



Australian Government

Australian Centre for
International Agricultural Research

Final report

Project full title

Improving adoption and scaling of proven beef production technologies in Nusa Tenggara Barat and Kalimantan Selatan

project ID GMCP/2020/149

date published 10/01/2023

prepared by Professor Heather Burrow

*co-authors/
contributors* Professor Dahlanuddin, Dr Tanda Panjaitan, Dr Nurul Hilmiati, Dr Erika Valerio, Professor Rene Villano, Dr Isaac Koomson, Dr Moh Taquuddin, Dr Stella Thei, Professor Luthfi Fatah and Dr Ika Sumantri

approved by Dr Peter Horne

*final report
number* FR2022-044

ISBN 978-1-922787-70-5

published by ACIAR
GPO Box 1571
Canberra ACT 2601
Australia

This publication is published by ACIAR ABN 34 864 955 427. Care is taken to ensure the accuracy of the information contained in this publication. However, ACIAR cannot accept responsibility for the accuracy or completeness of the information or opinions contained in the publication. You should make your own enquiries before making decisions concerning your interests.

© Australian Centre for International Agricultural Research (ACIAR) 2022 - This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without prior written permission from ACIAR, GPO Box 1571, Canberra ACT 2601, Australia, aciarc@aciarc.gov.au.

Contents

1	Acknowledgments	3
2	Executive summary	4
3	Background.....	5
4	Objectives	6
5	Methodology	7
5.1	Objective 1	7
5.2	Objective 2	7
5.3	Objective 3	8
5.4	Objective 4	8
5.5	Objective 5	8
6	Achievements against activities and outputs/milestones	9
7	Key results and discussion	14
7.1	Objective 1	14
7.2	Objective 2	36
7.3	Objective 3	41
7.4	Objective 4	47
7.5	Objective 5	55
8	Impacts	62
8.1	Scientific impacts – now and in 5 years	62
8.2	Capacity impacts – now and in 5 years	62
8.3	Community impacts – now and in 5 years	63
8.4	Communication and dissemination activities	63
9	Conclusions	64
10	References	65
10.1	References cited in report.....	65
10.2	List of publications produced by project.....	65
11	Appendixes	68
11.1	Appendix 1: Progress of scaling site groups.....	68
11.2	Appendix 2: Analysis of the nodes by district	98

1 Acknowledgments

In Indonesia, sincere thanks are due to the collaborating research partners in both the previous CropCow project and this SRA, including: Indonesian Centre for Animal Research and Development (ICARD); the Beef Cattle Research Institute, Grati (BCRI-Grati); the University of Mataram (UNRAM); Lambung Mangkurat University (ULM); Balai Pengkajian Teknologi Pertanian /Assessment Institute for Agricultural Technology, Nusa Tenggara Barat (BPTP NTB); and Balai Pengkajian Teknologi Pertanian/Assessment Institute for Agricultural Technology, Kalimantan Selatan (BPTP KalSel). Additional thanks are due to the public and private scaling institutions, traders and market chain participants and the many collaborating smallholder farmers and their community groups and organisations who contributed so positively and strongly to the project's activities.

In Australia, the University of New England provided generous in-kind support of the project and their staff contributing to the project.

The authors gratefully acknowledge the very significant efforts of many project researchers and technical staff located in both Indonesia and Australia who were responsible for field and laboratory data collection and collation and analysis of project data.

2 Executive summary

The *IndoBeef* program was terminated prematurely due to funding issues and a final *CropCow* report was submitted to ACIAR/DFAT in January 2021. This SRA picked up where *CropCow* left off, with this report outlining progress in three broad areas: 1) adoption and scaling research in Nusa Tenggara Barat (NTB) and adaptation of the Integrated Village Management System (IVMS) developed in NTB for use in Kalimantan Selatan (KalSel); 2) identification of value-chain partners, particularly processors, wholesalers and retailers interested in forming a new high-quality value chain to supply high-end tourist hotels and retailers in NTB based on cattle finished for market by smallholder farmers; and 3) socioeconomic analyses that supports the two previous areas. Key achievements over the term of this SRA include:

- Adoption and scaling research in NTB: baseline survey data from NTB were analysed to identify the key drivers for adoption by farmers. This included non-viability of traditional methods, availability of incentives, local farmer champions while access to inputs (machinery, land and water, financial credit and technical assistance) were the most important promoters of adoption. An exit survey was conducted, with results to be analysed over coming months. Components of the IVMS that were widely adopted included cattle fattening based on *Leucaena* in the dryland; planting *Leucaena* cultivar *tarramba*; increased farmer access to bank loans; and capacity building of field researchers, trainers, Dinas staff and the farmers themselves.
- Adaptation of the IVMS system for KalSel: monitoring and analyses of nodes and a scaling site all focused on breeding herd productivity and using components of the IVMS continued in KalSel, with the scaling out models extended to other locations. A livestock market was also imitated in Pulau Sari. Economic modelling confirmed the benefits from the integration of crop (including oil palm) and cattle enterprises.
- Development of new beef value chain supplied by smallholder farmers: despite very active engagement with a wide range of government and private sector agencies including a meat processor, large retailer, hide processor, palm kernel cake supplier and a bank, it was not possible to identify partners willing to invest in the development of a new beef value chain in NTB. However research and engagement is continuing with the aim of providing additional information that would support potential investors in their decision-making.
- Socioeconomics and gender: analyses of household survey data and focus group discussion data derived from surveys focused on farmers' responses to the Covid-19 pandemic were undertaken and reports and scientific publications have been prepared and submitted for publication in international journals.

Despite major disruptions to the original *CropCow* project and this SRA through the Covid-19 pandemic, the project completed all of its contractual milestones except for securing investors in a new high-quality beef value chain and undertaking a workshop with those potential investors in Brisbane to enable them to learn from the Meat Standards Australia meat grading scheme.

3 Background

CropCow, an ACIAR project funded by DFAT, made good early progress assessing the drivers and impediments to on-farm practice change and wider adoption of proven approaches to improving smallholder cattle production systems¹. Funding cuts were, however, imposed in late 2019 resulting in a rapid reduction of activities and full early closure of *CropCow* on 31st December 2020.

In picking up where *CropCow* left off, the broad aims of this SRA were three-fold. Firstly, it continued the promising assessment of alternative approaches to adoption and scaling in Nusa Tenggara Barat (NTB) and tested whether the entire system or individual components of the Integrated Village Management System (IVMS) could be adapted to increase both adoption and scaling. Secondly, it undertook research to determine whether components of the IVMS could be effectively adapted to completely different but emerging smallholder cattle sectors in Kalimantan Selatan (KalSel).

Finally, the project scoped options to develop a new beef value chain focused on suppliers, processors, wholesalers and consumers in NTB. Earlier research undertaken by Indonesian and New Zealand collaborators in NTB demonstrated that using the bull fattening strategies from IVMS, in conjunction with proven meat processing technologies, could significantly improve the tenderness and eating quality of beef from smallholder farmers, thereby creating a demand for higher quality beef from high-end hospitality, food service and retail outlets in Lombok (and likely elsewhere across Indonesia). Whilst there was strong interest in supplying such a market amongst smallholder farmers and at least one meat processor, additional value-chain partners (e.g. processors, wholesalers and retailers) would need to be engaged to supply the volumes of beef sought by the buyers. If those options were subsequently tested beyond the term of this SRA it would deliver proof of concept that smallholder farmers could supply and be rewarded for their beef products through an accredited meat grading scheme ('Standar Daging Sapi Indonesia') based on the proven technologies and innovations implemented by Australia's Meat Standards Australia (MSA) scheme.

These three core research activities were strongly supported by socioeconomic analyses using household and gender-specific data derived from the earlier *CropCow* project and new data as it accrued over the period of this SRA.

¹ See <https://www.indobeef.com/>

4 Objectives

This project had five objectives, namely to:

1. Identify and evaluate alternative approaches to adoption and scaling of proven on-farm animal production technologies and test whether the entire IVMS or individual components of the system can be adapted to increase adoption and scaling;
2. Adapt components of the proven IVMS as required to ensure suitability of the system to the needs of smallholder farmers in KalSel and establish a scaling site linked to the scaling research in NTB to improve adoption and scaling in KalSel;
3. Scope the possibility of developing a new beef value chain focused on smallholder farmers who use components of the IVMS together with commercial meat processors and wholesalers to deliver quality-assured beef that meets the specifications of high-end consumers in NTB;
4. Assess the social and economic context underpinning decision-making processes of smallholder farmers and the socioeconomic impact of the proposed on-farm and value chain interventions; and
5. Examine the roles of gender and the extent of women's engagement in smallholder farmer livestock production and marketing.

5 Methodology

5.1 Objective 1

The methodology used to achieve Objective 1 included transcribing field officers' handwritten notes and digital audio recordings derived from weekly and monthly records from the CropCow project, together with new data derived from this SRA, and progressively analysing the transcribed data using qualitative data analysis methods to identify guidelines for designing successful and durable scaling institutions and approaches. Thereafter a detailed report was prepared, outlining the results of the analyses and recommendations and guidelines for designing successful and durable scaling institutions and approaches. Following completion of the project, these results will be published in a peer reviewed international journal.

Additionally, this objective specifically identified and targeted institutional development and technological and scaling interventions that contributed to women's economic empowerment, with a report prepared outlining progress with institutional development and scaling interventions, particularly as they contributed to women's economic empowerment.

The institutional capacity building that commenced in the CropCow project was extended to demonstrate what is needed to maintain durable scaling institutions, specifically relating to institutional development and scaling interventions focused on women's economic empowerment. A report describing the institutional capacity building that has occurred over the CropCow project and this SRA was prepared, with recommendations on the institutional capacity building needed to maintain durable scaling institutions.

The technical capacity of project team members, scaling institutions and farmers was built to enable them to undertake technological and practice change through training in animal and forage crop production technologies as well as the range of methods and approaches required to achieve adoption and scaling.

5.2 Objective 2

Methodology used to address Objective 2 included:

- Analysing and summarising existing data from the on-farm introduction, testing and evaluation of local and introduced forages and crop by-product resources for beef production in the CropCow project, and new data derived from this SRA, to recommend local and introduced forages and crop by-project resources for cut-and-carry beef production by smallholders in KalSel;
- Preparing a report recommending the best options for use of local and/or introduced forages and crop by-product resources to improve cut-and-carry beef production by smallholder farmers in KalSel;
- Developing recommendations on the potential to integrate cattle and crop production in three different agro-ecological zones in KalSel, leading to increased cattle turn-off and farmer profitability; and
- Establishing nodes and a scaling site in KalSel linked to the scaling research being undertaken in NTB in Objective 1.

5.3 Objective 3

Methodology used to address Objective 3 included:

- Analysing and summarising the findings and lessons from the ARISA beef value chains project in Sumbawa to help guide this objective;
- Engaging with a range of beef industry stakeholders in Indonesia and with MLA in Jakarta to identify potential value chain partners who would be interested in co-investing and contributing to a new beef value chain targeting high-end retailers and consumers, with the aim of securing additional funding at the end of this SRA to test the system and provide proof of concept of the system in NTB. This involved mapping the potential value chain sectors needed to deliver high quality beef in NTB and comparing that map with successful beef value chains elsewhere to determine the options that might exist in NTB/Indonesia;
- Organise a visit of value chain representatives and key Indonesian researchers to Brisbane to learn about the processes and standards applied to enable the eating quality of beef to be guaranteed through the MSA scheme and also visit beef producer(s), meat processor(s), wholesaler(s) and retailer(s) who supply MSA-accredited beef to understand how the scheme can be implemented at a practical level and to improve the capacity of the Indonesian value chain partners; and
- Develop recommendations on the next steps to development of a quality-assured voluntary meat grading scheme that could be implemented in NTB as a proof concept in Indonesia.

5.4 Objective 4

Methodology used to address Objective 4 included:

- Analysing and summarising farm household survey data from the CropCow project to identify the socioeconomic characteristics of smallholder farmer households in NTB and KalSel and their production capacity and motivation to increase productivity and/or their scale of production;
- Analysing farm household survey data from the CropCow project to identify the economic and livelihood benefits of integrating crop and cattle production amongst smallholder farming systems; and
- With industry stakeholders, analyse the potential for new beef value chains supplied by smallholder farmers in NTB to high-end markets in Indonesia, and develop a chain development plan that includes goals, benefits, challenges, activities and a time scale.

5.5 Objective 5

Methodology used to address Objective 5 included:

- Completion of Women's Empowerment in Livestock Index (WELI) survey data collection in at least 200 selected farmers and market chain participants in NTB and KalSel; and
- Analysing data from the CropCow Focus Group Discussions and new WELI data to investigate possible areas of inequity impacting on women farmers and market chain participants and provide recommendations on possible ways to overcome those inequities.

