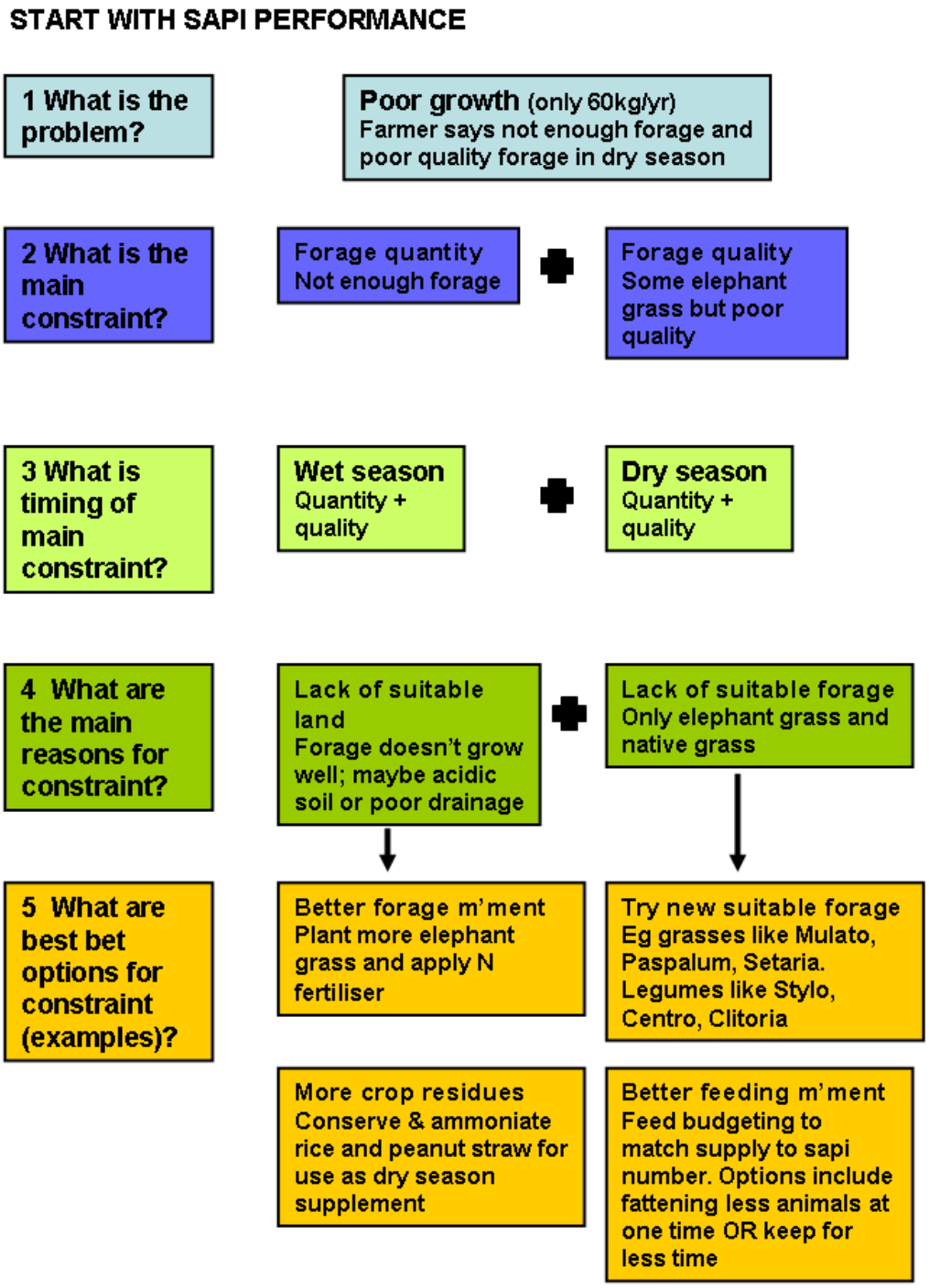
VILLAGE		Bontomanai												
OGT		Ilham												
Farmer Name = SIKING - BEST BET OPTIONS - UPDATED VERSION - NOV 2008 to MAR 2009														
Type Land	Land (Ha)	Activity	J	P	M	A	M	J	J	A	S	O	N	D
Ricefield (0,5 ha)	Ricefield I (0.25 ha)	Food crops	Rice					peanuts					Planting rice	
		Grazing					tether grazed				tether grazed			
		Cut and Carry												
	Ricefield II (0.25 ha)	Food crops	Rice											
		Grazing												
		Cut and Carry												
Dry land (1 ha)	1 ha	Food crops	Intensive/elephant grass management (0.5 ha) + Introduce new forages (Paspalum, mulato, setaria) + legume (Centrosema, siratro) Nov 2008 Increase Gliricidia below elephant grass, Clitoria & Centro with new grasses, companion plant stylo with maize.											
		Grazing	tether grazed + some elephant grass					Tether graze + some elephant grass and Gliricidia					tethered(elephant grass+ native grass)	
		Cut and Carry												
Back yard (0.03 ha)	0.03 ha	Food crops	Cocoa (0.015 ha) + Mango											
		Grazing	Tether grazed + some elephant grass + bran and peanut straw mid dry								tether grazed+ bran)		tethered + elephant grass	
		Cut and Carry												
Breeding cycle (mating, calving, weaning							Calving			Mating				Early weaning
Conservation of crop residues										peanut hay				
Period of use											feed peanut hay			
Labour use			plant rice			harvest rice		plant peanut		harvest peanut			planting rice	

11.5 Appendix 5

Example of Best Bet identification process – Dusun Tappale, Bone

Cattle system: Fattening system; no cows, 4 males kept in kandang; sells to traders for Kalimantan market.

Forage system: Has 0.25ha land with ~0.1ha elephant and native grass
Uses grass for cut and carry; no conserved crop residue



11.6 Appendix 6

Summary of farmer group discussions from project villages in Gowa, Barru and Bone - McDonald, Corfield, Rachman, Bahar (June 2010).

Note: BBF = Best Bet Farmer; SOF = Scale Out Farmer

Barru , Tompo village(Table A.6.1) – 4 BBFs and 3 SOFs interviewed

Most BB farmers and many scaleout farmers are planting new forage grasses and expanding their areas of elephant grass. Sudirman started with 3x3m and now has 0.7ha. Farmer La Salli indicated she used to have about a quarter of her forage needs, now she has enough. Paspalum is preferred to elephant grass. The new grass are generally grown closer to the house or kandang, are easier to cut and lighter to carry. This enables women and children to assist (1), allowing the family more time together. Some are replacing elephant grass with the new grasses, and cutting their forages at more regular intervals, and feeding more tree legume, indicating they have a better understanding of forage quality. They state their animals do better on the leaf than on the elephant grass stem they used to feed them. Regular fertilising suggests they are now treating their forages more like a crop, although none have replaced any crop area as yet.

The new forages have led to a substantial labour saving from 4-6 hours down to 1-2 hours, or in some cases 30 minutes. The extra time is spent on crop weeding, from which most farmers expect an increase in yield, or on off-farm work, such as construction work, providing additional income.

Farmers indicate they are getting a better price for their cattle and believe this is coming not only from the increased Rp/kg (i.e. market driven) but also from the better condition of their animals. Some intend increasing their animal numbers. The extra animal sales have led to an increase in household income, which has been spent on education, weddings, lending money and buying motor bikes. The motorbikes are used to take children to school, and for carrying forages, thus saving even more time, or in some, cases to go to off-farm work (2).

Although not many are using early weaning, most are recognising oestrus in their cows and either taking it to a bull in the village or using artificial insemination (AI). It happens that one of the best bet farmers is an AI specialist.

There is now a much better relationship between all farmers in the village. They say they have made many new friends from the government and even the police officer is promoting forages. Farmers help other farmers if they are ill or away because it is now much quicker and easier to collect forage. Farmers report that this did not happen before because forage gathering was too time consuming and difficult.

The farmers spoke very favourably of this project in comparison to other projects because the project stayed to give on-going assistance rather than just giving animals, with no assistance, then taking them away. Having the OGT in the village was highly regarded. Clearly the OGT (Adrianty) has established a very good relationship with the farmers, has communicated well, and achieved excellent results. Due to their labour saving, increased income and understanding of forage quality, the number of scaleout farmers in this village will almost certainly continue to grow.

Barru, Mattirowalie village (Table A.6.1) – 3 BBFs and 4 SOFs interviewed

There has been a big change in forage availability as a result of the project. Farmers are expanding to other areas. They find the new grasses easy to cut and lighter to carry, and

cattle are performing well on them. Again, paspalum is the preferred species. There is some recognition of forage quality as farmers say paspalum looks better than elephant grass, they are cutting their forages at regular intervals (elephant grass monthly, new grasses fortnightly), and some are feeding tree legume when cattle are not in good condition, or more in the dry season. Most planting has been on upland with some replacing maize crops and one best-bet farmer and one scaleout farmers replacing upland rice with new grasses.

There has not been a big change in labour demand for feeding as previously they were just grazing their animals in their own paddock for most of the day and using some cut and drop. The only labour saving has come as a result of the new forages being closer. Hence there has been little opportunity for change in other activities. However, the new forages have allowed children to assist in forage collection.

Farmers are getting a better price for their cattle and feel this is due to animal condition as well as increases in price/kg. All best bet farmers have increased their cattle numbers. Household income has increased as a result of cattle sales and the money is being spent on buying more land, home renovations, motorbikes (2) and a computer for children.

There has been little change socially as they had lots of elephant grass previously and were already sharing with other farmers (3).

Farmers were happy with the project because it had addressed what they needed, and provided on-going assistance. The project increased their skills and built capacity whereas government projects rely on provision of money. The OGT (Sudirman) had good communication.

Barru, Anabanua village (Table A.6.2) – 3 BBFs and 2 SOFs interviewed

There has been a big impact of the new forages, that are easy to cut, easy to carry, and easy to expand. Most farmers are feeding the new grasses to their cattle. The grasses are being planted mostly on upland, with two best-bet farmers replacing some upland rice with forages. All farmers prefer mulatto and paspalum to elephant grass, and Sudirman indicated that paspalum was better than the others in the shade.

There was some recognition of quality with all BBF and SOFs now cutting elephant grass at monthly intervals, and the new grasses fortnightly or at 15-20 days, and all farmers are using Gliricidia. They are using it all year round but more so in the dry season, and are expanding their living fences with Gliricidia. Most farmers are now using fertiliser (urea), hence treating forages more like a crop. Some farmers (best-bet and scaleout) are still using rice straw and peanut crop residue, especially the latter, sometimes in dry season when forage is lacking, and sometimes in wet season when they are busy.

Labour has been reduced from about 3-5 hours per day down to ½-1 hour, for Taibe 15 minutes. They all had elephant grass previously but mostly far away. The saved time is being used for weeding the rice crop and conserving forage. There has been no take-up of off-farm work. The increased weeding time has increased rice crop yields from 2.5-3.0t up to 3.5t. Prior to the project, only the farmer collected forage, now his wife and children help, and his wife is happy about it!

Most farmers are still using natural weaning, but all best-bet farmers and some scaleout farmers are bringing their cows to a village bull (unselected bull). Before the project they were using free mating. They are getting a better price for their cattle due to both animal condition and increased market prices. They are selling 3yo at about Rp10M, 2yo at Rp5M. Most best-bet farmers selling when they need the money, but one best-bet farmer and one scaleout farmer are selling when the price is right. Traders like their cattle because they are in better condition, and have better skin.

Household income has increased for all best-bet farmers. Rustam has bought a tractor and more cattle, while others are using it for education, more cattle, more land,

renovations, purchase of a motorcycle, or saving for Hajj. Social interaction has improved with farmers exchanging forage planting material. Before the project this would occur within a family but now between other farmers. The farmer group is now very active, there is good cooperation and even some friendly competition. There is less conflict within the village, and less theft due to proximity of forage to houses.

Dinas has been involved in the farmer group and in the forage program. The local army security says it has improved village security and so he is actively promoting the planting of forages.

Farmers felt this project was good because it was here for a longer term and provided regular assistance. Other projects have just provided seed and then gone. Both the OGT and the PPL were good, but the PPL had to cover the whole village whereas the OGT could focus on forages and cattle and in 1 sub-village.

Barru, Lompo Riaja village (Table A.6.2) – 4 BBFs and 2 SOFs interviewed

There have been major changes in the forages farmers are growing, and the use and location of them. Some had forages (elephant grass) a long way away before, but now they close; one farmer indicated that paspalum was unpalatable, but he was the only farmer in all the interviews to indicate this. Nearly all others indicated that cattle preferred paspalum and mulato. Tajuddin indicated that previously 1 bag of native grass was not enough for his cattle, but now 1 bag of the new grasses or 1 bag of elephant grass leaf is enough. Farmers like all the new species, and have adjusted their management; cutting elephant grass at 1-1.5 months (or about 1m height), and the new grasses fortnightly.

Most farmers are adding fertiliser after each cutting (urea + phosphate), and expanding their area of forage in their upland, but none are replacing any crops as yet. They are feeding a small amount of Gliricidia, mostly all year round, and in some cases the cattle are just taking it themselves. This suggests they haven't quite grasped the concept of feed quality as yet, although some scaleout farmers are planting some rows or fences of Gliricidia. Their cattle feeding system is a mixture of grazing within their own paddock, and using some cut and drop for their cows. However, they do have bulls in their kandangs, and for these they use cut and carry. For most, there has been little change in their system, just better quality feed.

Labour saving is highly varied. For those who had forages a long way away, and used cut and carry, having the new forages close by has reduced labour time for forage collection from 5-6 hours/day down to 1 hour. For others who are still using tether grazing and cut and drop, there has been little time saving. Those that are saving time are using it in their rice crop and indicate there has some benefit to their crop yield. There has been no take-up of off-farm work.

All farmers are still using natural weaning. Some farmers are tethering their cow with a bull at oestrus, but others still free mating. Most farmers still sell animals at 3-4yo or when they need the money, as before. One farmer (Umar) sells at 3yo if animal has good condition score, but if it is not performing well, sells it early and buys another one, or if forage is becoming scarce, just sells it. Animals are selling for around Rp8-10M at 3yo, Rp4M at 2yo, depending on condition. Farmers are getting a better price for their cattle but believe it is largely because of the better market price per kg (it used to be Rp30k/kg, now up to Rp60k/kg). Some want to increase their cattle numbers. As yet there is no buying and selling of cattle, just breeding and fattening.

Farmer income has increased, largely from cattle sales, with extra money going on education, weddings and house renovations. There is now a better relationship between the best bet farmers and other farmers in the village, and with other villages, with sharing of forages. However, the farmers have not formed a farmer group and have no plans to do so. There has been no change in PPL visits or offers from Dinas.

Despite the lack of uptake of much of the technology, farmers indicated the project was better than other projects. The main difference about this project was that farmers didn't have to pay for any seed or service, and they had more regular contact from the OGT than with the PPL. Tajuddin felt they could continue the activities and teach other farmers despite the departure of their OGT.

Table A.6.1. Changes in farming and cattle management systems as a result of project activities (outcomes), and subsequent impacts for Tompo and Mattirowale (Barru).

Activity	**Tompo (4BBFs, 3 SOFs)**				**Mattirowalie (4BBFs, 2 SOFs)**			
	Best bet		Scaleout		Best bet		Scaleout	
	Before	After	Before	After	Before	After	Before	After
FORAGE USE								
Native grass	much	little	much	some	much	little	much	some
Rice straw	some	none	some	?	?	?	?	?
Fresh maize straw	?	?	?	?	?	?	?	?
Peanut residue	some	some	some	some	?	?	?	?
Elephant grass	some	more	some	more	some	more	some	more
Tree legumes	little	some	little	some	little	much	little	more
New grasses	n/a	much	n/a	much	n/a	much	n/a	much
FARMING SYSTEM								
Replacing crop areas with forages	n/a	no	n/a	no	n/a	some	n/a	1 farmer 0.4ha
Replacing elephant grass with new grasses	n/a	some	n/a	some	n/a	?	n/a	?
Location of new forages	n/a	Mainly upland	n/a	Mainly upland	n/a	Mainly upland	n/a	Mainly upland
EG Cutting management	When needed	30 days	When needed	30 days	40 days	40 days	When needed	25-40 days
New forage cutting	n/a	15 days	n/a	15 days	n/a	15 days	n/a	15 days
Fertiliser use on EG	none	After each cut	none	After each cut	After each cut	After each cut	After each cut	After each cut
Fertiliser use on new forage	n/a	After each cut	n/a	After each cut	n/a	After each cut	n/a	After each cut
Tree legume planting	none	some	none	some	none	yes	none	some
Understanding of forage quality	no	yes	no	yes	no	some	no	yes
LABOUR								
Time for forage collection	4-6 hrs /day	1-2 hr /day	4-6 hrs /day	1-2 hr /day	1 hrs /day	0.25 hr /day	1 hrs /day	0.25 hr /day
Main use of spare	n/a	WC,	n/a	WC,	n/a	Small	n/a	Small

time		OFW		OFW		WC, OFW		WC, OFW
Participants	Mostly men	Both[1]	?	?	Family, 1 man only	Family	Man + children	Man + children
CATTLE SYSTEM /MANAGEMENT								
Operation	Breed &fatten	Breed &fatten	Breed &fatten	Breed &fatten	Breed &fatten	Breed &fatten	Breed &fatten	Breed &fatten
Feeding	C&C + tether/ free grazing	Most C&C to kandang	?	?	C&drop+ free grazing in pdk	Same, 1 using kandang	C&drop+ free grazing in pdk	Same, more use of kandang
Kandang use	some	all	?	?	some	all	most	most
Early weaning	none	Some planning	none	none	none	1 at 7m	none	none
Preferential feeding	none	none	none	none	none	1 farmer	none	none
Mating	free	control, some AI	free	control	1 control, others free	control, Ds bull	free	Control Ds bull
Cattle numbers	Av 4-5	Av 10	Av 1	Av 2	Av 4	Av 6	Av 2-3	Av 6
Cattle sales	n/a	Av 5	n/a	Av 1	n/a	Av 3	n/a	Av 1
Selling system	As needed	As needed	As needed	As needed	As needed	As need, 1 plans regular	As needed	As need, 1 plans regular
Selling age	2-3 yo	2 yo	2-3 yo	2 yo	1-4 yo	1-4 yo	1-4 yo	1-4 yo
Better prices	n/a	yes	n/a	yes	n/a	yes	n/a	yes
Reason for better price	n/a	AC + MP	n/a	AC + MP	n/a	AC + MP	n/a	AC + MP
IMPACTS								
Labour use impacts	n/a	Crop yld, more cows, OFW	n/a	Expect extra Yield	n/a	Crop yld, OFW, Family close	n/a	Crop yld, OFW, Family close
Income change	n/a	increase	n/a	increase	n/a	increase	n/a	increase
Main source of income change	n/a	cattle	n/a	cattle	n/a	Cattle, 1 from timber	n/a	cattle
Main uses of income	n/a	House, MB[2], Edu, wedding, lending	n/a	Similar to BB	n/a	House, MBike[2], computer	n/a	Similar to BB
Communication better	n/a	better	n/a	better	n/a	better	n/a	better
Cooperation	n/a	better	n/a	better	n/a	Same[3]	n/a	Same[3]
Sharing of	n/a	better	n/a	better	n/a	Same[3]	n/a	Same[3]

resources								
Farmer animal group formed	yes	Yes, also women' s group	n/a	yes	?	Yes, but not active	?	Yes, but not active
Govt policy	n/a	Support forages & cattle	n/a	same	n/a	Support forages & cattle	n/a	same
PPL/K visits	n/a	?	n/a	?	n/a	No change	n/a	No change

WC-weeding crops; R-rest; OFW-Off-farm work (e.g. construction, timber); BM-brick making

AC-animal condition, MP-market prices; MB – motorbike; C&C – Cut and Carry

Table A.6.2. Changes in farming and cattle management systems as a result of project activities (outcomes), and subsequent impacts for Anabanua and Lompo Riaja (Barru).

Activity	**Anabanua (3BBFs, 2 SOFs)**				**Lompo Riaja (4BBFs, 2 SOFs)**			
	Best bet		Scaleout		Best bet		Scaleout	
	Before	After	Before	After	Before	After	Before	After
FORAGE USE								
Native grass	much	little	much	some	much	little	much	some
Rice straw	some	little	some	little	?	?	?	?
Fresh maize straw	?	?	?	?	?	?	?	?
Peanut residue	some	some	some	some	?	?	?	?
Elephant grass	some	some	some	some	some	more	some	more
Tree legumes	little	more	little	more	little	little	little	little
New grasses	n/a	much	n/a	much	n/a	much	n/a	some
FARMING SYSTEM								
Replacing crop areas with forages	n/a	some	n/a	some	n/a	none	n/a	none
Replacing elephant grass with new grasses	n/a	?	n/a	?	n/a	none	n/a	none
Location of new forages	n/a	Mainly upland	n/a	Mainly upland	n/a	Upland, backyard	n/a	Upland, backyard
EG Cutting management	2 months	30 days	2 months	30-40 days	?	30-40 days	?	30-40 days
New forage cutting	n/a	15 days	n/a	15 days	n/a	15 days	n/a	15 days
Fertiliser use on EG	none	After each cut	none	After each cut	After each cut	After each cut	After each cut	After each cut
Fertiliser use on new forage	n/a	After each cut	n/a	After each cut	n/a	After each cut	n/a	After each cut
Tree legume planting	none	some	none	some	none	little	none	little

Understanding of forage quality	no	yes	no	yes	no	some	no	some
LABOUR								
Time for forage collection	3-5 hrs /day	0.5-1 hr /day	3-5 hrs /day	0.5-1 hr /day	1-6 hrs /day[1]	15min-2 hr /day	0 hrs /day	15min /day
Main use of spare time	n/a	CW, CF	n/a	CW, CF	n/a	CW	n/a	CW
Participants	Just men	Family[1]	?	?	Man only	Man only	Man only	Man only
CATTLE SYSTEM /MANAGEMENT								
Operation	Breed & fatten	Breed & fatten	Breed & fatten	Breed & fatten	Breed & fatten	Breed & fatten	Breed & fatten	Breed & fatten
Feeding	?	?	?	?	free grazing in pdk	Same, 1 + C&Cto bull in kandang	free grazing in pdk	Same, 1+ C&C to bull in kandang
Kandang use	all	all	?	?	some	most	some	most
Early weaning	none	none	none	none	none	none	none	none
Preferential feeding	none	none	none	none	none	none	none	none
Mating	free	control, village bull	free	control, village bull	Free mating	Tether at oestrus	Free mating	?
Cattle numbers	Av 4-5	Av 12	Av 3	Av 9	Av 5	Av 10	?	?
Cattle sales	n/a	Av 5	n/a	Av 3	n/a	Av 3-4	n/a	?
Selling system	As needed	Most as needed, 1 at a price	As needed	Most as needed, 1 at a price	As needed, 1 on CS	As needed, 1 on CS	As needed	As needed
Selling age	2-3 yo	2-3 yo	2-3 yo	2-3 yo	3-4 yo	3-4 yo, 1 on CS	3-4 yo	3-4 yo
Better prices	n/a	yes	n/a	yes	n/a	yes	n/a	yes
Reason for better price	n/a	AC + MP	n/a	AC + MP	n/a	MP	n/a	MP
IMPACTS								
Labour use impacts	n/a	Rice yld 2.5 to 3.5t, , OFW	n/a	?	n/a	Crop yld better	n/a	Too early to tell
Income change	n/a	increase	n/a	increase	n/a	increase	n/a	increase
Main source of income change	n/a	Cattle rice	n/a	cattle	n/a	Cattle	n/a	cattle

Main uses of income	n/a	House, MB[2], Edu, cattle, tractor	n/a	Similar to BB	n/a	House, education, wedding	n/a	Similar to BB
Communication better	n/a	better	n/a	better	n/a	better	n/a	better
Cooperation	n/a	better	n/a	better	n/a	better	n/a	better
Sharing of resources	n/a	better	n/a	better	n/a	better	n/a	better
Farmer animal group formed	Yes	Yes, more active	n/a	Yes, more active	None	None	None	None
Govt policy	n/a	Support forages	n/a	same	n/a	No change	n/a	No change
PPL/K visits	n/a	same	n/a	same	n/a	No change	n/a	No change

CW=Crop work; R-rest; OFW-Off-farm work (e.g. construction, timber); BM-brick making

AC-animal condition, MP-market prices; MB – motorbike; C&C – Cut and Carry

Gowa, Pabbentengang (P) and Maccini Baji villages (MB) (Table A.6.3)

According to best bet farmers, before the project farmers had limited forage but now they have plenty. Farmers said they are cutting their new grasses at 20 days, elephant grass at 1m, and indicated if it is left too long it gets too stemmy. In Maccini Baji, the main change to their system has been the forages, the good performance of their cattle, and the labour saving. Now they tether graze until about 11 o'clock then use cut and drop, mainly with elephant grass. Previously they used mostly free grazing. In both villages they stated that young forage gives fat cattle, old forage gets poor cattle, which indicated they have an understanding of forage quality.