6 Achievements against activities and outputs/milestones

Objective 1: To identify and evaluate alternative approaches to adoption and scaling of proven on-farm animal production technologies in NTB and test whether the entire IVMC or individual components of the system can be adapted to increase adoption and scaling

no.	activity	outputs/milestones	completion date	comments
1.1 (PC, A)	Transcribe field officers' hand-written notes and digital audio recordings derived from weekly and monthly records from the CropCow project, together with new data derived from this SRA, and progressively analyse the transcribed data using qualitative data analysis methods to identify guidelines for designing successful and durable scaling institutions and approaches.	A detailed report from the analyses of thematic responses using NVIVO software, providing recommendations and guidelines for designing successful and durable scaling institutions and approaches, ultimately resulting in peer reviewed publication(s) in an international journal(s)	30/06/2022	Base-line and an end-line surveys were undertaken at the start of the project and immediately prior to the end of the project. Data from the base-line surveys have been analysed and a report prepared outlining the key factors impacting on adoption. Because the end-line surveys were completed just before the end of the project, data from those surveys will only be analysed from July 2022 following the completion of the project.
1.2 (PC, A)	Specifically identify and target institutional development and technological and scaling interventions that contribute to women's economic empowerment	A report outlining progress with institutional development and scaling interventions, particularly as they contribute to women's economic empowerment	30/06/2022	The project's adoption and scaling activities strongly emphasised the role and need for women's empowerment. However, the report that was prepared did not specifically differentiate institutional development and scaling interventions by gender.
1.3 (PC, A)	Extend the institutional capacity building that commenced in the CropCow project to demonstrate what is needed to maintain durable scaling institutions, specifically including those from 1.2	A report describing the institutional capacity building that has occurred over the CropCow project and this SRA, with recommendations on the institutional capacity building that is needed to maintain durable scaling institutions	30/06/2022	A report summarising the institutional capacity building that occurred in this project is presented in the Key Results section 6 of this report.
1.4 (PC, A)	Build the technical capacity of project team members, scaling institutions and farmers, stakeholders to undertake technological and practice change through training in animal and forage crop production technologies as well as the range of methods and approaches required to achieve adoption and scaling	A report describing changes in the technical capacity of stakeholders (project team members, scaling institutions and farmers) to undertake technological and practice change	30/06/2022	A report summarising the capacity building of stakeholders that occurred in this project is presented in the Key Results section 6 of this report.

PC = partner country, A = Australia

Objective 2: To adapt components of the proven IVMS as required to ensure suitability of the system to the needs of smallholder farmers in KalSel and establish nodes and a scaling site linked to the scaling research in NTB to improve adoption and scaling in KalSel

no.	activity	outputs/milestones	completion date	comments
2.1 (PC, A)	Analyse/summarise existing data from the on-farm introduction, testing and evaluation of local and introduced forages and crop by-product resources for beef production in the CropCow project, and new data derived from this SRA to recommend local and introduced forages and crop by-product resources for cut-and-carry beef production by smallholders in KalSel	A report recommending the best options for use of local and/or introduced forages and crop by-product resources to improve cut-and-carry beef production by smallholder farmers in KalSel	30/06/2022	A report summarising achievement of these outputs is presented in the Key Results section 6 of this report.
2.2 (PC, A)	Develop recommendations on the potential of integrating cattle and crop production in three different agro-ecological zones in KalSel to lead to increased cattle turn-off and farmer profitability	A report examining the success of integrating cattle and crop production in three different agro-ecological zones in KalSel and its impact on cattle turn-off and farmer profitability, including recommendations for other farmers and scaling institutions	30/06/2022	A report examining the success of integration cattle and crop production in different agro-ecological zones in KalSel is presented in the Key Results section 6 of this report.
2.3 (PC, A)	Establish nodes and a scaling site in KalSel that are linked to the scaling research being undertaken in NTB in Objective 1	The successful establishment of nodes and a scaling site in KalSel, with strong linkages to the scaling research being undertaken in NTB	30/06/2022	A report outlining the successful establishment of nodes and a scaling site in KalSel is presented in the Key Results section 6 of this report.

PC = partner country, A = Australia

Objective 3: Scope the possibility of developing a new beef value chain focused on smallholder farmers who use components of IVMS together with commercial meat processors and wholesalers to deliver quality-assured beef that meets the specifications of high-end consumers in NTB

no.	activity	outputs/milestones	completion date	comments
3.1 (PC, A)	Analyse/summarise the findings and lessons from the ARISA beef value chains project in Sumbawa to help guide this objective	A report on the findings and lessons from the ARISA beef value chains project in Sumbawa	30/06/2022	The findings from the ARISA beef value chains project in Sumbawa were reviewed and a summary is provided in the detailed results section of this report.

no.	activity	outputs/milestones	completion date	comments
3.2 (PC, A)	Engage with a range of beef industry stakeholders in Indonesia and with MLA in Jakarta to identify potential value chain partners who would be interested in co-investing and contributing to a new beef value chain targeting high-end retailers and consumers, with the aim of securing additional funding to test the system and provide proof of concept of the system in NTB	Map the potential value chain sectors needed to deliver high quality beef in NTB and compare that map with successful beef value chains elsewhere to determine the options that might exist in NTB/Indonesia. Thereafter, engage with a wide range of beef industry stakeholders to determine their potential interest in establishing such a beef value chain	30/06/2022	A large number of formal and informal meetings and workshops were conducted by the project with the aim of identifying potential value chain partners prepared to invest in specific sectors of a new beef value chain. Details of these meetings and workshops are contained in the results section of this report. Unfortunately, at the end of the project, the project was unable to identify new value chain investors. Work is continuing following completion of the project to fully evaluate the changes needed across all sectors of Indonesia's beef value chains to deliver a quality- and safety-assured beef grading scheme and to evaluate the implications of those changes from both an economic and a sustainability perspective.
3.3 (PC, A)	Organise a visit of value chain representatives and key Indonesian researchers to Brisbane to learn about the processes and standards applied to enable the eating quality of beef to be guaranteed through the MSA scheme and also visit beef producer(s), meat processor(s), wholesaler(s) and retailer(s) who supply MSA-accredited beef to understand how the scheme can be implemented at a practical level and to improve the capacity of the Indonesian value chain partners	A report on the findings from the visit by value chain representatives and researchers to learn about how the MSA scheme might be adapted for implementation in NTB/Indonesia	30/06/2022	This workshop was initially planned for May 2021 but due to international travel restrictions associated with the Covid-19 pandemic, it could not proceed at that time. Subsequently, the project's failure to identify potential value chain investors meant the workshop was ultimately cancelled.
3.4 (PC, A)	Develop recommendations on the next steps to development of a quality-assured voluntary meat grading scheme that could be implemented in NTB as a proof concept in Indonesia.	A report outlining recommendations on the next steps to development of a quality-assured voluntary meat grading scheme in NTB, together with roles and responsibilities of personnel assigned to act on those next steps	30/06/2022	A series of recommendations on the next steps to development of a quality- and safety-assured voluntary beef grading scheme either specifically for NTB or a broader 'Beef Standards Indonesia' grading scheme is provided in the Key Results section 6 of this report.

PC = partner country, A = Australia

Objective 4: Assess the social and economic context underpinning decision-making processes of smallholder farmers and the socioeconomic impact of the proposed on-farm and value chain interventions

no.	activity	outputs/ milestones	completion date	comments
4.1 (PC, A)	Analyse/summarise farm household survey data from the CropCow project to identify the socioeconomic characteristics of smallholder farmer households in NTB and KalSel and their production capacity and motivation to increase productivity and/or their scale of production	A detailed report describing the socioeconomic characteristics of smallholder farmer households in NTB and KalSel and their production capacity and motivation to increase productivity and/or their scale of production, ultimately resulting in peer reviewed publication(s) in an international journal(s)	30/06/2022	These analyses have been completed and the results are being compiled and prepared for inclusion in the “Bali Beef Book” chapter relating to socio-economic and cultural aspects. A summary of the results is also presented in the Key Results section 6 of this report.
4.2 (PC, A)	Analyse farm household survey data from the CropCow project to identify the economic and livelihood benefits of integrating crop and cattle production amongst smallholder farming systems	A detailed report which identifies the economic and livelihood benefits of integration crop and cattle production amongst smallholder farming systems. The report will also be adapted to ensure its suitability for extension purposes and use by the scaling nodes and sites in both NTB and Lombok	30/06/2022	Detailed quantitative analysis of determinants of adoption have been completed. Writing up the results and drafting a paper for submission to an international journal will be completed by the end of 2022. A summary of the results is presented in the Key Results section 6 of this report. Livelihood indicators have been generated from the baseline survey.
4.3 (PC, A)	With industry stakeholders, analyse the potential for new beef value chains supplied by smallholder farmers in NTB to high-end markets in Indonesia, and develop a chain development plan that includes goals, benefits, challenges, activities and a time scale	A detailed value chain development plan including goals, benefits, challenges, activities and a time scale needed to establish a new beef value chain supplying beef from smallholder farmers in NTB to high-end markets in Indonesia	30/06/2022	Despite strong promotion of the concept of a new beef value chain amongst government and private sector stakeholders, it was not possible to identify investors particularly from the critically important meat processing sector. Hence it was not possible to develop the detailed value chain development plan customised for specific value chain partners. A more detailed report is outlined in the Key Results section 6 of this report.

PC = partner country, A = Australia

Objective 5: Examine the roles of gender and the extent of women’s engagement in smallholder farmer livestock production and marketing

no.	activity	outputs/ milestones	completion date	comments
5.1 (PC, A)	Complete Women’s Empowerment in Livestock Index (WELI) survey data collection in at least 200 selected farmers and market chain participants in NTB and KalSel	WELI survey data collection completed amongst at least 200 selected farmers and market chain participants in NTB and KalSel	30/06/2022	Completed
5.2 (PC, A)	Analyse data from the CropCow Focus Group Discussions and new WELI data to investigate possible areas of inequity impacting on women farmers and market chain participants and provide recommendations on possible ways to overcome those inequities	A detailed report on areas of inequity that impact on women farmers and market chain participants in NTB and KalSel, together with recommendations on possible ways to overcome these inequities, ultimately resulting in peer review publication(s) in an international journal(s)	30/06/2022	Several peer-reviewed publications are now in preparation for submission to international journals. The results have also been or are being prepared for presentation at conferences, as outlined in the Publications list at the end of this report.

PC = partner country, A = Australia

7 Key results and discussion

7.1 Objective 1

Output 1.1: A detailed report from the analyses of thematic responses using NVIVO software, providing recommendations and guidelines for designing successful and durable scaling institutions and approaches, ultimately resulting in peer reviewed publication(s) in an international journal(s)

This objective built on the research undertaken in the previous *CropCow* project and aimed to identify and address the key factors influencing successful adoption of proven technologies, taking gender needs and farmers' preferences into consideration. The scaling research activities were able to continue throughout the extent of travel restrictions due to the COVID-19 pandemic. This was because the field officers chose to live in the same zone where they worked, so the lockdowns did not impact their implementation of the activities.

The field officers completed the baseline data collection in October 2020 in six districts: Central Lombok, Dompu, East Lombok, North Lombok, Sumbawa and West Sumbawa. The data were collected using two methods: Key Informant Interviews (KIIs; n = 109 selected for analysis) and Focus Group Discussions (FGDS; n = 36 selected for analysis). The participants in this baseline study were farmers (scaling-out groups, node groups, women's groups) and staff members of scaling-out institutions (Dinas and two farmers' associations in East Lombok).

The data were transcribed in Bahasa by the FOs in November and translated to English (by a certified translator) from December 2020 to February 2021. Data analysis began in March 2021 and was conducted by a UNE research fellow using the content analysis approach. The qualitative content analysis allowed reduction of the dataset through a systematic and reliable procedure (Bryman, 2016) without losing contextual information (Krippendorff 2018). For the coding process, the researcher used the software NVIVO Version 12. The preliminary code structure was oriented according to the guideline questions. After finishing the first stage of the coding process, the researcher refined the structure using the following criteria: (1) recurrence of themes in the narratives within a participant category and (2) relevance of the emerging themes to the research aims.

Our findings suggest the main drivers for adoption in the area studies are the non-viability of traditional methods (e.g. a lack of bulls for natural mating pushes farmers to adopt artificial insemination), the presence of incentives (e.g. government programs that support farmers in accessing resources, inputs or services) and success stories from farmers using the innovation (e.g. local champions). On the other hand, our results suggest that access to inputs to implement innovation (e.g. machinery to process the forage), natural resources (e.g. land and water), financial credit and appropriate technical assistance are the most important promoters of adoption in the area.

The baseline study findings also suggest that cattle are seen by the majority of farmers as savings - for emergencies, or specific means such as children's education or to buy other assets (e.g. motorcycles) rather than as a source of income. This may present problems in making the local market more volatile (unpredictable offer) and may also impact the

quality of meat (older animals) in the market. Regarding farmers' market access, our findings suggest farmers have a limited strategy to sell cattle. There is no cattle market in Sumbawa Island. Hence, most farmers deal with the local traders who resell the cattle to a larger trader or to other farmers. On Lombok Island, there are weekly cattle markets but most farmers prefer to sell at the gate. Markets are ruled by middle-men who prohibit the farmers to enter the auction arena. Farmers therefore wait at the market gate with agreed prices when the middle-men take out the cattle and bring them to the auction arena.

While the baseline results identified drivers and barriers to innovation adoption by farmers, an exit survey was subsequently designed and conducted. For the exit survey, the number of units of analysis (interviews) were decreased and the strategy for targeting study participants was improved. The aim was to maximise the use of the project's resources and the quality of the qualitative data collected.

The field officers completed the end-line data collection in November 2021 in six districts: Central Lombok, Dompu, East Lombok, North Lombok, Sumbawa and West Sumbawa. The data were collected using two methods: Key Informant Interviews (KIIs; n = 75 selected for analysis) and Focus Group Discussions (FGDS; n = 14 selected for analysis). The participants in the end-line study were farmers (scaling-out groups, node groups, women's groups) and staff members of scaling-out institutions (Dinas and two farmers' associations in East Lombok). The data were transcribed in Bahasa by the FOs in November 2021 and translated to English (by a certified translator) from February 2022 to June 2022. Due to the amount of time required to have the data translated to English, data analysis will only begin in July 2022 and will be conducted by a UNE research fellow using the content analysis approach.

Over the past 12 months, an innovation system analysis of the Indonesian beef sector in Nusa Tenggara Barat (NTB) was also undertaken. This analysis applied the agricultural innovation system (AIS) framework to identify constraints for boosting beef production in the region. For this analysis, we used qualitative data (in-depth interview and focus group discussion) collected in NTB (baseline) and data from a literature review. The results showed significant constraints across all AIS functions, ultimately translating to poor innovation adoption of cattle farming. The results showed that the beef AIS was constrained by multiple factors, including lack of accessible credit by farmers and SMEs, poor capacity building, and lack of a policy portfolio that includes value chain development and more strategic agricultural budget allocation.