Most are using fertiliser after cutting. The new forages are being grown mainly on upland, sometimes in mixture with maize. In MB, one scaleout farmer indicated he uses I bag (urea) over 15 ares (0.15 ha), presumably over a year, but this was not clear. In both villages, some best-bet farmers are using Gliricidia in all seasons, others let cattle graze it, and most are planning to plant more. Tayang (P) is no longer using rice straw but uses fresh maize stover, and Emba (P) fed rice straw and cassava before project, but not now. Most farmers (P, MB) are using much less rice straw, with one scaleout farmer indicating cattle don't like it anymore.

In both villages, farmers are saving much time for forage collection, now using 1-2 hours per day compared to half a day previously. They are using the time to do other jobs such as brick making, crop weeding, vegetable growing or resting. Farmers indicate they are getting better crop yields as a result of the extra weeding. Also, wives and children can now help with forage collection - they indicate they are happy to do so, because it gives the man more time to do other jobs.

In both villages, there is no early weaning because of a fear of theft, with the possible exception of Tayang (P), who puts manure on the cow's udder to discourage suckling. Weaning depends somewhat on the availability of forage and the condition of the cow. If she is poor, then they might wean. Most farmers are selling when they need the money, but Tayang (P) sells when the price is right. Most are breeding and fattening their calves, but again, Tayang is doing some buying and selling. Commonly they sell at 2-3 years, and the price depends on the condition of the animal. Tayang used to have 3 animals, now he has 10.

In both villages farmers indicated their income had increased since before the project. Generally this was considered due to cattle sales, increased crop yield and more time for brick making. The extra money is being spent on education, house renovations, buying more cattle, and renting more land.

In P, prior to project, there was little communication in the village whereas now there is good communication between the best-bet farmers within the village. There is more tolerance to sharing of forages; before everyone protected their forage area. Best-bet farmers are sharing their forages with scaleout farmers. There was a similar story in MB.

(P, MB) There has been no change in visits by PPL or interest of Dinas.

(P, MB) Compared to previous maize project, farmers felt this project was significantly better because we continued to assist them. Having the OGTs was very good. The farmers now want to form a farmer group, with a business orientation.

Table A.6.3. Changes in village farming and cattle management systems as a result of project activities (outcomes), and subsequent impacts for Pabbentengang and Maccini Baji (Gowa).

Activity	**Pabbentengang (3 BBFs, 2 SOFs)**				**Maccini Baji (?BBFs, ? SOFs)**			
	Best bet		Scaleout		Best bet		Scaleout	
	Before	After	Before	After	Before	After	Before	After
FORAGE USE								
Native grass	much	little	much	some	much	little	much	some
Rice straw	some	little	some	little	some	little	some	little
Fresh maize straw	some	some	some	some	some	some	some	some
Peanut residue	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Elephant grass	some	much	some	much	some	more	some	more
Tree legumes	little	some	little	some	little	some	little	some
New grasses	n/a	some	n/a	some	n/a	some	n/a	some
FARMING SYSTEM								
Replacing crop areas with forages	n/a	some	n/a	some	n/a	some	n/a	some
Replacing elephant grass with new grasses	n/a	no	n/a	no	n/a	no	n/a	no
Location of new forages	n/a	Mainly upland	n/a	Mainly upland	n/a	Mainly upland	n/a	Mainly upland
EG Cutting management	?	30 days	?	30 days	?	30 days	?	30 days
New forage cutting	n/a	20 days	n/a	20 days	n/a	20 days	n/a	20 days
Fertiliser use on EG	none	After each cut	none	After each cut	After each cut	After each cut	After each cut	After each cut
Fertiliser use on new forage	n/a	After each cut	n/a	After each cut	n/a	After each cut	n/a	After each cut

Tree legume planting	none	some	none	some	none	some	none	some
Understanding of forage quality	no	yes	no	yes	no	yes	no	yes
LABOUR								
Time for forage collection	3-4 hrs /day	1-2 hrs /day	3-4 hrs /day	1-2 hrs /day	3-4 hrs /day	1-2 hrs /day	3-4 hrs /day	1-2 hrs /day
Main use of spare time	n/a	CW, BM, R	n/a	CW, BM, R	n/a	CW, BM	n/a	CW, BM
Participants	Just men	Family[1]	Just men	Family[1]	Just men	Family[1]	Just men	Family[1]
CATTLE SYSTEM /MANAGEMENT								
Operation	Breed & fatten	Breed & fatten	Breed & fatten	Breed & fatten	Breed & fatten	Breed & fatten	Breed & fatten	Breed & fatten
Feeding	Tether grazing	Tether & C&C	Tether grazing	Tether & C&C	free grazing in pdk	Same, 1 + C&drop	free grazing in pdk	Same, 1 + C&drop
Kandang use	little	some	little	some	little	some	little	some
Early weaning	none	some	none	none	none	none	none	none
Preferential feeding	none	some	none	none	none	none	none	none
Mating	Free mating	control, village bull	Free mating	control, village bull	Free mating	control, village bull	Free mating	control, village bull
Cattle numbers	?	?	?	?	?	?	?	?
Cattle sales	n/a	?	n/a	?	n/a	?	n/a	?
Selling system	As needed	Most as needed, 1 at a price	As needed	Most as needed, 1 at a price	As needed	As needed	As needed	As needed
Selling age	2-3 yo	2-3 yo	2-3 yo	2-3 yo	2-3 yo	2-3 yo	2-3 yo	2-3 yo
Better prices	n/a	yes	n/a	yes	n/a	yes	n/a	yes
Reason for better price	n/a	AC + MP	n/a	AC + MP	n/a	AC + MP	n/a	AC + MP
IMPACTS								
Labour use impacts	n/a	crop yld increase	n/a	Too early to tell	n/a	crop yld increase	n/a	Too early to tell
Income change	n/a	increase	n/a	increase	n/a	increase	n/a	increase
Main source of income change	n/a	Cattle Rice, bricks	n/a	cattle	n/a	Cattle Rice, bricks	n/a	cattle
Main uses of income	n/a	House, MB, Edu,	n/a	Similar to BB	n/a	House, MB, Edu,	n/a	Similar to BB

		cattle, land				cattle, land		
Communication better	n/a	better	n/a	better	n/a	better	n/a	better
Cooperation	n/a	better	n/a	better	n/a	better	n/a	better
Sharing of resources	n/a	better	n/a	better	n/a	better	n/a	better
Farmer animal group formed	None	Want to	n/a	Want to	None	Want to	n/a	Want to
Govt policy	n/a	No change	n/a	No change	n/a	No change	n/a	No change
PPL/K visits	n/a	No change	n/a	No change	n/a	No change	n/a	No change

CW=Crop work; R-rest; OFW-Off-farm work (e.g. construction, timber); BM-brick making

AC-animal condition, MP-market prices; MB – motorbike; C&C – Cut and Carry

Gowa, Mangempang village (Table A.6.4) – 4 BBFs and 1 SOF interviewed

All best bet farmers interviewed rated labour saving from the combination of new forage introductions, better forage management and relocation of forage banks closer to their household as the most significant impacts so far. Time spent on forage collection and feeding has reduced from 4-5 hours/day before the project to around 1 hour/day now, liberating significant labour for other activities. The scaleout farmer was new, so too early for such impacts.

BBFs used saved labour for crop maintenance and off-farm work. One farmer (Mustari) now growing chillies while another farmer (Taba) uses saved time for fish farming. All farmers reported that having new forage banks closer to household enabled other family members (especially their wives) to participate in forage collection and feeding, allowing the husband to undertake other income generating work.

Of new forages grown *Paspalum atratum* and *Brachiaria* x mulato were most preferred and these were cut at around 14 day intervals, while elephant grass (EG) was cut every 30 days at around 1m high, compared to around 3m previously. Both EG and new grasses were now fertilised with urea after each cut. No fertiliser was used previously for forages. New forage banks were grown in upland areas and some farmers reported replacing seasonal upland crops (e.g. maize) with permanent forage banks. Both BBFs and SOF said they now feed a little *Gliricidia*, mainly in the dry season and most said they had planted some more (usually < 20m) since the project started. One BBF (Taba) has planted 200m of new *Gliricidia* fences. Farmers did not use much rice straw before and still don't, while most continue to feed some fresh maize stover in season.

Most BBFs say they practice early weaning but apparently still return calves to cows at night. No BBFs or SOFs practiced preferential feeding of weaned calves. Most now take cows to any available bull in the village as soon as they recognise oestrus. Farmers said they already knew about oestrus detection (via PPK) but OGT encouraged them to change from previous uncontrolled mating system. While not full control mating, it probably assists improved calving percentage and reduced calving interval, which might account for increase in cattle numbers.

There were no apparent changes from the pre-existing breeding/fattening / sell as needed cattle management / selling strategies. BBFs felt while prices had increased, they were similar to those received in other villages – i.e. market driven rather than a response to better condition. However the SOF present said traders he spoke to were prepared to pay a premium for cattle fed new forages by cut and carry as they observed better condition and growth.

Cattle numbers held or managed by BBFs more than doubled since the project started while the number of cattle sold had also increased over the same period. For example BBF Rala started with 2 head and now has 5; BBF Mustari started with 1 and now has 7 and BBF Taba started with 5 and now has 9. One BBF (Arifuddin) had the same number before and after, but he had sold at least 7 head in the interim. All farmers present said their household incomes had increased significantly over the last 2 years. Cattle was the dominant factor for 2 BBFs while the others indicated crop revenue (chillies) and off-farm work, facilitated by use of saved labour. Extra income was used to purchase new land (Mustari) house renovations (Arifuddin, Rala) and wedding, motor bike and hand tractor (Taba).

All farmers said farmer to farmer communication and cooperation had improved as a result of sharing new forage resources and knowledge. Farmers were also able to assist each other with forage collection when required as forage banks were closer and new forages easier to handle. On a village scale the increased household wealth had resulted on more disposable income available for contribution to maintenance of their mosque.

In terms of impacts on local government policy farmers reported that growing new forages was now part of village level policy conditions for farmers to receive cattle from Dinas. As a result farmers were now thinking of starting a new farmer group focussed on cattle production.

Both farmers and village officials felt that this project provided ongoing and targeted assistance and support compared to other projects which simply provided seed etc and left. As a result most farmers present felt confident they would be able to continue and expand the new forage and cattle management practices after OGTs depart. Farmers reported that about half of farmers in the “best bet” sub-village had already planted new forages while between 10 and 30% had done so in other sub-villages to date (total around 200 farmers).

Gowa, Bontomanai village (Table A.6.4) – 3 BBFs and 10 SOFs interviewed

Most BBFs and SOFs agreed that the biggest impact to date was from labour saved through the combination of new forage introductions, better management of existing elephant grass and relocation of new forage banks closer to household and cattle. Two BBFs reported reductions from 4-6 hours/day to 0.5-1 hour /day – similar to other villages while one SOF reported a reduction from 1 hour/day to 20 mins/day.

Only one BBF (Sikking) reported spending longer now on forage collection, feeding and animal management than before (5 hours/day now compared to 2 hours before). However there was some doubt about this from OGTs and other farmers present. As Sikking’s EG was a long way from his house and his new grasses are still small and co-located with EG it may well be that he has not experienced labour savings.

Of new forages tried most BBFs and SOFs preferred Paspalum and mulato. No herbaceous legumes were in use as few had been tried here. BBFs and SOFs cut both EG and new grasses around 25 day intervals and fertilised with urea after each cut. All new forage banks were grown in spare upland with no-one yet replacing cropland with perennial forages. Most BBFs indicated that they now understood more about the importance of forage quality e.g. that fresh leaf was better then stem; that shorter cutting intervals (and height) for EG improved leaf/stem ration and quality and that grasses required N input to maintain good growth and quality. For instance BBF Basri observed that cattle preferred new grasses because of more leaf which he said was more digestible. All farmers present said they fed some *Gliricidia,* mainly in the dry season, but mainly as opportunistic cut and drop. BBF Basri said he fed about 3kg fresh *Gliricidia* each day for 3 cattle.