Ongoing institutional capacity building and building the technical capacity of stakeholders to undertake both technological and practice change continue throughout the term of this SRA. From October to November 2021, NTB BPTP implemented a "look and learn visit" in node groups across all six project districts. This activity was centred on IVMS practices where the field officers and UPTD (Regional Technical Implementation Unit) guided farmers in comparing and contrasting contexts and supporting farmers from scaling nodes in developing action plans. From January 2022, the team started the evaluation of the "look and learn" activities (see Appendix 1).

A further study was conducted to assess the implementation of the innovation component of the IVMS and farmer group institutional development at node and scaling site groups. The survey is quantitative in nature and covers six districts and 174 farmer groups. The senior team conducts the survey, four field researchers and local enumerators with

coaching and training from the senior team. Data from this study will be analysed following completion of the project from July 2022 using statistical analysis.

Over the term of the SRA, it was possible to observe asymmetrical incorporation of project animal production recommendations in extension bodies at district and sub-district levels. The districts of Dompu, East Lombok and North Lombok had a significant buy-in by Dinas with budget allocation to implement activities promoted by the project, such as forage conservation programs, the establishment of nurseries, and increased visits to the UPTDs. At the sub-district level, there was a noticeable improvement in the support provided by the UPTDs to the farmer groups. UPTDs have distributed working areas among staff for farmer group facilitation and they replicate field officers' activities similar to the node groups (e.g. regular cattle weighing and animal health control). UPTDs also have a greater involvement in farmer group activities such as facilitating regular group meetings. Additionally, UPTDs in East Lombok inserted project innovation contents (cattle fattening based on tree legume) into the implementation of Dinas' intern loan scheme for cattle fattening.

All project scaling research activities were concluded in June 2022. However, over the past year, the merging of several research Indonesian organisations (among them the BPTP) into a new organisation called BRIN (National Research and Innovation Agency) imposed some challenges to implementation of this component of Objective 1.

Output 1.2: A report outlining progress with institutional development and scaling interventions, particularly as they contribute to women's economic empowerment

Although the project's adoption and scaling activities specifically identified and targeted institutional development and scaling interventions that contributed to women's economic empowerment, the analysis of those activities reported in Output 1.3 and 1.4 did not specifically differentiate institutional development and scaling interventions by gender.

Output 1.3: A report describing the institutional capacity building that has occurred over the CropCow project and this SRA, with recommendations on the institutional capacity building that is needed to maintain durable scaling institutions

The focus of this component of the CropCow project was on scaling out appropriate technology based on a simple, easy to understand design, as that was believed likely to be most effective. The activities were planned directly in conjunction with the scaling institutions and hence, the scaling institution became more familiar with activity planning based on farmer needs. The placement of project field officers in the villages where they were contributing also helped improve the capacity of the subdistrict technical staff as they regularly worked together. CropCow activities (in particular improving the supply of high quality feeds to the cattle) were incorporated into existing government programs and synergised with other programs, thereby ensuring subdistrict Dinas staff became more active in communicating and facilitating adoption of innovations to improve cattle productivity. Additionally, facilitation through CropCow increased the confidence of banks to provide loans for cattle fattening. Project innovation in the nodes improved farmer groups' abilities to function as an institution, thereby changing the mindset of farmers towards more productive practices. It also further improved the adoption of cattle fattening based on tree legumes. The project established many learning sites that demonstrated good cattle management practices for farmers across all of the 6 districts targeted by the project.

There were though some limitations during the implementation process, including a lack of participation of extension staff at the village level, meaning the adoption is still concentrated at the node levels. The project was also not successful in facilitating the marketing of fattened bulls. Similarly, ongoing monitoring and evaluation (M&E) was conducted by the project team and the scaling institutions, but M&E could have been more valuable for the project had it been more structured, regular and participatory.

Effectiveness of implementation of this component of the project

- The project's innovation (components of IVMS) was considered very compatible with the local agro-ecosystem and its facilitation significantly improved the knowledge and commitment of the scaling institutions that contributed to the adoption of innovations by participating farmers.
- The main component of the project's innovation that was adopted was the use of tree legume planting and feeding to cattle (*Leucaena* in Sumbawa and *Sesbania* in Lombok). The adoption rate varied between districts, depending on factors such as land availability, the leadership within each institution and availability of operational funds from each institution.
- In Sumbawa Island, there was a more rapid adoption of *Leucaena* planting and use by the non-native communities (especially Balinese and Sasak) than in the local Sumbawanese and Mbojo ethnic groups. However, adoption by the local community did increase over the life of the project, stimulated by the rapid improvement in cattle performance.
- Most of the adoption by farmers occurred through cross visits to established farms (farmer groups). The cross visits were very effective in changing farmers' mindset thereby leading to the adoption.
- In some districts (especially North and East Lombok) the use of cattle dung to make organic fertilizer was stimulated by the facilitation by the project team.
- Interventions to improve calving rates were effective in Lombok island but not in Sumbawa Island. Table 4 in Output 1.4 shows that none of the nodes in Sumbawa focused on the cow-calf system (mating and weaning management), even though the extensive grazing system in Sumbawa would have benefited more from that intervention than the cut-and-carry system generally practiced in Lombok.

Benefits of project facilitation

The project's facilitation role delivered benefits at a number of levels, including:

- Provision of support to the national cattle development program: the project's approach was well aligned with government programs such as SIKOMANDAN (Sapi Kerbau Komoditas Andalan Negeri) and its efforts to achieve beef self-sufficiency. The most significant support was through improved feed supply and quality.
- Provision of support to provincial cattle development programs: the project's approach was very relevant to the strategic planning by the Provincial Dinas Peternakan and their aims to improve both the supply and quality of the local beef. In particular, the project supported the Governor's initiative known as "industrialization". Due to the project's interventions, the supply of "fat cattle" was increased, thereby either increasing the live weights of the cattle at time of slaughter or the cattle were slaughtered at their previous weights but at a much younger age.
- Provision of support to district cattle development programs: at the district levels, the project's facilitation (especially through visioning and participatory planning

activities) ensured the local staff were more aware of their tasks and functions. The facilitation also helped improve the effectiveness of the cattle distribution program by the district government and member of parliament by: a) creating business opportunities (improved cattle fattening); b) improving farmers' capacity to implement technologies' c) helping to rehabilitate eroded soil (especially in the sloping land areas); and d) facilitating adoption of innovations and transforming extensive systems to more intensive systems.

Project innovations that were adopted by the scaling institutions' annual programs

Project innovations that were adopted by the scaling institutions' own programs included:

- Establishment of a team to facilitate project implementation using operational funds provided by the institution (Dompu and Sumbawa);
- Provision of a local government budget to establish forage nurseries (Dompu, Sumbawa);
- Inclusion of at least one component of project innovation (forage production) in the annual program (all districts);
- Provision of a counterpart budget for cattle infrastructure from parliament members (East Lombok);
- Provision of interest free loans for cattle fattening (East Lombok);
- Distribution of 45 feeder cattle to farmers (Dompu); and
- Improving farmers' capacity to adopt project innovations (all districts).

Sustainability of project good practices

Project practices that were deemed to be sustainable beyond the life of the project include:

- Supply of *Leucaena* seedlings to farmers is planned to continue every year (Dompu);
- An Action Plan through to 2026 was established to improve supply of high-quality forages (Dompu);
- Funds provided by members of parliament can be allocated to sustain project practices after the project finishes (all districts);
- A support budget was proposed by the local governments to sustain project good practices (all districts);
- The implementation of project innovations continues to be used as a key performance indicator for extension staff (East Lombok); and
- Cattle feed sufficiency becomes a key performance indicator of the institution (Dompu).

The dynamics of scaling out through scaling institutions

- The low fiscal capacity of all scaling institutions limited the ability for the scaling institution staff to operate and facilitate the project's scaling out plans – this was made worse by the Covid-19 pandemic.
- In East Lombok, a zero-interest loan helped improve adoption of project innovations. In 2021, IDR 77 billion was disbursed to 817 farmer groups involving more than 5000 farmers.
- North Lombok's government adopted the zero-interest loan system from east Lombok.

- In central Lombok, adoption was very slow in the first two years, but improved remarkably following the introduction of a national program “One thousand cattle village” that stimulated very active participation amongst the scaling institution. Since 2019, there has been a big increase in the number of farmers planting Leucaena, facilitated by the scaling institution. A similar response occurred with the introduction of a national program “Food estate” in Labangka subdistrict (Sumbawa) aimed at stimulating project innovations by the scaling institution.
- Sumbawa and Sumbawa barat districts were the pioneers in adopting Leucaena-based cattle fattening systems. However, their low fiscal capacity limits them to further accelerate the adoption.
- In Sumbawa district in 2020, the project facilitated intensive communication between legislative and executive key leaders. As a result, special funding support was provided in 2021 to establish Leucaena nurseries and facilitate replanting in 10 large scale cattle breeding groups. This approach has been very effective and should be considered by other districts.
- Effective leadership was believed to be the key to high adoption by farmers and project facilitation by the scaling institutions. This was demonstrated by the Head of Dinas PKH Dompu who was previously an NGO development facilitator and implemented good leadership to ensure the scaling institution worked effectively as a system. That person had a clear understanding of the project’s strategy as well as understanding that it was his job to improve cattle productivity in his region. Hence, he was outcome-oriented and implemented processes of activity planning and monitoring to achieve the outcomes being targeted. He was also willing to empower officials at all district and sub-district levels by providing them with good support and motivating them to achieve their and the project’s objectives. He also led his team by example.

Lessons learned

- Improving the capacity of staff from the scaling institution from district to subdistrict level was an effective strategy to improve participation by the scaling institution from planning to implementation.
- Using adult learning methods (exploring experience and reflection) was a very effective method of improving the capacity of the scaling institution staff.
- Cross visits to other farmer sites was the most effective strategy to improve awareness and motivation of both scaling institution staff and farmers to adopt new innovations.
- Good practices promoted by the project became an effective tool for the scaling institutions to advocate policy at district levels. However, the success of such advocacy was determined more by personal and informal approaches rather than formal institutional-level approaches by researchers to key leaders at both the scaling institution and local parliament levels.
- There remains an ongoing need to improve the capacity of project researchers and team members on an advocacy technique to incorporate research outcomes into policy.
- Cattle distribution is still the focus of priority programs delivered by local governments, with an increased emphasis with the shift of cattle distribution from Dinas to parliament members.
- Local government programs are mostly supported by national funding through the

Directorate General of Livestock and Animal Health Services (MoA). Hence the integration of project activities was therefore more effective through national programs such as 1000 cattle village, Food Estate and SIKOMANDAN.

Output 1.4: A report describing changes in the technical capacity of stakeholders (project team members, scaling institutions and farmers) to undertake technological and practice change

The intervention - IVMS

The intervention known as Integrated Village Management System (IVMS) comprises different components including calf weaning, controlled mating, strategic feeding by feeding lower quality diets to dry (non-lactating) cows and higher quality diets to the weaned calves and fattening bulls using forage tree legumes, animal health management, waste (manure and urine) management as well as through use of equitable beef market chains by strengthening the farmers’ institutional groups. Establishing the IVMS and strengthening farmers’ institutional groups in each of the six districts targeted by the project varied in the degree of IVMS component implementation based on the biophysical condition, the needs of the district and the social condition. Better breeding management was for instance successfully adapted for use in east Lombok district, though the extent of the use of forage tree legume for fattening bulls was limited due to limited land availability and hence, the potential to grow forage tree legumes. However, the main IVMS component introduced as the entry point for each district was establishing forage tree legumes, feeding forage tree legume and empowering farmer institutional group.

Node Groups

A ‘Node Group’ is a group of farmers who implement IVMS as a proof of concept and learning centre for other farmer groups and government or non-government organisations within the surrounding area and who experience similar constraints and biophysical conditions in their beef production systems. Node groups were selected as a prerequisite for IMVS implementation based on them having an active farmer group that had collaborated with an earlier research project using IVMS and who were willing to collaborate to implement IVMS across combined breeding and fattening operations or stand-alone breeding and fattening operations. The node number in each district varied depending on the area of the region, the number of farmers or groups of farmers and the availability of groups that were willing to implement IVMS practices. The total number of nodes at the time of node set up was 27 nodes and the nodes remaining at the end of the project was 8 Nodes (Table 1.4.1). An analysis of each of the nodes is also presented in Appendix 2.

Table 1.4.1 Number of nodes existing to the end of the project (shown as ‘Actual Node’)

No	Districts	Initial Node (n)	Actual Node (n)	Members (head)	IVMS (Breeding/ Fattening)
1.	North Lombok	4	3	145	B and F
2.	Central Lombok	4	1	48	B and F
3.	East Lombok	7	1	17	B
4.	West Sumbawa	5	1	10	B and F
5.	Sumbawa	3	1	14	B and F
6.	Dompu	4	1	20	F
7.	Total	27	8	254	

A range of factors caused some nodes to discontinue through to the end of the project, including factors of field officers, internal farmer groups, government technical or extension officers in the area and node locations. By way of example, field officers did not engage sufficiently well with the node group leader or the group leader was not fully convinced that the field officer was willing to cooperate in implementing IVMS. Another issue was that the farmers were expecting incentives that the project was not able to supply, if they implement IVMS. Some nodes also discontinued their collaboration because the field officer failed to maintain communication during the Covid-19 pandemic.

The node groups' internal problems also caused major difficulties in demonstrating the IVMS principles. Those problems included, for example: it was difficult for the project to arrange meetings with members of a group; there was unresolved internal conflict within the group; some members of the group failed to practice IVMS; the distance between the members was too great for easy participation; the cattle were individually housed instead of being managed as part of a communal cattle housing system; a suitable meeting place not available; group members did not actually control the land on which their cattle grazed, meaning land was not available to improve high forage supply; the group often received alternative government provisions or aids, meaning they elected to adopt those opportunities rather than those offered by the project; and the site was not fit for field school activities.

The availability and support from technical or government extension staff around the potential node site to some extent determined the sustainability of the node group. Strong collaborations between the project's field officers and local extension staff improved the farmer group institutionalisation processes and encouraged the effective implementation of IVMS.

IVMS components adopted and demonstrated at node level

1. Controlled mating

Controlled mating was one of seven of the IVMS production-based components successfully adapted at node level in East Lombok. The Kebun Telaga farmer group as a node successfully raised funds from members to purchase a superior Bali bull based on their criteria. This node traditionally used natural mating before participating with the project. The understanding of the importance of mating cows with a selected superior bull delivered by field officers was understood and accepted by the group leaders and members of this node. The group then set up regulations to use only the selected bull for mating with the cows belonging to the group member in a collective housing. However, the group did not implement a mating calendar approach as recommended by the field officer. The main reason group members did not accept the mating calendar was due to the long lag time needed to ensure some cows were joined during the recommended mating season, because calving is currently distributed throughout the year and hence, the calving interval would need to be extended for some cows. The node situated in this area, Kebun Telaga, has access to water all year round, thus supplying good quality forage though in limited amounts during drier times of the year.

Successful implementation of controlled mating also occurred at Bumbang Wetan, a node in Central Lombok. Bumbang Wetan was able to set up a mating season between April and October and replace the selected bull every year. The bull was selected from available bulls in the village. The node group set up the mating calendar because of an

association with the crop calendar and aimed to concentrate calving between January to July. The node site is situated in a dryland area dominated by rainfed farming. Rainfed farming begins in October and ends in April, allowing the farmer to facilitate mating of cows outside that time. Therefore, the implementation of bull control and a mating calendar was accepted by the group members.

Controlled mating has also been practiced widely in the Karang Kendal node group in north Lombok, as the group had been collaborating with a previous ACIAR project for about 10 years. The group persistently practiced controlled mating though it has had to accommodate the government program on artificial insemination which on some occasions interrupted their system. However, another node group in north Lombok (Bagenda Maju) chose to practice both artificial breeding and natural mating to unselected bull. The node group had previously implemented breeding practices using only artificial insemination. The contribution of the natural mating component to the system was accepted to ensure that if the artificial breeding failed to achieve pregnancies, then natural mating would still enable the cow to calve every year. Artificial breeding facilitates the occurrence of crossbreeding with exotic cattle breeds where the weaned offspring produced have a price that is three times higher than weaned local Bali calves.

Controlled mating was not adopted in Sumbawa Island, where the traditional breeding system relies on natural mating with cows joined to any bull available throughout the year.

2. *Weaning*

Weaning is a key element in the IVMS breeding practices and it was accepted and successfully practiced in all breeding node groups in Lombok and Sumbawa islands. Weaning occurs when the calf is between 5 and 7 months of age. All node group members understood the importance and benefits of weaning to maintain cow reproduction performance. However, weaning was accepted for various reasons not only cow reproduction performance. Those reasons included farmers who managed cattle on behalf of other owners received their share of payment earlier, some farmers were able to sell weaned calves at younger ages and some farmers were able to simultaneously use weaning to do a nose pierce to control the weaned calf (as well as apply the nose tags that enabled the calves to be weaned without separating them from the cows). Weaning was the most acceptable breeding management practice in all breeding node groups.

3. *Feeding management*

The feeding management component of the IVMS focuses on the introduction of high-quality forage tree legumes to the cattle production system to increase feed supply and quality and strategically feed to the animals to meet their nutritional requirements. Both *Leucaena* and *Sesbania* forage tree legumes were in Lombok Islands but only *Leucaena* was introduced in Sumbawa. Both legumes were adopted by most of the node group members, with various capability among them in established the legumes based on their land availability. The number of sites in each district and the land area established for these legumes across all node groups between 2019-2022 are shown in Table 1.4.2.

Table 1.4.2. Number of forage tree legume sites established in node groups (2019-2022)

No	Districts	Node (n)	Leucaena (n)	Sesbania (n)	Area (Ha)
1.	North Lombok	3	6,891	36,841	32.2
2.	Central Lombok	1	28,165		16.5
3.	East Lombok	1		11,091	1.4
4.	West Sumbawa	1	35,932		38.1
5.	Sumbawa	1	78,700		30.0
6.	Dompu	1	100,765		43.2
7.	Total	8	250,453	47,932	161.4

Sesbania is very well suited to North Lombok and East Lombok districts. Members of the node groups in those districts grew Sesbania mostly in paddy field bans in strips ranging from 0.25 – 1.0 metre in width. This system really mimics the integration of Sesbania in the paddy field bans that exist in central Lombok. However, the lifespan of Sesbania established in rice field bans is relatively short i.e. between 2 and 4 years. Therefore, to maintain the system, ongoing access is needed to Sesbania seeds and seedlings. This problem was recognised from the earlier ACIAR project due to intensive use of paddy fields so as not to give the opportunity for sesbania seeds to grow to produce seedling as occur in central Lombok.

The use of Leucaena has been widely and strongly accepted by all node groups in Sumbawa Island and to some extent in north and central Lombok. The acceptance of Leucaena by the node groups in north and central Lombok may be due to the similarity of those agro-ecological zones to Sumbawa, which is dominated by dryland. The long lifespan of leucaena and its high seed production enables farmers to readily share seeds with other farmers.

Feeding strategies for farmers to use forage tree legumes for all classes of animals have been guided by the field officers and their recommendations have been implemented and adapted by all node groups.

4. *Fattening based on forage tree legume*

Fattening cattle based on forage tree legumes has been widely adopted by all fattening node groups in Lombok and Sumbawa. Node group members are aware of the benefits of forage tree legume inclusion in their cattle diets and that its inclusion significantly improves the bull body condition and appearance. Through their feeding of legumes to their cattle, the node members also noticed that the fattening bulls don't like a change in diet. Hence they now feed those bulls continuously with forage tree legumes and continuous feeding has become more important than the amount of legume fed.

Adoption of fattening feeding practice based primarily on Leucaena is widespread amongst node groups in both Sumbawa and Lombok (North and Central). Leucaena for fattening is offered at rates of 60% or more of the animal's diet with irregular supplementation using rice bran, and to a lesser extent, forage or corn stover in Dompu district. However, the use of forage in addition to leucaena during the wet season and corn stover during transition periods from wet to dry season is widely practiced in Sumbawa district. Leucaena is fed up to 100% of the diets during peak dry season when the node groups reduce the cattle numbers being fattened or sell the larger animals and replace them with smaller feeder stock.

5. *Animal health management*

De-worming practices were introduced in all node groups, however routine adoption of the practice was low even though the advantages of treating the animals to control worms have been proven to be high. The reluctance of the farmers to adopt was associated with the cost of treatment. Farmers in all node groups preferred to treat only when cases of worm infestation are obvious, particularly amongst calves.

6. *Waste management*

Most nodes, except those in Dompu, adopted use of animal waste by processing manure into compost. Inadequate family labour is one of the greatest concerns about making compost and using it for crops. However, some of node groups regularly produced compost and sold it as an extra income from raising cattle. The node group in east Lombok also collected cattle urine and processed it to become liquid fertiliser.

7. *Equitable market chain*

The process of establishing equitable market chains was achieved through strengthening node group institutions and by establishing regular group meetings and cattle weighing. Those activities provided insight to node group members about the value of their fattening products and increased their confidence in negotiating with middleman or butchers to achieve a better price for their cattle.

Capacity Development

1. *Project team members (field officers)*

Field officers received on-going training to up-grade their technical and facilitation skills during regular meetings between the field officers and the senior team at BPTP. That training included the ability to interpret biological data and their relevance to the cattle farming enterprise at farmer level. At a practical level, the field officers used those data analytical skills to encourage farmers to analyse their own cattle farming performance (e.g. to examine reasons behind changes in cattle weights and the implications of those changes on the farming system, using language understood by the farmers and simple graphics to visualize data).

As a result of the field officers' capacity development, two field officers were subsequently recruited as permanent government officers in Dompu District, one as a member of the veterinary team and the other as a forage quality supervisor. The field officer based in East Lombok has since become a permanent facilitator for training series run by Ridho Illahi Cooperative in East Lombok, with those training series usually attended by 50-60 participants from across NTB. The field officer in Sumbawa has since been employed as a reference/resource person for farmers and various organisations to provide advice regarding cattle fattening enterprises in Sumbawa (e.g. Collaborative and innovative research and development initiative by Animal Research Centre). The remaining field officers in Central Lombok and Dompu have started their own small businesses as an exit strategy following the end of the project.

2. *Farmers in node groups*

Farmers in node groups received capacity development on technical, facilitation and analytical skills in various forms including:

- Continuous facilitation by field officers through regular group meetings and cattle weighings. These activities served as an avenue to reflect on what farmers have planned to do in regard to implementation of IVMS components, what they actually did and finally to assess the results, including identification of barriers during implementation.
- Continuous facilitation by the field officers around group organisational development encouraged functioning farmer group organisations through regular meetings where members discussed group progress, identified problems/challenges and opportunities to solve problems, developed work plans and monitored achievements, promoted the use of group levies, encouraged income generating activities, and monitored progress by transparently sharing cash flow reports on a regular basis during group meetings.
- Farmers regularly tested and adapted IVMS components on their own farms with facilitation from the field officers and members of the senior BPTP team.
- Node groups were prepared to host “look and learn” visits from scaling site groups. This hosting activity increased farmers’ abilities to express their ideas and share details about what IVMS components they implemented in their own farms, what changed and the results achieved from those changes.

A number of significant changes and achievements of node groups have been identified as a result of the capacity building as summarised below.

a. *North Lombok*

- Node group capacity development: Node group Bagenda Maju was able to organise small working teams inside the group to deal with waste management from compost processing through to marketing. They sold their compost product across most of North Lombok District and achieved loyal customers because of the quality of their compost. They have achieved a gross income of Rp. 5,000,000 gross from compost selling, with the amount distributed amongst the working members, purchasing inputs for the next compost making, and making contributions to group cash reserves. The group leader reported they learned how to manage this working group and maintain its motivation through the transparent profit-sharing scheme and through discussions and facilitation from the field officers and the BPTP senior team.
- Node group capacity development: Node group Bina Karya was able to organise members to purchase land collectively for use as a collective pen. 17 of 18 group members purchased a piece of 1 Are (10 m x 10 m) for the price of Rp. 15 million to build the pen with little support from the project and most of the contributions coming from the farmers. Previously, they had grazed their cattle under cashew trees in their upland areas, where two cattle belonging to a member farmer was stolen with an estimated loss of Rp. 40 million. Since then, member farmers agreed to house the cattle in a collective pen to increase their control over cattle theft.
- Personal capacity development: The leader of Node group Bagenda Maju was invited as a resource person for a compost processing training workshop conducted by Sesait Village Government in 2021. That training was attended by several farmer group representatives from Sesait village (a neighbouring village).

- Personal capacity development: Node group members were able to strengthen their bargaining positions during cattle sales to middle men. Due to the regular cattle weighing where farmers knew the sale weights of their cattle, they were able to relate cattle weights to the sale prices being offered, thereby improving their bargaining position with middle men who use weight estimates to determine prices.

b. East Lombok

- Organisational development: similar to North Lombok, Node Group Kebun Telaga was able to organise small working teams to process compost. Their product has been sold in various sites in East Lombok up to West and Central Lombok. The group leader uses a labour payment system for processing compost (Rp. 100,000 / ton product) with profits shared amongst the group.
- Women's empowerment. Women farmers in Kebun Telaga were encouraged by the group leader to get involved in processing and selling forage tree legume seed planting medium. They sell their product through social media and provide delivery to their customers. These women farmers reported improved income from their business. Previously they earned additional income from weaving, but weaving takes longer and needs greater efforts. With this planting medium business, they reported they were able to increase the rate at which they earned their income.

c. Sumbawa

- Organisational development: Node Group Berkembang showed their ability to assist each other building pens for fattening cattle. The system collects money from each member every month and then builds one unit fattening pen in compliance with technical recommendations. This was repeated every month until all members had their own fattening pen.

3. Scaling institutions staff at site level

Collaborating scaling institution staff received capacity development through various activities, including:

- Involvement in the regular cattle weighing and data interpretation for each node group.
- Onsite training during visits from the BPTP senior team.
- Active involvement during 'look and learn' visit activities (described below).
- Regular interaction with field officers and the senior team through a WhatsApp group.

Changes / achievements of scaling institution staff that were reported included:

- Improved confidence to deliver IVMS information.
- Improved communication and facilitation capacity.
- Improved confidence to talk to farmers and facilitate farmer groups.
- Changed approaches to running Dinas aid programs (West Sumbawa). Previously, the aid was just distributed without proper facilitation and monitoring from Dinas staff. After collaborating with the project, the Head of the Livestock Division admitted that what they had done previously was inappropriate. Now they try to follow the project's approaches and strategies in facilitating farmers / farmer groups, including on-going facilitation and learning processes for both staff and farmers.

Scaling out approaches

Scaling out is largely a social and institutional process that may operate at various institutional scales: farmer to farmer, farmer group to farmer group, village to village, and between government and private sector organisations etc. The combinations of scaling activities in this project operated at farmer group to farmer group and farmer to farmer levels, while interactions between the different parties was supported and facilitated by scaling institution staff and project field officers. There were 3 strategies implemented by BPTP for scaling out the IVMS innovation. They were:

1. *Reaching out scaling site groups through Scaling Institutions. At the end of this project, the functioning scaling institution was the Dinas in every District.*

BPTP NTB supported capacity development of scaling institution (UPTD staff) to facilitate scaling site groups as mentioned above.