In terms of cattle management, 3 BBFs (Basri, Sikking and Dula) say they now wean at 6 months, though there was some doubt as to whether they in fact return their calves to

cows at night. BBF Dula still weaned naturally but said calves self-wean around 8 months, while at least one SOF said he now weaned at 7-8 months with very good results for cow and calf. BBFs and SOFs say they now give better quality forage to weaned calves. One BBF (Sikking) takes his cows to any available bull at oestrus, while other BBFs and SOFs seem to be employing a mixture of this and uncontrolled mating during communal grazing, as before.

Most BBFs and SOFs still used a combined breeding/fattening system, selling when needed as before, with selling age usually between 2-3 years. However some (especially Sikking and Basri) say they plan to move towards cattle as a business rather than remain just cattle keepers. Farmers all said that, before the project, cattle were just a secondary activity but now with better feeding and breeding management they see opportunity to get better prices and income. Farmers say trader response same as before – no change yet but BBF Sikking says prices received now better compared to neighbouring villages because of better cattle condition and growth e.g. 2 YO male RP 8 million *cf* RP 5 million for 2YO male in next village. BBF Basri received RP 5 million for 2 YO female.

Most BBFs and some SOFs had increased cattle numbers owned or managed since project start, while cattle sales had also increased over the same period. Examples include, BBF Sikking (2 cattle before, now 8, sold 3); BBF Dula (4 cattle before, now 10, sold 4); BBF Basri (6 cattle before, now 4, sold 2). All BBFs say household income has increased significantly, mainly from cattle but also from additional income from off-farm work and improved crop yields. SOFs think income increased from crops and cattle but too early to tell if due to project or general market improvement. Farmers have used extra income for house improvements, children's education and saving for Hajj.

As with Mangempang all farmers said that farmer to farmer communication and cooperation had improved as a result of sharing new forage resources and knowledge. Farmers were also able to assist each other with forage collection when required as forage banks were closer and new forages easier to handle. BBF Dula noted that many farmers now want new forages when enough planting material available but meantime are planting more EG and learning to manage it better by following BBFs. Similarly farmers reported that growing new forages was now part of official village policy conditions for farmers to receive cattle from DINAS. As a result farmers were now thinking of starting a new farmer group focussed on cattle production.

Bontomanai farmers felt that this project provided on-going and targeted assistance and support compared to other projects which simply provided seed etc. and left. As a result, most farmers present felt confident they would be able to continue and expand the new forage and cattle management practices after OGTs depart. In contrast to Mangempang, farmers thought that only around 10% of farmers in best bet sub-village had planted new forages and a lot less in other sub-villages – mainly to due limited access to planting material in early stages. However they all felt confident that this would improve rapidly and that they (the BBFs and current SOFs had the knowledge and experience to assist other farmers and ensure the on-going spread of new practices.

Table A.6.4. Changes in farming and cattle management systems as a result of project activities (outcomes), and subsequent impacts for Mangemgpang and Bontomonai (Gowa).

Activity	**Mangempang (4 BBFs, 1 SOF)**				**Bontomanai (3 BBFs, 10 SOFs)**			
	Best bet		Scaleout		Best bet		Scaleout	
	Before	After	Before	After	Before	After	Before	After
FORAGE USE								
Native grass	much	some	much	some	much	some	much	some
Rice straw	none	none	none	none	?	?	?	?

Fresh maize straw	some fresh	some fresh	some fresh	some fresh	some fresh	some fresh	some fresh	some fresh
Peanut residue	n/a	n/a	n/a	n/a				
Elephant grass	some	more	some	more	some	more	some	more
Tree legumes	none	some	none	some	some	some	some	some
New grasses	none	some	none	some	none	some	none	some
FARMING SYSTEM								
Replacing crop areas with forages	none	some	none	some	none	none	none	none
Replacing elephant grass with new grasses	none	none	none	none	none	none	none	none
Location of new forages	upland	upland closer	upland	upland closer	upland	upland closer	upland	upland closer
EG Cutting management	>3m >30 days	~ 1m 30 days	>3m	~ 1m 30 days	>3m	?m 25 days	>3m	?m 25 days
New forage cutting	n/a	14 days	n/a	14 days	n/a	25 days	n/a	25 days
Fertiliser use on EG (mainly urea)	none	some each cut	none	some each cut	none	some each cut	none	some each cut
Fertiliser use on new forage	n/a	some each cut	n/a	some each cut	n/a	some each cut	n/a	some each cut
Tree legume planting	none	Some[3]	none	some	none	some	none	some
Understanding of forage quality	little	more	little	more	little	more	little	more
LABOUR								
Time for forage collection	4-5 hrs /day	~ 1 hr /day	4-5 hrs /day	~ 1 hr /day	~ 5 hrs /day [2]	0.5-1 hr /day	~ 5 hrs /day	0.5-1 hr/day
Main use of spare time	n/a	CW, OFW, OW	n/a	CW	n/a	CW, OW	n/a	CW
Participants (M-man only, B-both man& wife, A-all	M	A	M	A	M	A	M	A
CATTLE SYSTEM /MANAGEMENT								
Cattle Operation	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening
Main feeding system	GR, CD	CD, CC	GR, CD	CD, CC	GR, CD	CD, CC	GR, CD	CD, CC
Kandang use	none	some	none	some	few	most	none	some
Early weaning	none	some	none	some	none	most	none	some
Preferential feeding	none	none	none	none	none	none	none	none

Mating	free	partial [1]	free	partial [1]	free	partial [1]	free	partial [1]
Cattle numbers	Av 2.5	Av 5	n/a	n/a	Av 4	Av 7	n/a	n/a
Cattle sales	n/a	~ 5	n/a	n/a	n/a	Av 3	n/a	n/a
Selling system	As need	As need	As need	As need	As need	As need	As need	As need
Selling age	2-3 yo	2-3 yo	2-3 yo	2-3 yo	2-3 yo	2-3 yo	2-3 yo	2-3 yo
Better prices	n/a	yes	n/a	yes	n/a	yes	n/a	yes
Reason for better price	n/a	AC + MP	n/a	n/a	n/a	AC + MP	n/a	n/a
Trader interest change	n/a	same	n/a	n/a	n/a	same	n/a	n/a
IMPACTS								
Labour use impacts crops, off-farm (OFI)	n/a	Increase ylds, OFI	n/a	too early	n/a	Increase ylds, OFI	n/a	too early
Income change	n/a	Increase	n/a	Increase	n/a	Increase	n/a	Increase
Main source of income change	n/a	cattle, OFW	n/a	OFW	n/a	cattle	n/a	Crops, cattle
Main uses of income	n/a	house, vehicle, land	n/a	Child educat	n/a	House, Hajj, educat	n/a	hajj
Communication better	n/a	better	n/a	better	n/a	better	n/a	better
Cooperation	n/a	better	n/a	better	n/a	better	n/a	better
Sharing of resources	little	more	little	more	little	more	little	more
Farmer animal group formed	none	Not yet planning	none	Not yet planning	none	Not yet planning	none	Not yet planning
Govt policy impacts	n/a	Some Desa	n/a	Some Desa	n/a	Some Desa	n/a	Some Desa
PPL/K visits	few	more	few	more	few	same	few	same

CW=Crop work; R-rest; OFW-Off-farm work (e.g. construction, timber); BM-brick making

AC-animal condition, MP-market prices; MB – motorbike; C&C – Cut and Carry; GR - grazing

[1] Partial control mating system – farmers recognise oestrus and take to any available bull in village – usually bull kept in kandang or backyard. Some farmers simply tether their cow close to rice fields in dry season when free grazing of stubble occurs i.e. tether and hope system.

[2] One farmer says he now uses 5 hrs/day, before only 2 hrs/day but dubious claim

[3] One BBF has planted 200m of Gliricidia hedges, other BBFs only <20 m

Bone, Mattirowalie village (Table A.6.5) – 5 BBFs and 4 SOFs interviewed

Most BBFs and SOFs present affirmed that the biggest single impact to date was labour saving from the combination of new forage introductions, better forage management and re-location of forage banks closer to households. Time spent on forage collection and feeding has reduced from 4-6 hours/day before the project to around 0.5-1 hour/day now, liberating significant labour for other activities. Scaleout farmers were new so too early for such impacts. BBFs and SOFs used saved labour mainly for crop maintenance and off-

farm work. One BBF (Suyuti) also used saved time for house building while BBF Nurdin worked as a chainsaw operator. All BBFs reported better crop health and yields resulting from more attention. BBF Ali said that before the project he used to produce 10 bags from his rice land, now twice as much due to better weed control.

Most BBFs and SOFs prefer Paspalum and Mulato but still grow EG. None have persisted with herbaceous legumes as too hard to maintain and regenerate from seed. BBFs Nurdin, Ali, Suyuti and Suryani all grow new forages in upland. BBF Jide converted 0.5 ha of rice land (50%) of total rice land) to new forages because he believes it is more profitable than selling rice. He also intercrops forages with his Cocoa plantation. One SOF also replaced 0.05ha of rice land with forages. One BBF (Nurdin) fertilises Paspalum with urea every 3rd cut but needs to fertilise EG after every cut to get same production. All BBFs use urea on new forages and EG now- never before project. One SOF uses manure on new forages every 6 months – good slow release. Most farmers are cutting Paspalum and mulato every 15 days and EG every 30 days. Most BBFs and SOFs feed some Gliricidia in dry season mixed with grasses, but only one SOF reported planting some new Gliricidia rows. No farmers use rice or peanut straw now, though some still plant peanuts.

In terms of cattle management all BBFs say they now do early weaning at 7-8 months. None did so before. The picture for SOFs is less clear. No specific preferential feeding is done though all say they now give good quality forage to cows and calves as well as males in kandang. BBFs Jide has his own bull and all other SOFs present use his bull as it is a good one. Farmers say they now recognise oestrus for mating purposes. Most BBFs and SOFs say they still breed and fatten, selling when money needed but usually males at around 3 YO for up to RP 10 million. One SOF just buys and fattens while BBFs Ali and Suyuti plan to sell younger and more regularly as he thinks this is more profitable. Most farmers say prices have improved – mainly market driven but one SOF says it is because of better animal condition. Trader interest is much as before. BBF Ali said last time he sold to a trader he told him his cattle weighed more than trader estimated because of better condition – so he paid more.

All BBFs say they have experienced big increases in their household income and wealth since the project began, mainly due to cattle. SOFs say similar, but too early to really tell yet. Cattle numbers owned or managed have also increased rapidly since the project started, as have the number of cattle sold. Examples include BBF Jide (start 2,, sold 5, now 15); BBF Ali (start 5 cattle , sold 7, now many); BBF Nurdin (start 4 sold 13, now 14); BBF Suyuti (start 5, sold 5, now 7); BBF Suryani (start with 2, sold 12 now 5); SOF1 started 1, sold 2, now 5). Farmers have used their extra income to build or improve housing (Suyuti and Jide, Nurdin) buy motor bikes and household goods e.g. fridge, TV (Suryani); improve infrastructure e.g. biogas set-up (Nurdin) or save for Hajj (Ali). SOFs say too early to get good info yet.

Village scale social impacts include better communication and cooperation e.g. sharing new forage material, Jide's bull (accessed for free). Farmers say it is now easier to help farmers who are sick or away with forage collection and feeding - before could only help with supplying stock with water. Other family/social impacts include ability of women to not only help with forage gathering but keep their own cattle (competing with the men). Before the project, just a few women owned cattle. Women say they are happy to take on additional role of forage gathering and feeding as long as men also continue to help – but not happy if just left to women now.

Farmers say almost 100% of farmers in main sub-village have now planted new forages, and now most farmers have a kandang, though not all are using it full time. Before project, not many farmers had a kandang. BBFs and SOFs have formed new farmer group named *Mabbiga* which loosely means breeding more cattle in Bahasa Bugis. Main focus is to have Dinas cattle schemes to provide cows through group rather than just individual farmers. OGT Suryani helped to set up group and provide information from Lombok project 096 on their Farmer Group establishment.