2. *Look and learn visit*

From October to November 2021, the BPTP implemented a "look and learn visit" in node groups across all six project districts. Several steps were taken to ensure the look and learn visit was effective and provided good opportunities for participants to reflect on the possibility of further changed practices. Those steps were:

- Refreshing on-site training of UPTD staff in IVMS components by the field officers as well as undertaking the processes of preparing participants prior to, during, and after the look and learn visit.
- Before visiting node groups, participants from scaling site groups were divided into IVMS thematic groups, with those participants then responsible for focusing on their 'themes' in observations and discussions during the visit.
- During the visits, host node group members were split amongst the IVMS component themes and charged with explaining their theme component to look and learn participants.
- After the visit, visiting farmers from the scaling site groups shared results of their visit to the rest of their group members. That was followed by a facilitated 'compare and contrast' activity facilitated by staff from the scaling institutions (mostly UPTD staff), who also participated in the visit. Farmers contrasted their existing conditions relative those of the node groups, then agreed on the area that they would focus on to improve their farming enterprise in the short and medium term, with working plans also developed for the area of improvement.

Table 1.4.3 shows the results of the Look and Learn activity. Through this activity, 72 scaling institution staff and 357 farmers were exposed directly to implementation of IVMS components by the node groups. Another 758 farmers received information about IVMS from visiting farmers. Hence, information about IVMS was spread to 72 SI staff and 1115 farmers through this series of Look and Learn Visits.

Table 1.4.3. Number of farmer and scaling institution (SI) staff exposed to IVMS

District	Visiting SI staff	Visiting Farmers	No Group Members	Sub-Total
North Lombok	22	75	111	208
Central Lombok	6	67	160	233
East Lombok	11	78	247	336
West Sumbawa	7	38	85	130
Sumbawa	6	51	85	142
Dompu	20	48	70	138
Total	72	357	758	1187

Six months after the Look and Learn Visit, a survey was conducted to monitor progress of the visiting group in implementing their focus area of improvement. Survey results showed that farmers received varying benefits from demonstrations of the IVMS components at each district as shown in Table 1.4.4.

Table 1.4.4. Focus of IVMS components in each node group

District	Focus of IVMS Components
North Lombok	<ol style="list-style-type: none"> 1. Feed management (planting tree legume) 2. Waste management (compost processing) 3. Animal health management (pen construction according to technical standard) 4. Group organizational development (regular meetings and group levy)
Central Lombok	<ol style="list-style-type: none"> 1. Feed management (planting tree legume, improved grass) 2. Fattening (using Sesbania, Leucaena, Gliricidia) 3. Waste management (compost processing and selling) 4. Group organizational development (regular meetings and group levy)
East Lombok	<ol style="list-style-type: none"> 1. Mating management (using selected bull) 2. Calf weaning 3. Feed management (planting Sesbania, Leucaena and improved grasses) 4. Fattening (using Sesbania and Gliricidia) 5. Waste management (compost processing) 6. Group organizational development (regular meetings, committee refresh and group levy)
West Sumbawa	<ol style="list-style-type: none"> 1. Feed management (planting Leucaena) 2. Fattening (using Leucaena)
Sumbawa	<ol style="list-style-type: none"> 1. Feed management (planting Leucaena and improved grass, dry feed conservation) 2. Fattening (using Leucaena and Gliricidia) 3. Animal health management (pen construction based on recommended innovation) 4. Group organisational development (completing group admin, regular meetings and group activity like gotong royong)
Dompu	<ol style="list-style-type: none"> 1. Feed management (planting Leucaena and improved grasses), Fattening (using Leucaena) 2. Group organizational development (access to Bank loan under KUR scheme at BNI)

3. Production of IVMS handbook

Three hundred (300) copies of the IVMS handbook were printed and distributed to the six districts. The handbook contains concise information about IVMS components that can be

used as a reference by those who facilitate farmer groups to implement IVMS innovations. The handbook was also distributed to Dinas staff at District and sub-district levels.

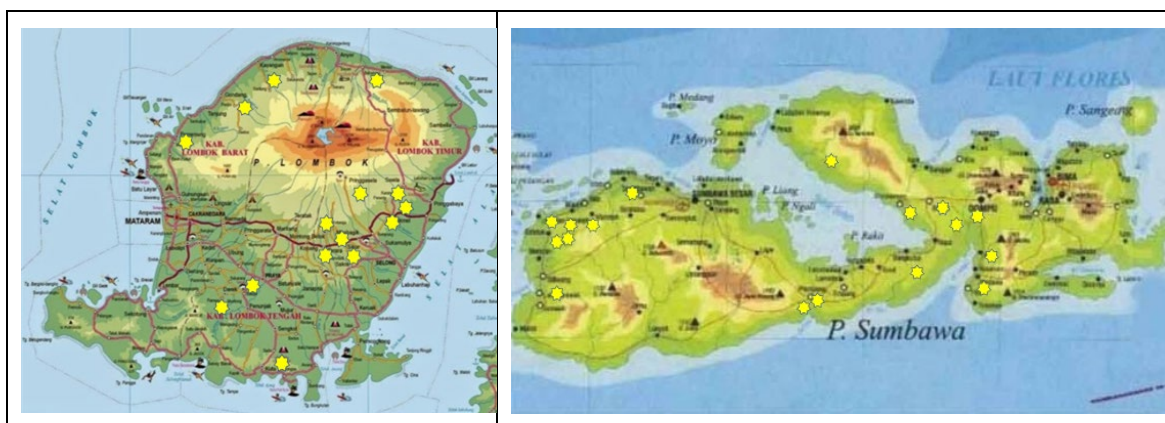
Scaling out groups

Over the term of the project, 90 scaling out groups covering 2,138 farmers across six districts were exposed to the IVMS. Another 41 groups comprising of around 800 farmers were not included in facilitation by scaling institute staff. Appendix 1 summarises progress made by each of the scaling site groups. Contributing factors that impacted on changing scaling sites included the group's aid orientation and lack of motivation, group internal conflict, the scaling institute's lack of confidence and motivation to facilitate farmers, lack of a clear understanding of the roles of scaling institution staff in the scaling site groups, the scaling institution considered this activity as an additional burden and not part of their formal duty, location and distance from the sites, frequent staff rotation amongst the scaling institutions, lack of coordination between sub-district and district offices, job distribution between extension and technical staff, and some extension staff believed their responsibility was to focus only on food crops (see Appendix 1 for detailed information for each group).

Table 1.4.5. Number of implementing and not implementing site groups in the six districts

District	Number of Sub-districts	Note	Not implementing		Implementing	
			Number of site groups	Number of group members	Number of site groups	Number of group members
North Lombok	4 out of 5	Bayan, Gangga, Pemenang and Kayangan	11	333	14	389
Central Lombok	3 out of 12	Jonggat, Praya Barat Daya and Pujut	0	0	21	961
East Lombok	8 out of 12	Masbagik, Aikmel, Pringgasela, Sikur, Wanasaba, Terara, Montong Gading and Suela.	8	222	8	203
West Sumbawa	6 out of 8	Brang Ene, Taliwang, Jereweh, Seteluk, Sekongkang and Poto Tano	17	190	15	139
Sumbawa	4 out of 24	Plampang, Empang, Labangka and Utan	2	19	10	160
Dompu	7 out of 8	Hu'u, Woja, Pajo, Dompu, Kempo, Pekat and Kilo	3	55	22	286
Total			41	819	90	2138

Figure 1.4.1. Location of scaling out sites on Lombok and Sumbawa islands



The most adopted IVMS component

Forage tree legumes, fattening cattle based on forage tree legumes and compost were the most adopted IVMS components for nodes and scaling sites. Analyses of the survey data on forage tree legume establishment and utilisation either for fattening or breeding is in progress. Achievements of the scaling out of leucaena and fattening are shown in Table 1.4.7.

Table 1.4.7. Number of existing forage tree legume sites that were established between 2019 and 2022 and total number of cattle being fattened at the time of the end-line survey

No	District	Number of farmers	FTL established (2019-2021)		Total fattening cattle (June 2022)
			Number	(Ha)	
1	Dompu	163	129,800 ^a	76.0	180
2	Sumbawa	193	283,105 ^a	102.0	335
3	West Sumbawa*	83	152,492 ^a	80.0	79
4	East Lombok	445	48,034 ^{a,b}	18.5	126
5	Central Lombok	842	109,312 ^{a,b}	226.8	643
6	North Lombok*	697	163,796 ^{a,b}	242.0	152
	Total	2,423	1,044,219	774.3	1,515

Note: a = leucaena, b= sesbania and * = update in January 2022

New output 1.4: Team reflections on how well the various components of the adoption and scaling research activities worked to achieve its planned outcomes

What worked well

1. Adoption of cattle fattening based on Leucaena in the dryland
2. Adoption of planting Leucaena cultivar tarramba
3. Increased access of farmers' access to bank loans
4. Training of field researchers
5. Training of trainers / Dinas staff
6. Training of farmers

What did not work

1. Controlled mating, especially in Sumbawa island
2. Weaning, especially in the free grazing system
3. Budget allocations by local government offices for the program

What could future users change in the methods to make them more successful in their own situation?

1. The strategy would have worked better if it had begun with influencing policy at least at the district level, so that sufficient budget could be allocated to the local government office to participate effectively in the program
2. It might be better to employ local government staff to become field researchers in each district (rather than the project employing those people directly, as occurred in this project) so that the innovations can be easily internalized into the local government program
3. The program should have been coordinated at the provincial level to attract provincial and national government participation

The following tables provide more details on reflections undertaken by the project team in January 2022. Please note some reflections were deemed to be too sensitive for inclusion in a public-access report. However, if further analysis of these reflections would be useful to better understand the adoption and scaling processes, the team would be prepared to dis-identify the information for that purpose.

What has worked well

(*Liaison officer - senior team member appointed as an adviser for field officers in each district)

No	Category	Explanation
1	Communication and coordination	<ul style="list-style-type: none"> • Communication with stakeholders has been good • Coordination meeting with stakeholders informed and updated progress of project activities in the field
2	Teamwork	<ul style="list-style-type: none"> • Project leader/core team has been progressive • Problem solving exercises were conducted regularly • Support from Liaison Officers (LO)* was helpful to monitor and evaluate field results to keep field officers' work on the track • It has been great to gain experience working with a multi-disciplinary team using system approaches • Job distribution among team members for the handling of work programs is very clear • Field officers' performance have been great
3	Monitoring mechanism of the project progress	<ul style="list-style-type: none"> • Monthly progress reported • Activity in the field evaluated by senior team at node groups, helping field officers to evaluate the ongoing work and to plan and direct upcoming activities • Collection of biological data conducted (weighing and body condition scores) consider good tools to monitor livestock production, farmer group performance and field officers' capability to facilitate farmer group to adopt new management
4	Project implementation	<ul style="list-style-type: none"> • Project implementation was according to plan despite Covid-19 limiting the interaction with node groups • Implementation of IVMS component that need hand on training delayed to some extend due to Covid-19 • The degree of standard level of farmer groups as node to exercise and adopt IVMS varied from one site to the other - modification is needed to enable farmers to adopt according to their own standard

No	Category	Explanation
5	Internal and stakeholder capacity building	<ul style="list-style-type: none"> • Mentoring of field officers by senior team conducted to individual FO on daily basis for actual field problem solving and through monthly meeting for all FOs • Capacity building of FOs to understand production system in a social context conducted through hands-on training and data collection and analysis • Facilitation by FOs improved node groups' performance & enabled UPTD staff to help scaling site • Institutional capacity development of node groups and stakeholders for IVMS adoption has been good • Capacity building of team members for research (design, model development etc.) improved • Regular trainings for FOs very helpful for field activities • Training about IVMS for FOs, Node groups and stakeholders improved understanding to crucial problems in cattle production • Capacity development of scaling institutions conducted effectively • Dinas considers that the program has supported their routine duties • Stakeholders gain visioning ability and take lessons from group facilitation processes (built learning organization) • Trainings of trainers for Dinas went well • Trainings of facilitator have been good
6	Farmer facilitation and Scaling Institution	<ul style="list-style-type: none"> • Node groups reported that facilitation by FOs has been great including FO approach and strategies in facilitating. They expect the facilitation can be continued beyond the end of the project • Look-and-learn visit was effective for adoption and scaling • IVMS components (planting tree legumes; Leucaena and Sesbania), waste management (compost processing) and fattening based on FTL adopted to a certain degree by node farmers, scaling site farmers and farmers in their surrounding areas • Regular cattle weighing conducted to demonstrate impact of adoption • Farmer group organization was strengthened through the project's facilitation
7	Node	<ul style="list-style-type: none"> • Selected, established, and improved
8	Womens' involvement	<ul style="list-style-type: none"> • Farm housewives use compost to grow vegetables in the yard and share the vegetables with each other • Farm housewives extend the cattle production system by helping to provide feed for the cattle

What worked partially

No	Category	Explanation
1	Job distribution	<ul style="list-style-type: none"> All team members, including the senior team needed to comply with agreements on job distribution Some team members not fully willing to work as a team Work rhythm need to be harmonized FOs sometimes respond slowly to any change on strategy that needed to be made in the field as they were unsure how to communicate with farmer groups to initiate change
2	Coordination and communication	<ul style="list-style-type: none"> Coordination with scaling institutions needed to be conducted more frequently Coordination between team members needs improvement Coordination meeting often does not translate into field activities Evaluation meeting did not discuss all constraints Need to improve communication between nodes and scaling site groups
3	Liaison officers (LO) performance	<ul style="list-style-type: none"> LO did not perform very well Less intensive communication between FO and LO Inconsistent information and direction from LO to FO from one district to the other
4	Facilitation of Scaling Institution	<ul style="list-style-type: none"> Facilitation of scaling institution did not work very well Scaling institution adopted IVMS components based on their interest and financial availability
5	Group Facilitation	<ul style="list-style-type: none"> Strengthening farmer organization through regular meeting, hands on training and implementing IVMS such as cattle weighing, arrange natural mating and weaning still needs improvement FO could not effectively conduct node group regular meeting to lead and direct the meeting as node solving problem means Look-and learn visit was run in a congested period, close to the end of the project due to Covid-19 and delaying node groups ready for visitor Less inclusion of cattle business and marketing aspect Facilitation to scaling sites occurred during the restriction time due to Covid-19, limiting the room to maneuver for conducting hands-on training
6	Gender inclusion	<ul style="list-style-type: none"> Gender has not been mainstreamed in all activities as originally planned
7	Node	<ul style="list-style-type: none"> Node groups did not implement all IVMS components according to the agreement before being selected as nodes