No specific changes observed by farmers re local government policy arising from project. PPL situation somewhat confounded as Suryani both an OGT and PPL.

All farmers agreed that this project different because it gave them the means (forage) and practical knowledge about forage and cattle management to enable them to increase their income rapidly – compared to previous projects on peanuts and cocoa. BBF Ali said this project all about increasing knowledge. He said the OGT system worked well and was good as it increased his access to information.

Bone, Bune village (Table A.6.5) – 3 BBFs + 2 SOFs interviewed

All BBFs say biggest single impact is labour saving due to new forages, better forage management and new forage banks closer to household. Typical time reduction for collecting and feeding forages are from half an day to half an hour per day, year round. Labour saved is invested in crop production (rice and cocoa, peanuts -2 BBFs) and off-farm (BBF Hasbi working off-farm on construction work and rice harvest). More accessible and easily cut forages also allows other family members (especially wives) to participate in forage gathering and feeding. SOFs say too early for major impacts as only just started, but similar savings expected. 2 BBFs say extra attention to crops has resulted in increased yields from 60 bags to 75 bags. SOF said no yield benefits yet but crops more weed free and better for harvesting.

Most BBFs and SOFs prefer Paspalum to Mulato but still growing EG as well. Hasbi also grows some Setaria. No farmers are still using herbaceous legumes - same for SOFs. All BBFs and SOFs grow new forages in upland. New grasses (Paspalum and mulato) cut every 2 weeks, EG every 6 weeks at 1.5m by BBFs and SOFs present. BBFs and SOFs present apply urea but overall same amount for both new grasses and EG. All BBFs feed some Gliricidia mostly in dry season mixed with grasses. BBF feeds it mostly to cows, others to cows and calves. Some BBFs planted additional Gliricidia as living fences. One BBF said he feeds Gliricidia first because if mixed with grass cattle eat grass only. BBFs all say they still feed some rice straw in dry season but less than before because they have plenty of new forages.

In terms of cattle feeding and management All BBFs have kandang and do C/C feeding now whereas very few did before. Most SOFs have kandang now and farmers report almost 100% of farmers in village now have some new forages and EG (few before) and most have their own kandang (few before) though they don't always use it (often still tether graze in backyard). Of the BBFs, only Agustum and Oddang weaning at 6-7 months. BBF Hasbi uses natural weaning while SOFs just started so not yet practising early weaning. BBFs Oddang and Hasbi feeding weaned calves rice bran in addition to improved forages (also to cows for Hasbi). Agustum just improved forages to cows and calves.

BBF Hasbi has own bull which other farmers use because they consider it to be a good bull. All farmers say they prefer bigger bulls. Farmers say they now recognise oestrus and use this knowledge to try and ensure cows calve in small dry season so they can wean at end of small wet season. Before the project, most farmers just used uncontrolled mating during dry season cropland grazing.

Two BBFs still selling males at 3YO but Agustum now selling at 2 YO because he uses less labour and forage than to grow on to 3YO. Price RP 5million for 2YO and RP 7 million for 3YO. Agustum also sold a 1YO male for RP3.2 million. One SOF says he found it more profitable to sell younger (1 YO) for RP 3 million. He plans to sell more regularly and recently sold 2 x 2YO males for RP 11 Million total.

All BBFs say their household income and wealth has increased since project start. Most have increased both the number of cattle owned/managed and the number sold during this period, due to both cattle sales and additional off-farm work made possible by liberated labour. Two BBFs used extra income to buy motor bikes (Hasbi 2 and Oddang

1). Oddang also bought more cattle and saved money for Hajj. One SOF suggested you could use money from the sale of 2 (or 3) cattle to buy a wife!

In terms of social impacts, all farmers said there was better communication and cooperation across the whole village and it is now easier to help farmers who are sick or away with forage collection and feeding - before they could only help with supplying stock with water. There was also more time for family activities and more spread of forage/cattle workload between family members, especially wife.

Farmers say they want to expand new cattle and forage activities but still maintain a happy medium between cropping and livestock keeping. BBFs and SOFs have formed new farmer group SIPAKAINGE with main focus to acquire cattle from Dinas for group rather than just individual farmers. OGT Suryani helped to set up group and provide information from Lombok project 096 Group experience.

Farmers say more interest at sub-district level and also from PPLs – before none. Because there is a forage nursery in Bune, Dinas Pertanian and Peternakan have placed a project funded by the World Bank there for cattle breeding and fattening management, using 061 forage strategies. BBF Agustum is being trained as an extension office for this project. Most farmers said they can't compare this project with others because they have little previous project experience.

Farmers said that about 50% of farmers in the best bet sub-village have now planted new forages. About 90% of farmers now have EG, while about 70% of farmers now have a kandang (though not all use it for feeding all the time.). Before project only 20% of farmers had a kandang for feeding.

Table A.6.5. Changes in farming and cattle management systems as a result of project activities (outcomes), and subsequent impacts for Matterowalie and Bune (Bone).

Activity	**Mattirowalie (5 BBFs, 4 SOFs)**				**Bune (3 BBFs, 2 SOFs)**			
	Best bet		Scaleout		Best bet		Scaleout	
	Before	After	Before	After	Before	After	Before	After
FORAGE USE								
Native grass	some	less	much	some	much	less	much	some
Rice straw	some	less	some	less	some	less	some	less
Fresh maize straw	none	none	none	none	n/a	n/a	n/a	n/a
Peanut residue	n/a	n/a	n/a	n/a	n/a	none	n/a	none
Elephant grass	some	more	some	more	some	more	some	more
Tree legumes	none	some	none	some	none	some	none	some
New grasses	n/a	much	n/a	much	n/a	much	n/a	much
FARMING SYSTEM								
Replacing crop areas with forages	none	1 farmer (0.5ha)	none	1 farmer 0.05ha	none	none	none	none
Replacing elephant grass with new grasses	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Location of new forages	n/a	Mainly upland	n/a	Mainly upland	n/a	upland	n/a	upland
EG Cutting	When	30 days	When	30 days	As	6 weeks	As	6 weeks

management	needed		needed		needed	(1.5m)	needed	(1.5m)
New forage cutting	n/a	15 days	n/a	15 days	n/a	15 days	n/a	15 days
Fertiliser use on EG (mainly urea)	none	After each cut	none	1 uses manure	none	After each cut	none	After each cut
Fertiliser use on new forage	none	Every 3rd cut	none	1 uses manure	n/a	After each cut	n/a	After each cut
Tree legume planting	none	unsure	none	unclear	none	yes	none	unclear
Understanding of forage quality	less	more	less	more	less	more	less	more
LABOUR								
Time for forage collection	5-6 hrs /day	0.5-1 hr /day	5-6 hours /day	0.5-1 hr /day	4-5 hrs/day	0.5 hrs/day	4-5 hrs/day	0.5 hrs/day
Main use of spare time	n/a	CW, OFW	n/a	unsure	n/a	CW, OFW (i)	n/a	WC
Participants (M-man only, B-both man& wife, A-all	M	A	M	A (1 BBF B)	M	A	M	A
CATTLE SYSTEM /MANAGEMENT								
Cattle Operation	Breeding fattening	Breeding fattening	Breeding fattening	1 SOF breeding	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening
Main feeding system	gr	c/c	gr	c/c	gr	c/c	gr	c/c
Kandang use	some	All	some	most	few	all	few	most
Early weaning	none	All	none	some	none	40%	none	none
Preferential feeding	none	some	none	unclear	None	40%	None	unclear
Mating	free	control	free	control	free	control	free	unclear
Cattle numbers	Av 3	Av 8	Av 1	Av 5	?	?	?	?
Cattle sales	n/a	Av 8	n/a	Av 2	?	?	?	?
Selling system	As need	As need	As need	As need	As need	as need 1 at price	As need	As need
Selling age	3 yo	3 yo	3 yo	3 yo	3yo	2 @3yo 1 @ 2yo	3yo	Most 3yo 1 @ 1 yo
Better prices	n/a	yes	n/a	yes	n/a	yes	n/a	yes
Reason for better price	n/a	AC + MP	n/a	AC + MP	n/a	AC + MP	n/a	AC + MP
Trader interest change	n/a	same	n/a	same	n/a	same	n/a	same
IMPACTS								
Labour use impacts crops, off-farm (OFI)	n/a	Extra Yield	n/a	unsure	n/a	Extra Yields	n/a	unclear
Income change	n/a	increase	n/a	unsure	n/a	increase	n/a	increase
Main source of income change	n/a	cattle	n/a	unsure	n/a	cattle	n/a	cattle

Main uses of income	n/a	House, MB, Haj	n/a	unsure	n/a	MB, Hajj, cattle	n/a	bought wife
Communication better	n/a	better	n/a	better	n/a	better	n/a	better
Cooperation	n/a	better	n/a	better	n/a	better	n/a	better
Sharing of resources	n/a	better	n/a	better	n/a	better	n/a	better
Farmer animal group formed	none	formed	none	formed	none	formed	none	formed
Govt policy	n/a	same	n/a	same	less	more interest*	less	more interest[1]
PPL/K visits	n/a	same	n/a	same	less	more	less	more

CW-cropping work (weeding etc.); R-rest; OFW-Off-farm work (e.g. construction); other on-farm e.g. BM-brick making OW= other work;

AC-animal condition, MP-market prices; BY= better yield, MI = more income,, FT= more family time

[1] forage growing now part of Desa policy

Bone, Laburasseng village (Table A.6.6) – 3BBFs + 2 SOFs interviewed

Like Mattirowalie the biggest single impact to date has resulted from significant labour savings associated with new forages, better forage management, location of new forage banks closer to household and cattle, and use of backyard kandangs. Typical reductions from 5-6 hours/day to 0.5-1 hour per day have resulted, liberating saved labour for use in crop maintenance and also off-farm work (building, village office work etc.). More time for crop maintenance has lead to healthier and more productive crops and higher yields according to farmers present.

Most preferred new forages are Paspalum and Mulato, though some also grow Setaria and Panicum maximum cv Mombasa. New grasses are collectively known as “Rumput ACIAR” or “Rumput Australia”. Most still grow EG as well though some are thinking of replacing some EG with new forages. Cutting management is once every 25 days for both new grasses and EG. All BBFs and SOFs present report they apply urea to new forages and EG because they recognise it improves growth, especially in wet season i.e. they have worked out the cost benefits.

BBFs and SOFs growing most of their new forage grasses and EG in upland but some are replacing crops for forages on some cropland. Examples include BBF Sudding who replaced 0.8ha of his 2.3ha rice land with new grasses; Village secretary (SOF) who replaced 0.1ha of rice land with new grasses and BBF Junaedi who replaced 0.3ha of rice land with new grasses. All say these are permanent changes. All BBFs and SOFs present report they have continued to expand their new forage areas.

Gliricidia (locally called laju bunga) is now used by all BBFs and some SOFs mostly in dry season mixed with grasses. Farmers report that Gliricidia very palatable to cattle in dry season due to fresh green leaf. Many farmers are expanding their planting of Gliricidia fences (BBFs and SOFs). Most BBFs and SOFs present report that they feed only a small amount of Gliricidia. All BBFs no longer feed rice straw because there is no need to with new forages. SOF’s present say they do the same though a bit unclear here.Use of peanut straw unclear as it depends on how much they planted.

In terms of cattle feeding and management, most BBFs and SOFs said they did little cut & carry before the project but now mostly c/c. All BBFs say they now do early weaning around 6-7 months – picture less clear for SOFs. All BBFs say they preferentially feed weaned calves while most BBFs and SOFs say they recognise oestrus and take cows for mating to any available bull in the village at oestrus. One BBf (Damsi) has his own bull for

mating. Prior to project, it was all uncontrolled mating during communal grazing. Most BBFs and SOFs still using traditional breeding and fattening males for Kalimantan trade at 3-4 years, selling when they need money or when cattle big enough.

However many now say they plan to switch more to breeding and selling around 1-2 YO as they think it is more profitable. They say they can get RP 3 million for a 1 YO male and RP 3.5 million for 1 YO female – good price and don't have to feed for 2 more years. It was unclear if SOFs present doing the same but seems to be a general system shift. Some increased trader interest but early days. BBF Damsi says increased trader interest and price by promoting the fact that his cattle are fed on "Rumput ACIAR" i.e. he received a premium for feeding new grasses.