What did not work

No	Category	Explanation
1	Coordination and communication	<ul style="list-style-type: none"> • Coordination between team members needed improvement • Lack of communication between LO and FO • Less bonding between LO and FO • Coordination between LO and FO often did not work very well, FO often was left alone, and LO was less responsive • Collaboration between team needed improvement • Communication to Dinas/UPT needed to be conducted more frequently
2	Teamwork	<ul style="list-style-type: none"> • Collaboration among all the senior team was not at the same level, may be due to unclear job description
3	Performance of senior team	<ul style="list-style-type: none"> • Roles of LO in each district were not optimal • Some LO needed to give more attention to project targets and achievements • Some LOs were less active in doing evaluation relative to field activities • Understanding/perception of some team members on the project strategy and objectives was not sufficient • Some senior team members did not have a good understanding of field activities • Some senior team members were not focused on the project activities • Some senior team members did not fully commit to project meetings • There were some misunderstandings by some senior team members about who should work at node and at scaling site groups • Not all senior team members know node groups • Transcription process for end-line survey with LO was not satisfactory
4	Project implementation	<ul style="list-style-type: none"> • Some activities planned for scaling institution were not implemented, such as increasing the capacity of the UPTD staff • The methodology for implementing activities often changed, affecting the implementation of field activities • Tasks were often given at short notice so they were difficult to fulfill • Nursery establishment sometimes did not match to proper transplanting time • The work plan of awarding highly dedicated officers, visioning meetings and training for scaling institutions was largely not implemented due to Covid-19 • Some nodes did not function as learning sites, only implementing the feeding aspects • One size (IVMS) does not fit all areas either for node, scaling site or SI since all parties put greater concerns on feed shortages
5	Facilitation of node groups	<ul style="list-style-type: none"> • FOs did not deliver all information about IVMS components in the same way. The focus was heavily on forage tree legumes, using it as an entry point and then overlooking other elements such as weaning and seasonal mating

No	Category	Explanation
		<ul style="list-style-type: none"> • Need to improve farmers' capacity in cattle marketing to reduce losses in bargaining with middlemen
6	Facilitation of Scaling Institution	<ul style="list-style-type: none"> • Outbound activities that were planned for UPTD or SI could not be carried out due to Covid-19 • The appreciation to the officers who actively supported project activities could not be accomplished • Compost produced in large quantities requires support from Dinas for its marketing
7	Performance of Scaling Institution	<ul style="list-style-type: none"> • SI does not understand (or is not interested) in all IVMS components • SI facilitation to farmer groups was below expectation • Collaboration with extension staff was not going very well, they just did not go to farmer groups • Collaboration with village extension workers did not go well, some have not visited and provided supervision to the group • SI have limited budget sources from local government and unable to keep up with the activity and most of the staff activity to support province and national program
8	Capacity building	<ul style="list-style-type: none"> • Lack of SI staff capacity affected SI performance at scaling site groups • UPTD and Dinas Technical staff require regular training to improve skill and confidence to facilitate scaling activities • Frequently changing plan and implementations on SI facilitation • Many SI staff did not understand IVMS components, limited only to planting Leucaena and Sesbania
9	Publication	<ul style="list-style-type: none"> • Should have been more publication of research results • Experience from household and WELI survey, there were many missing data due to incorrect input coding by the enumerators making use of the results for reports. This made publication challenging
10	Project monitoring and evaluation mechanism	<ul style="list-style-type: none"> • Need regular project monitoring and evaluation • Need evaluation between senior team and FO to harmonise perceptions on the implementation activities • Need more regular monitoring and evaluation between Indonesian and Australian team on the progress of the project and to discuss direction of each activity to meet the objectives • Communication on adoption and scaling needed to be conducted more frequently • Communication and direction from Australian coordinator for adoption and scaling needed to be conducted more frequently to implement activities according to research methodology
11	Impacts	<ul style="list-style-type: none"> • Motivation to make more compost to get additional income has not yet been used widely, maybe due to need of quick cash, difficulty in transporting compost and less immediate response of the plant to compost application • Lamtoro beef is well known but has not created a significant impact on cattle sale and price. • Massive promotion has been undertaken of lamtoro beef but not yet able to attract sufficient national interest to fund relevant programs

7.2 Objective 2

Output 2.1: A report recommending the best options for use of local and/or introduced forages and crop by-product resources to improve cut-and-carry beef production by smallholder farmers in KalSel

Activities in Objective 2 over the period of this SRA were undertaken jointly by the ULM project team in close collaboration with BPTP KalSel. They included:

1. Ongoing monitoring of grass development locations developed during 2019 and 2020
2. Coordination with BPTP Kalsel to adapt the IVMS model implemented in NTB for use in South Kalimantan, including:
 - a. Analysing production and quality corn waste from several different varieties;
 - b. Improving breeding cow productivity without adjustment in reproduction period using seasonal feed availability;
 - c. Improving breeding cow and other livestock productivity by utilizing agricultural waste as part of a complete feed and concentrate diet, in particular corn;
 - d. Modification of technology and the formulation of complete feed and concentrate diets, to provide adequate feed in terms of both quality and quantity throughout the year;
 - e. Scaling up products through the use of processing tools;
 - f. Scaling out models of Pulau Sari to other locations;
 - g. Undertaking feed product on-farm trials.
3. Improving a value chain and marketing model by initiating a livestock market in Pulau Sari; and
4. Initiating the improvement of a cultivation group to form corporate farmer groups.

Initially we planned to scale out models of Pulau Sari, which is a mixed model plot of crop-grass-legume. Pulau Sari was designed as the first node while other neighboring locations that were believed to be suitable as the scaling site of this model were explored.

However, climate conditions and difficulties caused by the Covid-19 pandemic meant that other sites supporting plots of crop-grass-legume as implemented in Pulau Sari were not suitable. Plantings of corn, grasses and legumes were well below their potentials. Despite these constraints though, the research nevertheless concluded that this model plot was promising. The research found the mixed cultivation of forage and crop had strong potential to increase the feed supply for beef cattle.

Meanwhile in South Kalimantan Province there is a Program to promote the integration of oil palm and cattle. It is called SSKA KUINTIP (Sistem Integrasi Sawit-Sapi Berbasis Kemitraan Usaha Inti-Plasma or Integration System of Oil Palm and Cow based on Core and Plasm Partnership). This Program is supported by Gubernur Decree No 53/2021 about accelerating beef cattle self-sufficiency through integration of oil palm and cattle. This was aligned with our research activity plans. The plan was to improve breeding cow and other livestock productivity by utilizing agricultural waste as part of a complete feed and concentrate diet. In this case, we used wastes of oil palm and its derived products.

Considering this situation, we then decided to use the program of oil palm and cow integration as the selected option for use of local farmers to improve their beef production. For this purpose, our field visits were then focused on locations where the farmers had plots for raising beef cattle together with oil palm plantations. In that situation, there were three types of oil palm plantation that were combined with cattle production. These were

farmers' self-owned plantations, farmers as the plasm in core-plasm oil palm-cow integrated program, and farmers allowed by the plantation to place their cattle in the firm's oil palm plantation.

1. Ongoing monitoring of grass development locations

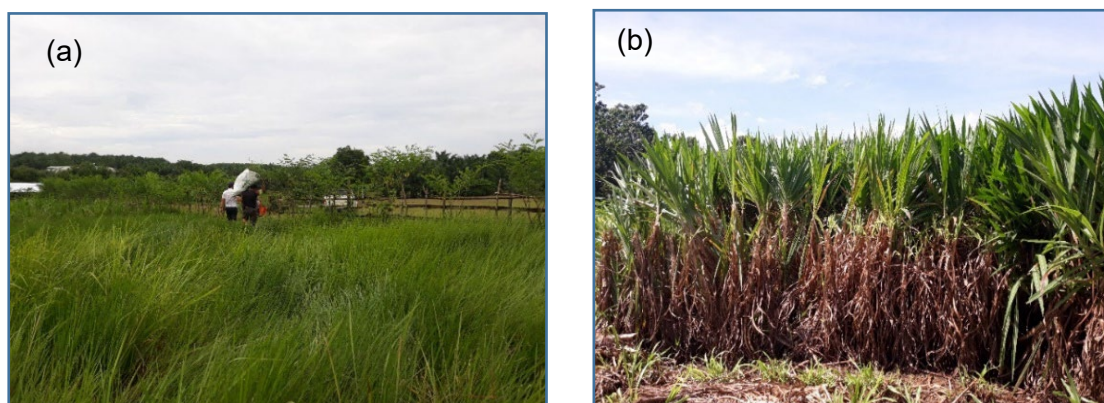
The grass nursery in Pulau sari and Kuringkit has developed very well. The mixed culture system of grass and horticulture commodities has been adopted by many farmers in Pulau Sari. It is estimated that around 40 ha of land is using this culture system (Figure 2.1.1).

Figure 2.1.1. Mixed culture system of grass and horticulture commodities in Pulau Sari village



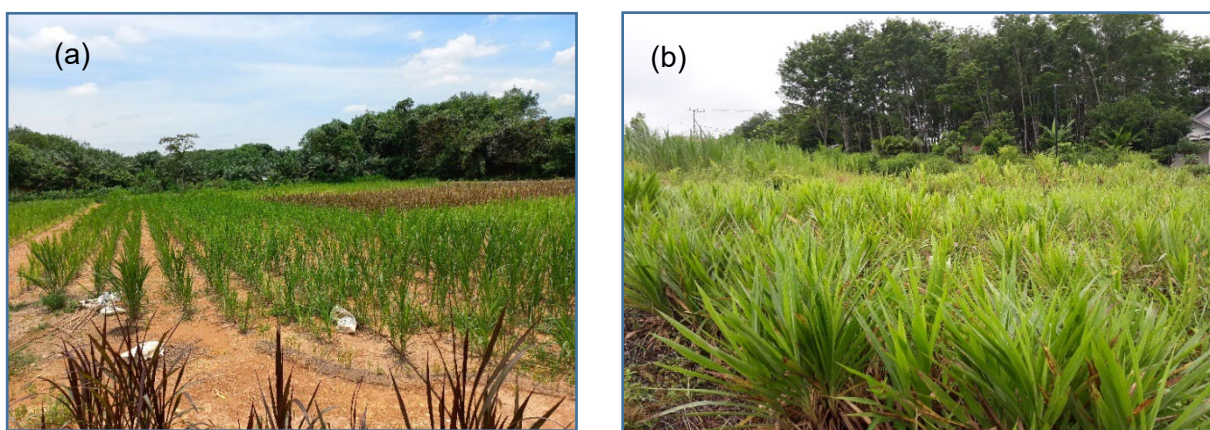
The grass nurseries have generally been well maintained and supply grass seeds for local farmers and others villages. High demand was found for dwarf elephant grass seed that not only fulfilled farmers' needs but also supplied government requests. However, the nursery was not well maintained in Durian Bungbuk village. The farmers' group in Durian Bungbuk leased land for the nursery and thus the sustainability and ongoing development of the nursery is very dependent on the ability of group to prolong the rent.

Figure 2.1.2. The grass nurseries in a) Pulau Sari village and b) Kuringkit village.



The new nursery locations were established in Bingkulu (Figure 2.1.3a) and Pulau Sari (Figure 2.1.3b) villages. In Bingkulu village, the nursery was completed with many grass species and cultivars e.g. red napier grass, Zanzibar napier grass, and Napier Pakchong grass.

Figure 2.1.3. New nurseries were established in a) Bingkulu village and b) Pulau Sari village.



2. Coordination with BPTP Kalsel to adapt the IVMS model implemented in NTB for use in South Kalimantan, including:

a. *Analysing production and quality corn waste from several different varieties*

A study was undertaken to identify optimal levels of organic fertilizer application needed to increase corn production and its by-product nutrient quality. Results are shown in Table 2.1.1 and clearly show that organic fertilizer from decomposed cattle manure increases straw production and quality. However, it was found that the optimum level of cattle manure applications was 5 ton/ha because it results in higher organic matter, increased crude protein and NFE percentages and lower crude fibre content.

Table 2.1.1. Corn straw production and chemical composition at different levels of cattle manure application (DM: dry matter; OM: organic matter; CP: crude protein; CF: crude fibre; NFE: nitrogen-free extract)

Cattle dung levels (ton/ha)	Straw production (DM ton/ha)	Chemical composition (%)			
		OM	CP	CF	NFE
0	18.83	95.82	7.96	33.27	53.78
3	22.78	95.12	8.37	31.73	53.58
4	20.55	95.45	8.53	31.82	53.84
5	20.37	95.98	8.56	31.59	54.49
6	21.58	95.35	8.57	31.56	54.24

The study on corn straw quality was also conducted on 3 commercial corn cultivars, namely Sumo, Perkasa and Super cultivars. Results indicated that nutrient content varied according to cultivar. Sumo cultivar had the highest corn production, producing 12 ton of corn grain/ha. This study clearly demonstrated that good corn straw quality provided good feed for cattle.

Table 2.1.2. Nutrient composition of corn straw (DM: dry matter; OM: organic matter; CP: crude protein; CF: crude fibre; NFE: nitrogen-free extract)

Cultivar	Nutrient content (%)					
	DM	OM	CP	EE	CF	NFE
Sumo	95.08	92.86	9.69	2.24	28.77	52.16
Perkasa	92.81	93.03	8.52	0.59	31.56	52.36
Super	90.03	89.71	9.52	0.51	29.62	50.06

The nutrient quality of the plants changed at each physiology stage. CP decreased and CF increased as plants reached the generative stage. Thus, cultivars that take a longer time to reach kernel maturity have lower straw quality.