Farmers say though their cattle are in better condition due to feeding rumput ACIAR (RA) traders will only pay same price as for other farmer's cattle in poorer condition not fed rumput ACIAR. However traders sell RA fed cattle for a higher price and so profit goes to trader not farmer. Farmers felt their household income had increased significantly since the project began, mainly due to increased cattle income. Details of individual cattle holdings were not recorded but BBF Junaide says he now has 9 cattle – more than double what he held at start.

Main village scale social impacts included more farmer to farmer cooperation, less competition for scarce forages but more friendly competition / pride re cattle and new forage production, ability to help other farmers with forage collection when needed. Farmers also report more time now for family activities e.g. recreation, shopping in town etc. BBFs say many scaleout farmers want to start out big (plant 0.5 ha) straight away but BBFs advise them to start slowly like they did and build up step by step with forage and knowledge/ experience. This is working well. Only local government response observed so far was village head at Tappale using Mosque loud speaker system to urge farmers to plant new forages.

All BBFs and SOFs plan to continue and expand new forage grasses (mainly Paspalum and mulato) , forage and cattle management options in the future. Farmers estimate that around 90% of farmers in best bet sub-village have planted new forages and many of these have established backyard kandangs BBFs have now formed a farmer group (with OGT help) which will focus on acquiring and selecting bulls for use by their group. OGTs have been liaising with project 096 OGTs to get information on how to set up bull management schemes similar to Lombok kandang groups.

BBF Junaedi said that main difference between this project and others was that this project helps individual farmers improve their situation - not just community level focus. He says the knowledge about forages and cattle management he received from this project allowed him to increase his cattle numbers from 5 to 9 over the 2 years of project involvement. The head of the sub-village said this project was focussed on a single theme – forages and cattle management – which was easy for farmers to understand and see potential.

Bone, Tappale village (Table A.6.6) - 5 BBFs and 5 SOFs interviewed

Most BBFs and SOFs said the most important result from the project for them was increased knowledge about new forages and how to better manage existing forages. BBF Herman says he now knows new forages are good but doesn't have enough time to manage them better because too busy with rice growing. As cattle management system in Tappale was mainly grazing (tethered in wet, free grazing in dry crop stubble) reduction in labour used for forage collection and feeding was much less here than in other Bone villages. For instance BBF Sulaeman said before project only minimal labour used because all tethered grazing – no C/C. Now uses 1 hour / day for C/C and kandang feeding but OK because cattle condition improved. BBF Haysim is almost the same as

Sulaeman but now takes only 0.5 hr/day. Usmi and other BBFs were similar. SOF response was unclear – but SOF Matto indicated some labour saving.

BBFs all say Paspalum and Mulato the best new forages because they are easier to cut than EG. They cut Mulato every 15 days because if they leave it for 1 month leaves become too tough. Paspalum is cut once a month as is EG. All say they apply some urea after each cut- amount unclear. BBFs say scaleout farmers also understand that younger grasses are better than old grasses. SOF Matto says scaleouts get forage cuttings and learn about forage management from BBFs and he has also done much experimentation about row spacing, which grasses to plant with which grass and about feeding mixes of new forages. All farmers agree that SOFs now have bigger new forage banks than BBFs. Most BBFs and SOFs are growing new forages in spare upland. BBF Haysim replaced 0.1 ha rice land with forage grasses while BBFs Herman and Usmi planted new forage in cocoa area (inter-planted). SOF Matto is gradually replacing his EG with new grasses. Other SOFs all have upland forage banks

Four out of 5 BBFs are now using some Gliricidia but only a small amount. SOF Matto feeds Gliricidia regularly and all other SOFs present indicated they also use some Gliricidia. Asked why they only use a small amount, BBFs and SOFs indicated due to lack of supply. All say they mix Gliricidia with grasses to feed mainly in dry season. Only 1 (Haysim) out of the 5 BBFs is now using rice straw because all say they have enough new forages. SOF Matto says he didn't use feed rice straw before but now does so in wet season to encourage cattle to drink more.

In terms of animal feeding management, over 90% of all farmers in sub-village now have a backyard kandang and are feeding C/C to cattle there. All BBFs except Haysim are now weaning at <8 months – Haysim still relies on natural weaning at around 12 months. BBFs say main benefit is better cow condition. Calves lose some weight for a few days then go ahead again. Only one SOF (Matto) says he weans at 7-8 months and sells straight away to traders so doesn't have to feed them. He gets RP 3 million. No farmers doing specific preferential feeding of weaned calves. Most BBFs still have kandang fattening system for bulls and so give them much more feed than their cows. The exception is Yunis, who says he feeds cows more because they have a bigger stomach! BBFs seem to do similar controlled mating to Laburasseng farmers – i.e. take cow to any available bull when in oestrus. SOF Matto has his own bull for control mating and currently has 8 cows and wants 10.

Most BBFs and SOFs still do combined breeding and fattening as before, selling as money is needed or at around 3 YO for males. SOF Matto used to fatten only but has switched to breeding and selling weaners direct to traders at 8 months old for RP 3 million each, because he says this is more profitable and easier to do than fattening. Matto says he now only grows enough rice to feed his family and invests his time and resources in cattle production. Farmers say that, in general, price for 3 yo male was RP 5 million and now RP 8 million, but change due to market - not due to improved cattle condition. They indicated that cattle condition had not improved significantly. They also said trader interest is the same as before – no change

BBFs say no real change in household income so no impacts on livelihoods.

In terms of village scale social impacts farmers say that having new forage banks close to household has enabled farmers to help each other with c/c and feeding when a farmer is sick or has to go away and also enabled other family members to participate in forages collection and feeding. Before only the farmers could do this as forages were too far away. Farmers also said there was now less conflict over scarce grazing and native forage resource around village. Farmers have not noticed any changes in government policy in response to project outcomes, though village head now uses mosque to tell people to grow new forages.

We did not ask farmers what is different about project compared to others or what their future plans were apart from wanting to carry more cattle.

Table A.6.6. Changes in farming and cattle management systems as a result of project activities (outcomes), and subsequent impacts for Laburasseng and Tappale (Bone).

Activity	Laburasseng (5 BBFs, 3 SOFs)				Tappale (5 BBFs, 5 SOFs)			
	Best bets		Scaleout		Best bets		Scaleout	
	Before	After	Before	After	Before	After	Before	After
FORAGE USE								
Native grass	much	small	much	small	much	some	much	some
Rice straw	most some DS	none	most some DS	some unsure	All 5 some DS	1 some in DS	some	some
Fresh maize straw	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Peanut residue	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Elephant grass	some	more	some	more	some	more	some	more
Tree legumes	none	all (small)	none	some (small)	none	80% some DS	none	Most some DS
New grasses	n/a	much	n/a	some	n/a	All some	none	all some
Main feeding system	GR, CD	CD, CC kandang	GR, CD	CD, CC kandang	GR, some CD	CC, CD kandang	GR, some CD	CC,CD kandang
FARMING SYSTEM								
Replacing crop areas with forages	n/a	2 BBFs 0.3 & 0.8ha	n/a	Some 1 SOF 0.1ha	n/a	1 BBF 0.1ha	n/a	no
Replacing elephant grass with new grasses	n/a	No	n/a	no	n/a	1 BBF	n/a	1 SOF
Location of new forages	n/a	upland	n/a	upland	n/a	upland	n/a	upland
EG Cutting management	As needed	25 days 1m	As needed	25 days 1m	As needed	30 days 1m	As needed	30 days 1m
New forage cutting	n/a	15 days	n/a	15 days	n/a	15 days	n/a	15 days
Fertiliser use on EG (mainly urea)	none	after each cut	none	after each cut	none	after each cut	none	after each cut
Fertiliser (urea) use on new forage	none	after each cut	none	after each cut	none	after each cut	none	after each cut
Tree legume planting	none	most	none	none	none	unclear	none	unclear
Understanding of forage quality	poor	better	poor	better	poor	good	poor	improving
LABOUR								

Time for forage collection	5-6 hrs/day	0.5-1 hr /day	5-6 hrs/day	0.5-1 hr /day	1-2 hr /day#	0.5-1 hr/day	1-2 hr /day#	0.5-1 hr/day
Main use of spare time CW, OFW, OW	n/a	CW, OFW, OW	n/a	CW, OFW, OW	n/a	n/a as little saved	n/a	n/a as little saved
Participants (M-man only, B-both man& wife, A-all	M	A	M	A	n/a	n/a as little saved	n/a	n/a as little saved
CATTLE SYSTEM /MANAGEMENT								
Cattle Operation	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening	Breeding fattening
Kandang use	n/a	n/a	n/a	n/a	some	all	some	most
Early weaning	none	All (6-8m)	none	unclear	none	80% <8m	none	1 of 5 7-8m
Preferential feeding	none	all	none	unclear	none	most	none	unclear
Mating	free	Control [1] 1 BBF full	free	unclear	free	All Control[1]	free	Most control [1] 1 own bull
Cattle numbers	?	?	?	?	?	?	?	?
Cattle sales	n/a	increase	n/a	increase	?	?	?	?
Selling system	As need	As need but shift	As need	As need	As need	As need	As need	As need. 1 regular, 8m
Selling age	3-4yo	2yo[2]	3-4 yo	unclear	3 yo	3yo	3yo	Most 3yo 1 at 8m
Better prices	n/a	no	n/a	no	n/a	increase	n/a	increase
Reason for better price	n/a	n/a	n/a	n/a	n/a	MP	n/a	MP
Trader interest change	n/a	some increase	n/a	some increase	n/a	same	n/a	same
IMPACTS								
Labour use impacts	n/a	BY, MI, FT	n/a	BY, MI, FT	n/a	n/a as little saved	n/a	n/a as little saved
Income change	n/a	Unclear [3]	n/a	unclear ****	n/a	Unclear [5]	n/a	Unclear[5]
Main source of income change	n/a	Unclear [3]	n/a	Unclear [3]	n/a	Unclear [5]	n/a	uUnclear[5]
Main uses of income	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Communication	n/a	better	n/a	better	n/a	better	n/a	better

Cooperation	n/a	better	n/a	better	n/a	better	n/a	better
Sharing of resources	n/a	better	n/a	better	n/a	better	n/a	better
Farmer pride, friendly competition	n/a	some	n/a	some	n/a	?	n/a	?
Farmer animal group formed	none	formed	none	formed	none	formed	none	formed
Govt policy responses	n/a	Desa level	n/a	Desa level	n/a	Same	n/a	same
PPL/K visits	?	?	?	?	none	formed	none	formed

CW-cropping work (weeding etc.); R-rest; OFW-Off-farm work (e.g. construction); other on-farm e.g. BM-brick making OW= other work;

AC-animal condition, MP-market prices; BY= better yield, MI = more income,, FT= more family time

[1] Partial control mating system – farmers recognise oestrus and take to any available bull in village – usually bull kept in kandang or backyard. Some farmers simply tether their cow close to rice fields in dry season when free grazing of stubble occurs i.e. tether and hope system.

[2]Farmers were moving toward selling younger at 1-2 years (because of better cost-benefit) but only just starting – so assume now selling around 2YO

[3] Farmers felt they weren't getting higher prices for their cattle because traders were paying them on age regardless of condition and pocketing the profits from better carcass weight. Therefore they were uncertain as to whether their household income had increased directly through cattle or indirectly through better crop yields and additional income via off-farm work resulting from use of labour/time saved on forage gathering and feeding.

[4] Farmers' initially said one or <1hr because mostly tether grazed but Rachmat clarified by adding up time for shifting cattle for grazing. Farmers agreed with this estimate.

[5]Farmers say little change to household incomes but if cattle prices and sales increased hard to believe

11.7 Appendix 7

Sulawesi Project Steering Committee
Summary of meeting notes November 2007 to October 2009

The role of the Project Steering Committee (PSC) was agreed in November 2007 as to provide overall guidance and advice on the direction and relevance of the project. The PSC Terms of Reference were:

- To ensure that the project is meeting its goals
- To assist with communication to external agencies and networks
- To participate in project reviews, workshops and events when possible
- To provide advice to the project teams on changes, priorities, policies and opportunities in relevant Indonesian agencies and institutes
- To assist the project teams to integrate project activities and outputs to new regions or agencies

A summary of the main discussion points for each PSC meeting follows.