Figure 2.1.3. Sampling corn straw and measuring corn straw production



- b. *Improving breeding cow productivity without adjustment in reproduction period using seasonal feed availability;*
- c. *Improving breeding cow and other livestock productivity by utilizing agricultural waste as part of a complete feed and concentrate diet, in particular corn;*
- d. *Modification of technology and the formulation of complete feed and concentrate diets, to provide adequate feed in terms of both quality and quantity throughout the year;*

Feed production was centralized in Pulau Sari village (Budidaya farmer group) for several reasons: i) to increase the effectiveness of use of processing tools; ii) this group was able to operate and maintain the tools needed for feed production; and iii) the feed ingredients needed to undertake the production were available locally.

Two types of feed were produced in Pulau Sari, namely feed concentrate and fermented complete feed. Feed concentrate was formulated based on grain processing by-products, namely rice bran and corn slammer. The CP of feed concentrate ranged from 18-20%. In other cases, the fermented complete feed had lower CP (14-15%) and higher CF (30-45%). This product was mostly composed of corn products (corn straw, corn cob and corn slammer). The ensilage process was applied to increase the digestibility and ensure its quality for storing over periods of more than 3 months. The study on the optimum ensilage time length at different formulation rates is still in progress and involves participation by bachelor students of ULM's animal science study program.



Figure 2.1.4. Ingredients for making fermented complete feed

e. *Scaling up products through the use of processing tools;*

The processing tools in Budidaya farmer group were developed using mechanization for pressing and packaging. Thus, the production capacity was increased while the consistency of product quality was maintained.

Figure 2.1.5. Mixing, pressing and packaging machine for complete feed



f. *Scaling out models of Pulau Sari to other locations;*

Scaling out was carried out through dissemination of technology and other activities in Pulau Sari. Several activities were organized such as training and visiting study and research sites. In 2022, a mining company which visited Pulau Sari copied the activity in Budidaya farmer group for their community service program in Satui, Tanah Bumbu Regency. There were several visits from farmer groups and young agropreneurs organised through a government program to study the project and activity. Some research was also conducted by bachelor students at ULM, who were also involved in a survey study on crop-cattle production systems by researchers from Gadjah Mada University (Indonesia) and Wageningen University and Research (the Netherlands).

g. *Undertaking feed product on-farm trials.*

3. *Improving a value chain and marketing model by initiating a livestock market in Pulau Sari;* and

4. *Initiating the improvement of a cultivation group to form corporate farmer groups.*

Output 2.2: A report examining the success of integrating cattle and crop production in three different agro-ecological zones in KalSel and its impact on cattle turn-off and farmer profitability, including recommendations for other farmers and scaling institutions

Investigations were undertaken on farmers who integrated cattle farming with oil palm production. Although the farmers nominally integrated oil palm and cattle, in their daily activities the two branches of farming were for most farms operated separately, including the financial flow as well as inputs and outputs. They were managed as two separate businesses. The exception to this was in cases where the oil palm plantation was owned by the farmer, and in those instances, the business was managed as a single business.

Farmers in general believed that integration of cattle and oil palm was a mutualistic combination of two businesses, with both farming aspects receiving benefits from their integration. From the 24 respondents who were interviewed, we found that 75% of the respondents benefited from increased cattle feed availability and 70% believed this integration of cattle and oil palm made transactions for cattle easier. They also believed that the security of both their plantation and their cattle increased (35%) and 40% of respondents indicated there were benefits from the integration in terms of land fertility.

Because of the existence of cattle in the plantation area, fertilizer usage could be reduced on average by 2.5 kg per tree each 6 months. Based on the current price of fertilizer of IDR 120,000/kg, the cattle-oil palm integration allows the farmer to reduce his fertilizer costs by up to IDR 60 million per annum. This represents about 49% of their total costs for the oil palm plantation per hectare.

Output 2.3: The successful establishment of nodes and a scaling site in KalSel, with strong linkages to the scaling research being undertaken in NTB

The establishment of the sites (nodes and a scaling site) was based on the integration of cattle and oil palm, with the aim of using the IVMS cattle management system, as it is suitable to be scaled out for the broader community. Each of those sites still need continuous efforts and ongoing facilitation of the farmers and the scaling institutions. The integration of cattle with oil palm was the only system where we were able to identify locations that were both suitable for our aims and were ongoing profitable businesses. The first location was Kelurahan Karang Taruna Kecamatan Pelaihari, where the farmers owned the oil palm plantations that were combined with their cattle. The second site of Jorong Village of Kecamatan Jorong was the site where an oil palm plantation allowed the farmers to place their cattle under a formal agreement. The third location was Tajau Pecah Village Kecamatan Panyipatan, where both cattle and the oil palm plantation were managed under the same management.

7.3 Objective 3

Output 3.1 – Analyse/summarise the findings and lessons from the ARISA beef value chains project in Sumbawa

The findings and lessons learned from the ARISA project included:

- High-end markets for high quality local beef in eastern Indonesia were able to be identified. These included tourist hotels, large restaurants and high-income households. However, the willingness of high-end consumers to pay more was very small. Based on survey results, almost 60% of the high-end consumer respondents indicated they were only willing to pay a premium of a maximum of 10% on top of the beef price at the traditional market, contrary to the results from many international studies, including those based on smallholder farmers and urban consumers in South Africa (Thompson et al., 2010). However, it should also be noted the ARISA survey results were not based on scientifically designed consumer taste panel tests designed to accurately assess consumer perceptions of beef (i.e. beef from traditional markets *cf.* beef that had been processed to meet international standards of beef quality as perceived by consumers). It should also be noted that the willingness-to-pay surveys were also not based on scientifically-designed

- evaluations by consumers who had all had the opportunity to evaluate traditional beef products and the products they were being requested to pay a higher price for.
- It was difficult to link the smallholder cattle producers with these high-end markets. Hotels for example, accepted local beef but they normally paid at least 30 days after the purchase was complete. That payment system did not suit the smallholders who always require an immediate cash payment.
 - Potential finishers of the cattle were identified but none of them ended up being an effective buyer. The constraints faced by those potential finishers included a lack of capital (or lack of access to finance) and the profit margin was considered too small.

Output 3.2 – Engage with a range of beef industry stakeholders in Indonesia and with MLA in Jakarta to identify potential value chain partners who would be interested in co-investing and contributing to a new beef value chain targeting high-end retailers and consumers, with the aim of securing additional funding to test the system and provide proof of concept of the system in NTB

Bali cattle are Indonesia's indigenous cattle breed and they are very well adapted to Indonesia's harsh beef production systems. However, they are often regarded as producing beef that is tough, and therefore inferior, relative to beef from other breeds. Recent research in conjunction with meat scientists from Massey University in New Zealand and the University of New England in Australia has shown that if correct slaughtering and meat processing practices are applied, beef from Bali cattle can deliver tender and tasty beef products that meet the palatability requirements of consumers.

In August and September 2020, and in anticipation of planned consumer taste-panel tests to demonstrate the feasibility of slaughtering cattle from smallholder beef farmers for high quality markets, several Bali bulls that had been fed with leucaena were slaughtered and meat samples were collected and aged for 7, 14 and 21 days. Those samples were analysed to provide a preliminary assessment of food safety and meat quality indicators in those bulls, relative to imported beef. The results are summarised in Table 1. All beef quality indicators suggest the beef from the Bali bulls was comparable in terms of tenderness attributes to the imported Brahman cross beef.

Table 3.2.1 summarises the improvement of quality of the quality assured Bali beef as a result of improved slaughtering methods and post-mortem ageing of the beef.

Table 3.2.1. Microbiological, physical and chemical characteristics of special Bali Beef relative to beef from traditional markets and imported beef

Variable	Beef from leucaena fed bulls, aged 7, 14 and 21 days			Beef from traditional abattoir	Imported beef (Brahman cross)	P value
	7	14	21			
Total plate count (CFU/gram)	700.00 ^a ± 846.2	1116.66 ^a ± 1273.5	916.67 ^a ± 1756.6	3350.00 ^b ± 1883.4	416.67 ^a ± 263.9	0.007**
Number of <i>E.coli</i> (CFU/gram)	1.50 ± 0.84	1.60 ± 0.49	0.83 ± 0.41	2.00 ± 0.89	0.81 ± 1.17	0.078
No. Salmonella	0	0	0	0	0	n/a
pH	5.62 ± 0.09	5.60 ± 0.10	5.58 ± 0.11	5.54 ± 0.30	5.66 ± 0.12	0.770
Tenderness (kg/cm ²)	4.21 ^{ab} ± 0.45	3.61 ^a ± 0.29	3.84 ^a ± 0.36	4.65 ^b ± 0.79	3.62 ^a ± 0.71	0.014**
Water Holding Capacity (%)	30.02 ± 0.54	30.22 ± 0.92	30.35 ± 1.13	30.18 ± 1.19	31.66 ± 1.44	0.094
Protein content (%)	24.08 ^a ± 1.35	23.79 ^a ± 1.63	23.16 ^a ± 0.67	23.61 ^a ± 1.04	27.55 ^b ± 1.63	0.000**
Fat content (%)	1.65 ^{ab} ± 0.75	1.90 ^b ± 1.05	1.11 ^{ab} ± 0.59	0.85 ^a ± 0.57	3.69 ^c ± 0.70	0.000**
Cholesterol (mg/100gr meat)	228.55 ± 41.5	236.7 ± 47.6	206.86 ± 59.9	160.87 ± 39.9	201.95 ± 57.8	0.111

^{a,b,c} Means in the same row with different superscripts differ significantly (P < 0.05)

This project therefore explored options to develop an entirely new value chain based on cattle from smallholder farmers supplying beef to the high-end hotels and restaurants servicing the hospitality and tourism industries in eastern Indonesia. The aim would be to brand the beef as high quality (as perceived by consumers), healthy (based on levels of microbial contamination of the beef) and halal-compliant beef that is produced by smallholder farmers using indigenous cattle. The brand name ‘Special Bali Beef’ was widely used to describe such beef products, as part of a national pilot project to describe beef from Bali cattle raised by smallholder farmers and fattened on a leucaena-based diet. The ‘Special Bali Beef’ branding is led by the Directorate of Animal Products, Processing and Marketing of the DGLAHS in the Indonesian Ministry of Agriculture.

‘Special Bali Beef’ is based on beef from Bali cattle with specific management and feeding of the animals and processing of the carcass and beef to improve its eating quality. Since July 2020, the project team has undertaken a series of activities designed to demonstrate the quality of the beef derived from cattle in smallholder farmer herds and to promote the concept amongst senior government officials including the Minister of Agriculture, all Directors General, all Directors and relevant staff from the Ministry of Agriculture in Jakarta, the Governors of several provinces, Heads of Dinas Peternakan and relevant officers at provincial and district level as well as representatives of banks and private sectors related to agricultural support. Additionally, educational opportunities were provided for government and private sector participants using virtual (on-line) webinars, which were very successful. The project also engaged with a wide range of beef industry stakeholders in Indonesia to identify potential value chain partners interested in co-investing and/or contributing to the proposed new beef value chain targeting high-end retailers and consumers to provide proof of concept of the system in NTB.

The ‘Special Bali Beef’ program achieved very strong and vocal support from both the Indonesian Minister for Agriculture and the Governor of NTB, beginning with a beef tasting demonstration of ‘Special Bali Beef’ at the Mandalika Hotel in Central Lombok in

August 2020. The event was attended by more than 100 participants, including the Minister of Agriculture, all Directors General and senior representatives of a wide range of government and private sectors. A team of experienced chefs prepared the beef steaks according to hotel hospitality standard. The Minister and the Governor publicly supported the further development of this 'Special Bali Beef' as a national beef brand. Furthermore, the Minister instructed all Directors General to follow up the development of this beef especially in NTB. The Minister's and Governor's public endorsement of 'Special Bali Beef' is available at: <https://www.youtube.com/watch?v=TolTdTshZmM>

Following that event, numerous additional formal meetings and informal discussions (via the *IndoBeef* WhatsApp group) continued to generate and improve local government and private sector support for the further development of the 'Special Bali Beef' brand. Project researchers followed up with a "*Branding and Marketing Strategies for 'Special Bali Beef'*" webinar in September 2020 for around 100 participants. The webinar had the dual aims of: a) disseminating results of studies on beef quality; and b) seeking agreement on the next steps to develop a 'Special Bali Beef' brand of beef that could supply high-end hospitality markets in Indonesia. A further very successful, full-day workshop and business meeting aimed at strengthening the local beef supply chain occurred in June 2021, with participants including a range of potential value chain partners such as meat processors, retailers and hospitality venues who were supportive of the ongoing development of the new beef value chain. 'Special Bali Beef' was also highlighted on several occasions during the 4th International Seminar on Livestock Production and Veterinary Technology on 6-7 September, where the Minister for Agriculture was again the Keynote Speaker (<http://peternakan.litbang.pertanian.go.id/intsem/home>).

Despite all the interest in development and support of the new beef value chain, no firm commitment was given by any private sector partner in investing in development of the new market and value chain. Yet commitment from modern beef processing facilities and, if the processors are not prepared to purchase the cattle from the farming sectors themselves, of cattle buyers (off-takers) will be critical to the establishment of a new and viable beef value chain.

Due to the difficulties in attracting big companies to develop and market the quality assured Bali beef, the project facilitated a start-up restaurant in early 2021 to sell wet aged Bali beef. While this beef was not able to be processed using many of the internationally accepted standards of quality assurance, ageing of the beef does improve both the tenderness and food safety of the beef relative to beef from traditional abattoirs. Many stakeholders (researchers, government officials and business people) have visited this small restaurant and provided favourable comments. In January 2022, the start-up transformed to a more modern restaurant (see <https://g.co/kgs/mYe2FE>). The volume of beef sold is still very small (about 50 kg/month) but it has the potential to expand with repeat customers satisfied with the beef quality. This restaurant has been an active show window for quality-assured Bali beef. The most recent coverage was by Technology Indonesia (<http://technology-indonesia.com/pertanian-dan-pangan/meathyme-sajikan-steak-dari-daging-sapi-lokal-kualitas-premium/>) facilitated by BPTP NTB and the Indonesian Agency for Agricultural research and Development (AARD), Ministry of Agriculture Republic of Indonesia.