Meeting 1 – 12 November 2007

No major discussion points

Meeting 2 – 28 July 2008 (UNHAS, Makassar)

- According to the PSC, **forage**, **early weaning and mating** and **knowledge and training** are the areas that the project can create most impact and that will be most beneficial to livestock production in the province.
- PSC propose to **meet every 3 months** to keep up to date with project work, identify areas of mutual interest and to share information. Also proposed that meetings be held in the study kabupaten as well as Makassar.
- There is a need for **strong collaboration** between OGTs and PPLs. PSC urged that PPLs in each regency become involved in project activities.

Meeting 3 – 24 October 2008 (Bappeda Bone, Watampone)

- There was much discussion about **farmer groups**, including: overcoming personality is an issue; grass roots group formation might be more effective than top down (government appointed) formation; important to ask farmers what the constraints are, then try to address them.
- Also discussion over what could be the **measurements of success** for the project. Responses included: benefit to society; reaching expected adoption rate; expansion to other sub-districts; move towards sustainability; change in attitude; enhanced skills and farmer participation.

- There was an **issue with communication** about the project, with calls for enhanced communication and socialisation, especially within Dinas and Bappeda at kabupaten level.

Meeting 4 – 27 May 2009 (Bappeda Propinsi, Makassar)

- PSC urged **expansion of project activities** to include neighbouring kecamatan and kabupaten – possible joint activities were discussed (eg farmer visits, co-funded PPL training)
- PSC enthusiastic for **increased training of PPLs** and extension staff. A model was discussed to use the PST and OGTs to train and mentor PPLs.
- Many PSC suggested that the time to adoption and impact was too long; there was discussion that adoption of new technology was not linear and that a slower rate might be better for sustainability.
- Dinas' 7-8 **forage centres** across the province were offered as a possible source of forage material and training in the future.
- The formation of a **working group in each kabupaten** was suggested to encourage a district approach and bring together relevant agencies and groups. The working group would comprise Bappeda, Dinas, project team, OGTs and farmers.

Meeting 5 – 9 October (Bappeda Propinsi, Makassar)

- PSC urged the project team to align project outcomes with Sulsel's **one million cattle initiative**, with Barru and Bone populations seen as central breeding stock for Sulawesi. Project activities in husbandry and forage development were seen as primary contributors and broader dissemination of project outputs.
- It was agreed that socialisation should be sought with relevant **Bupatis** to introduce project components, success and potential benefits. Team should comprise Dinas, Bappeda and project team.
- The development of a **pilot breeding centre** in Gowa was discussed, to be supported by the central government. It could also be used as a teaching facility for farmers, further development of project technologies and maintenance of institutional and community networks.

11.8 Appendix 8

Summary report of PPL training for ACIAR project SMAR-2006-061 (Bahar)

Timing

Bone (Kecamatan Libureng)	29-30 June 2009
Gowa (Kecamatan Bajeng)	11-12 November 2009
Barru (Kecamatan Barru)	14-15 November 2009

Subject matter

Practical aspects of forage and cattle management associated with Best Bet activities e.g. forage propagation, establishment, management, seed collection and use, cattle nutritional requirements, matching feed supply and quality to farmer's requirements, weaning and preferential feeding issues.

It was envisaged this PPL training would be less detailed and more basic than training given to OGTs, which initially focused on general project principles, best bet strategies and forage establishment and management with subsequent training in cattle nutrition, feed budgeting etc.

Aim

By providing this PPL training program we would expect that participating PPLs will gain:

- A good basic understanding of the aims of the project and associated strategies, including the farming systems and best bet approach to identifying constraints and opportunities for improved small-holder cattle production
- A good basic practical grounding in cattle nutritional needs and options to improve forage supply and quality, including better management and use of existing forages, new forage options and better cattle feeding practices
- A good appreciation of the benefits of the step by step, participatory-adaptive (working and learning together) approach used with farmers in this project.

Content and delivery

1. Classroom component

Better use of existing forage	Syamsu (with Rachmat)
Introduction (use) of new forage	Syamsu (with Rachmat)
Seasonal mating at best times	Rachmat (with Asmuddin)
Early weaning and preferential feeding	Asmuddin (with Syamsu)
Feed budgeting and planning	Syamsu (with Rachmat)

2. Field component

Visit to BB farmer field for practical demonstrations. Local OGTs involved in demonstration of forage biomass and quality assessment.

3. Review and feedback session.

Rachmat, Syamsu and Asmuddin to assess what PPLs have learned and gather feedback, especially in aspects of feed diet quality and forage budgeting.

Participation

Bone training participants

Peserta/ Participants	Jumlah (number)
PPL Kecamatan Libureng (PPLs of Libureng)	16
Tim OGT Bone (Bone OGT team)	4
Kepala BPP Kecamatan Libureng (Head of Libureng BPP)	1
Camat Libureng (District head of Libureng)	1
Danramil Kecamatan Libureng (District military officer Libureng)	1
Kepala Desa Ceppaga (tuan rumah) (Village Head Ceppaga (host))	1
Jumlah (Total)	24

Gowa training participants

Peserta/ Participants	Jumlah (number)
PPL dan PPK Kabupaten Gowa (Gowa PPLs and PPKs)	29
Tim OGT Gowa (Gowa OGT team)	4
Kepala Dinas Peternakan (Head of Dinas)	1
Camat Bajeng (District head of Bajeng)	1
Jumlah (Total)	35

Barru training participants

Peserta/ Participants	Jumlah (number)
PPL Kecamatan Barru dan Kecamatan Tanete Riaja (PPLs from Barru and Tanete Riaja districts)	24
Tim OGT Barru (OGT team Barru)	5
Kepala Dinas Peternakan (Head of Animal Husbandry)	1
Kepala Badan Ketahanan Pangan (Head of Food Security)	1
Kepala BPP Kecamatan Barru (Head of BPP)	1
Kepala Desa Tompo (tuan rumah) (Village Head Tompo (host))	1
Jumlah (Total)	33

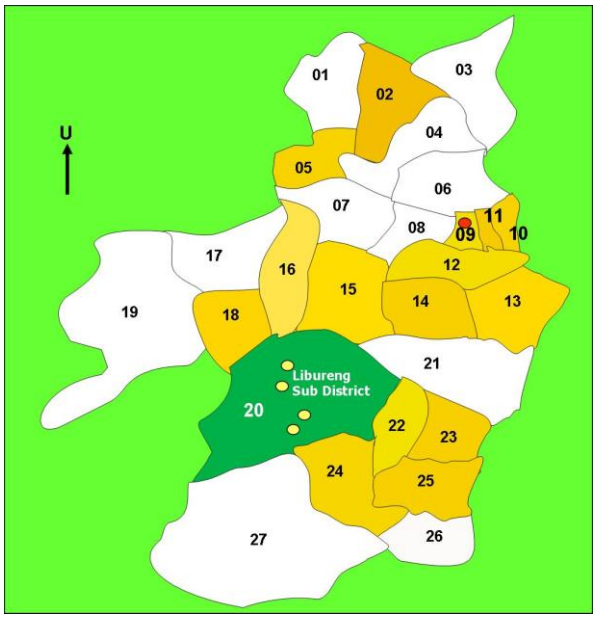
Forage nurseries established in Kecamatan Libureng after PPL training

Village	PPL	Source of forage material	Nursery size
Poleonro	Suriani	Tappale	10m x 10m
Tana Batue	Suriani	Mattirowalie	10m x 10m
Binuang	Rusdi	Mattirowalie	500 sq m
Mario	A. Sumantri	Tappale	10m x 10m
Ponre-Ponre	Haslinda	Mattirowalie	10m x 10m
Tompo Bulu	Suamir	Mattirowalie	20m x 20m
Wanua Waru	Unknown	Mattirowalie	20m x 20m
Masago	A. Elya	Laburasseng	1500 sq m
Cenrana	Kamaruddin	Mattirowalie	1500 sq m
Palakka	Mukhtar	Mattirowalie	10m x 10m

11.9 Appendix 9

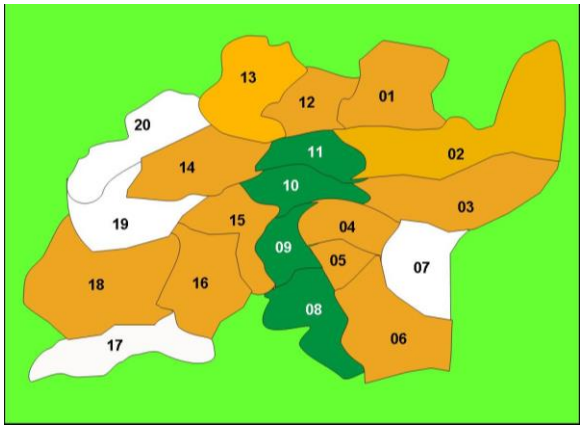
Incidence of scale out to neighbouring villages and sub-districts

1. Scale out in Kabupaten Bone



Scale out village map of Kabupaten Bone

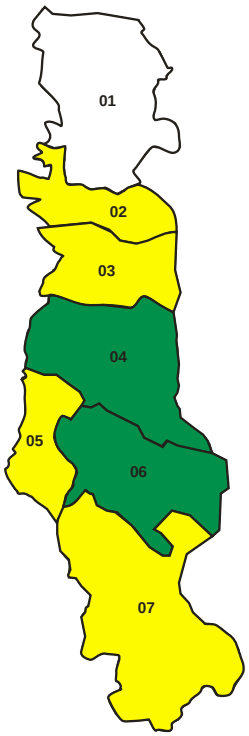
01 Ajangalle
02 Dua Boccoe (scale out)
03 Cenrana
04 Tellu Siatinge
05 Amali (scale out)
06 Awangpone
07 Ulaweng
08 Palakka
09 T. Riattang Barat (scale out)
10 T. Riattang Timur (scale out)
11 T. Riattang (scale out)
12 Barebbo (scale out)
13 Sibulue (scale out)
14 Cina (scale out)
15 Ponre (scale out)
16 Bengo (scale out)
17 Lamuru
18 Lappariaja (scale out)
19 Tellulimpoe
20 Libureng (061 study site)
21 Mare
22 Patimpeng (scale out)
23 Tonra (scale out)
24 Kahu (scale out)
25 Salomekko (scale out)
26 Kajuara
27 Bontocani



Scale out Kecamatan map of Kabupaten Bone

01 Mallinrung (scale out)
02 Mattirobulu (scale out)
03 Ceppaga (scale out)
04 Wanuaru (scale out)
05 Pitungpidange (scale out)
06 Polewali (scale out)
07 Suwa
08 Tappale (061 site)
09 Laburasseng (061 site)
10 Mattirowalie (061 site)
11 Bune (061 site)
12 Mattirodeceng (scale out)
13 Binuang (scale out)
14 Swadaya (scale out)
15 Mario (scale out)
16 Ponre-Ponre (scale out)
17 Baringeng
18 Tompobulu (scale out)
19 Poleonro
20 Tanabatue

2. Scale out in Kabupaten Barru



Scale out Kecamatan map of Kabupaten Barru

1 Mallusetasi

2 Soppeng Riaja (scale out)

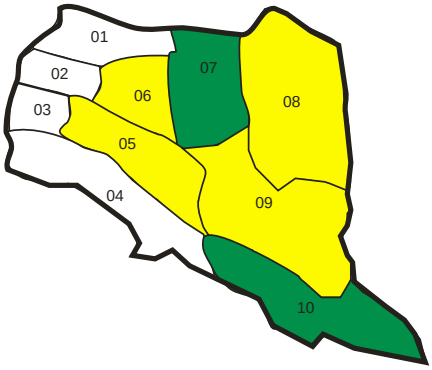
3 Balusu (scale out)

4 Barru (061 study site)

5 Tanete Rilau (scale out)

6 Tanete Riaja (061 study site)

7 Pujananting (scale out)



Scale out village map of Kecamatan Barru

1 Siawung

2 Mangempang

3 Sumpang Minangae

4 Coppo

5 Tuwung (scale out)

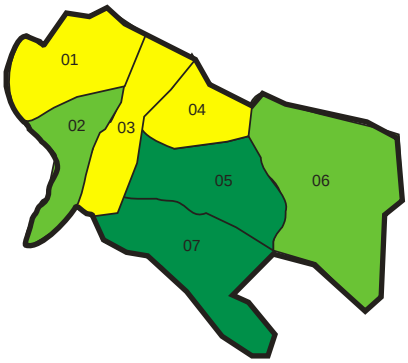
6 Sepee (scale out)

7 Tompo (061 site study)

8 Galung (scale out)

9 Palakka (scale out)

10 Anabanua (061 site study)



Scale out village map of Kecamatan Tanete Riaja

1 Lempang (scale out)

2 Lompo Tengah (005 site study)

3 Kading (scale out)

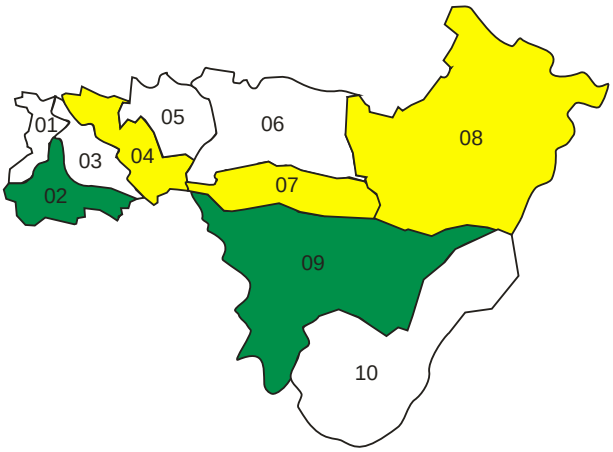
4 Libureng (scale out)

5 Lompo Riaja (061 site study)

6 Harapan (005 site study)

7 Mattirowalie (061 site study)

3. Scale out in Kabupaten Gowa



Scale out Kecamatan map of Kabupaten Gowa

1 Barombong

2 Bajeng (061 site)

3 Pallangga

4 Bontomarannu (scale out)

5 Patalassang

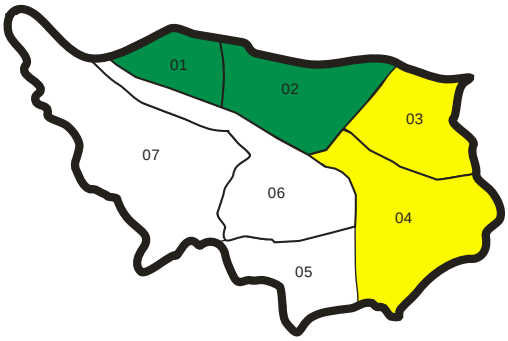
6 Parangloe

7 Manuju (scale out)

8 Tinggimoncong (scale out)

9 Bungaya (061 site)

10 Tompobulu



Scale out village map of Kecamatan Bungaya

1 Mangempang (061 study site)

2 Bontomanai (061 study site)

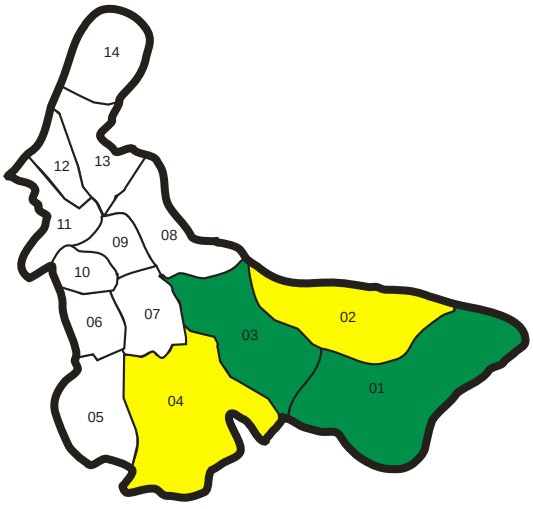
3 Jenebatu (scale out)

4 Sapaya (scale out)

5 Rannaice

6 Buakana

7 Bisolloro



Scale out village map of Kecamatan Bajeng

1 Pabbentengang (061 site study)

2 Paraikatte (scaleout)

3 Maccinibaji (061 site study)

4 Panyankalang

5 Tangkebajeng

6 Tubajeng

7 Kalebajeng

8 Merdekaya

9 Matallo

10 Limbung

11 Bone

12 Leppangen

13 Bontosunggu

14 Panciro

11.10Appendix 10

Summary of farmer assessment of project in comparison to previous projects in which they have been involved, and future intentions for project practices.

Farmer assessment of project	Future intentions
BARRU – Tompo Already many benefits from cattle; project was flexible for meeting with farmers; good system because the project did not give then take away; good having OGT in the village	Most plan to continue expanding forage areas with both elephant grass and new grasses. Some wish to expand cattle numbers as well. Farmer group, especially women's group, actively promoting the technology
BARRU – Mattirowale Previous projects just give seed and fertiliser then go, whereas this project stayed with OGT giving on-going assistance, had good communication and gave the farmers what they needed. This had a bigger impact because the govt projects depend on money, whereas this project focussed on skills and capacity building.	Kepala desa is now a scaleout farmer and is actively promoting the new forages and better forage and animal management in the village.
BARRU – Anabanua Project has been very good because it has been long term with regular assistance. Previous projects have simply given seed and gone. Both the PPL and OGT have been good, but PPL has whole village whereas OGT focussed on forage and cattle in 1 sub-village	Planting more new grasses and tree legume; buying more cattle; many farmers already clearing land in readiness for planting grasses
BARRU – Lompo Riaja Other projects just provide seed, farmers had to pay for it, then got a low price when they sold back, in this project didn't have to pay; project system no different; OGT more visits than PPL	Some farmers intending to expand forage areas and cattle numbers; Tajuddin says they can continue and teach other farmers what they learnt.
GOWA – Pabbentengang & Maccini Baji This project better because it stayed to provide on-going assistance, and the OGTs were more available than PPLs.	The farmers are expanding their forage areas and planting Gliricidia; they want to start a farmer group with a business orientation
GOWA – Bontomanai Farmers felt this project provided on-going and targeted assistance and support compared to other projects which simply provided seed etc. and left.	BBFs and SOFs confident to continue and expand the new forage and cattle management practices post OGTs. Only 10% of farmers in best bet sub-vilage had planted new forages and a lot less in other sub-villages – mainly to due limited access to planting material. However all confident this will improve rapidly and that BBFs and current SOFs could teach other farmers and supply them with new forages oOGT departs.
GOWA – Mangempang Farmers and village officials felt this project provided on-going and targeted assistance and support compared to other projects which simply provided	Farmers confident they would be able to continue and expand new forage and cattle management practices after OGTs depart. About 50% of farmers in

seed etc and left.	the “best bet” sub-village had already planted new forages while 10-30% had done so in other sub-villages (total ~ 200) .
BONE - Matirowalie This project different because it provided the means (forage) and practical knowledge about forage and cattle management to enable them to increase income rapidly – compared to previous projects on peanuts and cocoa. This project all about increasing knowledge. OGT system worked well and increased access to information.	All BBFs and SOFs plan to continue forage and cattle management options and expand new forage banks. They also have confidence they can teach other farmers. Almost 100% of farmers in best bet sub-vilage now growing new forages and farmer group now formed.
BONE - Bune Cant compare because little previous project experience	Farmers plan to expand forage banks, continue forage and cattle management practices and expand cattle activities but still maintain crop/livestock balance
BONE - Luburasseng This project targeted farmers, not communities and delivered more specific practical, focussed information on forages and cattle – enabling early impact. BBF Junaidi said knowledge received allowed him to increase cattle numbers from 5 to 9 over the 2 years. Kepala Dusun (also an SOF) said project focussed on a single theme – forages and cattle management – which was easy for farmers to understand and see potential.	All BBFs and SOFs plan to continue and expand new forage grasses and forage / cattle management options. Around 90% of farmers in best bet sub-village planted new forages and many have established backyard kandangs BBF and SOFs now formed farmer group (with OGT help) - focused on cattle production. BBF
BONE - Tappale No specific response recorded	No specific response recorded

11.11Appendix 11

OGT and PST feedback on changes to farmer capacity, farming systems and social systems in the study communities as a result of participating in the project

Table A.11.1. Project Specialist Team perceptions of significant changes to farmers as a result of participation in the project (summary of responses from Lombok and Sulawesi PST in May 2010)

Significant changes to farmer knowledge & skills	Significant changes to farming system	Significant changes to individual or community
Technical skills Planting and using forages Animal nutrition Early weaning Forage conservation for dry season Breeding management Organic fertiliser production Feed budgeting Animal health	**Productivity outcomes** Reduced calving interval Reduced calf mortality Increased cow condition Increased income Increased growth rate of young animals Increased cattle numbers (more feed) results in increased cash flow Increased birth weight Amount & quality of year-round forage increased Greater diversity of forage	**Individual changes** Increased confidence and pride Better interactions with other farmers Increased communication Increased status in community Attitude toward technology packet changed
Understanding causal links Quality bull → quality calves Preferential feeding pregnant cows → improved birth weight Early weaning reduces calving interval Controlled mating does not have negative effect on calves Early weaning → calf growth Crop residues help address feed shortage	**Land use & labour** More efficient use of spare land Non farm work decreased because better income from farming Change in crop-livestock balance Time and labour efficiency Increased land devoted to forage Decreased labour required for cattle management	**Community changes** Sharing information & resources Increased communication Increased collaboration
	Changed practices Increased bull mating ratio Kandang sanitation – inside and outside Use of compost as fertiliser Tree legumes valued as feed source	

Table A.11.2. On Ground Team perceptions of significant changes to farmers as a result of participation in the project (summary of responses from Lombok and Sulawesi OGTs in May and June 2010)

	Significant changes to farmer knowledge & skills	Significant changes to farming system	Significant changes to individual or community
Combined#	Enhanced technical skills: • feed budgeting, management, transport, preferential feeding • cattle management and breeding	Vacant land now actively planted with forages Chemical fertiliser being replaced by organic fertiliser Farmer income increased Change in feed management Change in animal management Orientation of farmers changed from cattle holding to breeding Greater efficiency of time and labour Change from extensive to intensive management	More collaborative attitude Greater involvement of wife and children More self awareness Greater communication Farmers more business oriented Greater time efficiency More time to find side business
Bone*	Better farm management skills	Improvements in forage, animal condition and labour saving	Better cooperation in village Increased income used to purchase motor bikes, renovate houses and buy more cattle
Barru*	Better knowledge of forage quality	Importance of forages greatly increased Labour saving from 4 to 1 hour per day Some farmers replacing upland rice with forage	Better security in village Increased cooperation
Gowa*	Better knowledge of forage quality	Growing new forages and elephant grass in upland Reduction in labour from 7 to 3 hours per day	Better cooperation between farmers

Feedback from Sulawesi and Lombok OGTs at final Project Meeting in Bali in May 2010 (Williams, van Wensveen)

* Additional information collected from OGT groups during final field visit in June 2010 (McDonald, Corfield)

11.12Appendix 12

Responses from farmers on social impacts of the project, June 2010

Regency/ Village	Key social impacts
Barru	
Tompo	Better relationship between all farmers in the village Made new friends in government; even the police officer is promoting forage Farmers now help other farmers who are ill or away as forage is easier to collect
Mattirowalie	Few changes socially as village already had much elephant grass and were already sharing resources
Anabanua	Social interactions improved with farmers exchanging forage material (not just family members) Farmer group active, with healthy competition between farmers Less conflict and less theft due to proximity of forage to houses
Lompo Riaja	Better relationship between BB and other farmers in the village Better relationship with farmers in other villages, with sharing of forages
Gowa	
Pabbentenang	Good communication between BB farmers within the village More tolerance to sharing of forages (before the project, everyone guarded their forage area) BB farmers readily sharing their forages with scale out farmers
Maccini Baji	
Mengampang	Improved farmer to farmer communication and cooperation as a result of sharing new forage resources and knowledge Farmers able to assist one another with forage collection Increased HH wealth has resulted in increased contributions to maintenance of the mosque
Bontomanai	Improved farmer to farmer cooperation and communication Farmers able to assist one another with forage collection
Bone	
Mattirowalie	Better communication and cooperation across the village Easier to help farmers who are sick or away Women more able to help with forage gathering and feeding Women also able to keep own cattle
Bune	Better communication and cooperation across the village Easier to help farmers who are sick or away More time for family activities More spread of forage/cattle workload between family members
Laburasseng	More farmer to farmer cooperation Less competition for forages Friendly competition on cattle and forage production

	Ability to help other farmers with forage collection More time to spend on family activities
Tappale	New forage banks close to home has enabled farmers to help each other with feeding Other family members able to collect and feed forage Less conflict over grazing resources