Output 3.3: A report on the findings from the visit by value chain representatives and researchers to learn about how the MSA scheme might be adapted for implementation in NTB/Indonesia

The visit by Indonesian value chain representatives to Brisbane to learn about Meat Standards Australia (MSA) and to visit suppliers of MSA-graded beef was initially planned to occur in May 2021. However, travel restrictions due to Covid-19 meant that planning for the visit was deferred in favour of greater emphasis on the workshops and forums outlined in the previous section, with the aim of securing commitment from potential investors in the proposed new beef value chain. In the absence of commitment from such investors, the visits did not proceed.

Output 3.4: A report outlining recommendations on the next steps to development of a quality-assured voluntary meat grading scheme in NTB, together with roles and responsibilities of personnel assigned to act on those next steps.

Given the current reluctance of potential commercial investors to invest in the proposed quality-assured beef value chain based on Bali cattle produced by smallholder farmers, a post-graduate student aligned with the project is now enrolled in research through UNE and aimed at identifying the steps needed to develop a “Beef Standards Indonesia” (BSI)-certified grading scheme modelled on the MSA scheme in Australia and which would underpin a digital marketing system for quality-assured beef. The first step in his research is to examine in detail the changes that will be needed in each value chain sector. As a starting point, he is using the map of existing Indonesian beef value chains shown in Figure 3.4.1 and then comparing that figure with a map of the proposed new BSI-certified value chain shown in Figure 3.4.2.

Figure 3.4.1. Map of existing Indonesian beef value chains (Waldron et al., 2016)

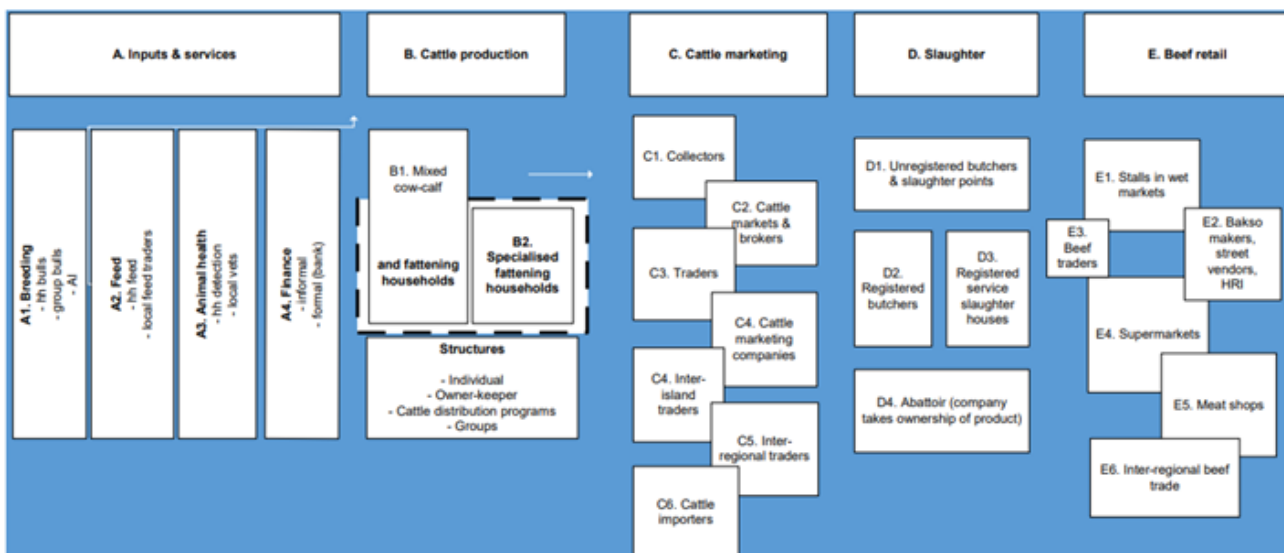
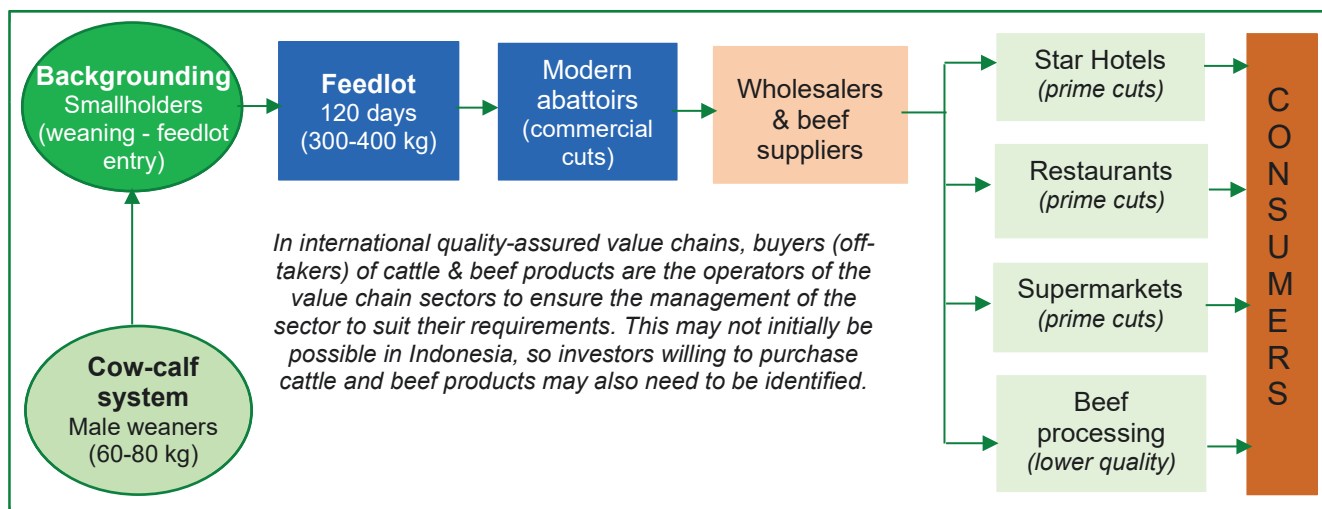


Figure 3.4.2. Proposed supply chain for high quality local beef (note that the supply chain for lower quality beef from traditional markets as shown in Figure 1 will not change directly as a result of the proposed new supply chain for quality-assured beef)



Even a very cursory examination of Figures 1 and 2 indicates there are major changes required at most sectors of the proposed new beef value chain, except for the farmer-led cow-calf and backgrounding sectors, where the farmers are already able to produce beef that will meet the specifications of a quality-assured value chain. However, even the farmers will likely need to make changes to the way in which they sell their cattle, because it is extremely likely that commercial value chain partners such as feedlots, abattoirs and wholesalers will require a record of financial transactions, meaning the farmers may need to establish bank accounts so a record of such transactions is available. Additionally, the farmers may need to change the way in which their cattle are transported to ensure beef quality is not impacted by poor handling and/or mixing of strange cattle just prior to slaughter.

It is therefore recommended the next steps to development of a quality-assured voluntary meat grading scheme should include:

- The UNE post-graduate student continues his detailed evaluation of changes needed at all sectors of the proposed beef value chain, with the aim of modelling those changes from an economic perspective based on actual cattle production data (from past research projects in NTB) and simulated data across the potential range of values for the new value chain sectors and recommending solutions to the challenges that he identifies through his research (persons responsible: Naufal Armanditya, co-supervised by Rene Villano, Heather Burrow, Peter McGilchrist and Tanda Panjaitan).
- The NTB-based project team continues their efforts to secure commitment from potential private- and government-sector investors to develop the proposed new value chain in NTB. This engagement would be underpinned by results of the economic modelling and ex-ante analyses presented to the different value chain sector stakeholders. The aim of the stakeholder consultation would be two-pronged: i) to refine the parameters associated with the performance analysis of the whole value chain; and (ii) to draw the attention and commitment of potential private- and government-sector investors to develop and establish the new value chain in NTB.
- If investors are unable to be identified within NTB, another possibility that could be worth exploring might be to seek co-investment from Australian partners with

established interests in the commercial feedlot sectors in Indonesia, who would likely focus on supplying product primarily to high-end consumers in urban areas such as Jakarta. Australian partners would likely recognise strong benefits for their own organisations through development of quality-assured markets that grade their beef products through a BSI-certified grading scheme. However, there are unlikely to be significant benefits for smallholder farmers in NTB, at least in the initial stages of the scheme. Once proof-of-concept was demonstrated for example in Java and parts of Kalimantan and/or Sumatra, it might then make it easier to identify investors interested in developing new facilities in eastern Indonesia.

- Once potential new investors have been identified and appropriate facilities and linkages between value chain sectors established, the process thereafter would be relatively straightforward. The MSA team from Meat and Livestock Australia (MLA) could be engaged in collaboration with Associate Professor Peter McGilchrist from UNE to undertake appropriately designed consumer taste panel tests of a wide range of consumers in Indonesia (Indonesians as well as visitors to Indonesia) to determine unique factors that would need to be addressed by a BSI-assured grading scheme, relative to international standards. This process is outlined by Thompson et al. (2010) based on an earlier ACIAR-funded project (LPS/2008/013).
- Thereafter, a process of ongoing monitoring and evaluation of compliance to the grading scheme would be implemented by the value chain partners, probably in conjunction with an Indonesian government agency. This system would evaluate the ongoing success of the scheme in delivering beef that meets the food safety, high quality and Halal-assurances required by high-end beef consumers in Indonesia. MLA's on-the-ground team based in Jakarta would likely strongly support such an initiative and provide ongoing guidance to the Indonesian agencies responsible for implementation.

7.4 Objective 4

Output 4.1: A detailed report describing the socioeconomic characteristics of smallholder farmer households in NTB and KalSel and their production capacity and motivation to increase productivity and/or their scale of production, ultimately resulting in peer reviewed publication(s) in an international journal(s)

Outputs and lessons learned

- Farm-level data collected from KalSel (n = 260) and NTB (500) were checked, edited and analysed. Using descriptive analytics, basic socio-economic characteristics of farmers in these study sites were compiled in a report.
- The majority of the farmer respondents in both provinces were male and relatively young adults.
- Farmers were characterised by diverse characteristics in terms of their socio-economic background, ethnicity, language, religion and educational attainment. These diversities were more pronounced in NTB province and sampled districts.
- Household assets and landholdings were often used as indicators of wealth of the households and they were captured in the nature of dwellings of households as well as ownership of productive and non-productive assets. Around 96.7% of respondents inhabited their own homes; 2.1% lived in borrowed homes with no payment; and 1.0% across the board lived in other residential arrangements and in

rented houses. Most respondents reported assets including transportation-related, information-based and agriculture-associated implements such as water pumps, farm tools and tractors.

- As expected, 64% of the respondents indicated farming was their main source of employment, and hence income. Wage labour, self-employment and salaried worker were some other secondary sources of employment.
- Most households (84%) were owner-operators of their lands, with 38% having obtained their lands through purchases while others accessed their lands through government grant, leasehold and communal land. Most land titles (56%) were under a single land title ownership and only approximately 2% were owned solely by females.
- Consideration and understanding of the diverse nature of the socio-economic backgrounds of farmers in the study area are requisites for upscaling proven production and market-based innovations and technologies. Given the heterogeneity of farmers, there is a need to consider potential adopters, their socioeconomic and biophysical realities and the different characteristics of technologies be considered.

Output 4.2: A detailed report which identifies the economic and livelihood benefits of integrating crop and cattle production amongst smallholder farming systems. The report will also be adapted to ensure its suitability for extension purposes and use by the scaling nodes and sites in both NTB and Lombok. In addition, a video of the livelihood resilience conferred by cattle systems to communities in times of major economic or natural disruptions will be produced.

Outputs and lessons learned

- Quantitative indicators of adoption were obtained using farm-level household data. The focus was to examine the socio-economic characteristics of farmers as outlined and identified in Objective 4.1. The micro-econometric analysis available at the end of the project is preliminary and a full report is still being prepared.
- Drivers of adoption of various IVMS components were modelled using micro-econometric approaches. The initial findings indicate the importance of various factors such as socio-cultural, financial, physical and farm-level characteristics as well as demographic and human characteristics.
- The modelling was conducted in multiple stages. First, the determinants of each IVMS component (vis-à-vis, supplementary feeding, weaning, AI, body condition scoring, vaccination and weighing) were considered. In the second stage, consideration of adoption of multiple components were examined. Finally, the determinants of the number of components adopted by individual farmer-households were examined.
- In KalSel, access to information, credit and non-farm income sources were important drivers of the different components, particularly supplementary feeding, vaccination and weaning. Semi-intensive farming systems were likely to engage in natural reproduction systems. The results resonate when considering the number of components identified.
- In NTB, being a member of a farmer group, having sources of agricultural information and access to credit were associated with increased adoption of different components of IVMS. The results were mixed in the context of different

farming systems, where semi-intensive farming was unlikely to engage in supplementary feeding and body scoring.

- The results of micro-econometric modelling of adoption decisions demonstrated key lessons including:
 - There is a need to model the different stages of adoption of IVMS or any production-based or market-based innovations at different stages of the adoption process. There was evidence that adoption decisions were not instantaneous but followed a multiple stage, such as awareness, non-trial evaluation, trial evaluation (or experimentation), adoption and revision (re-evaluation). Understanding the impacts of different drivers at each stage is imperative in designing appropriate intervention and extension policies.
 - Farmer respondents were heterogenous, as evidenced by the diversity of background of the respondents in terms of ethnicity, language, education and social and economic status. However, our evidence was inconclusive and indicated the lack of clarity on the impacts of these variables in the adoption of technologies. Therefore, it is imperative to further consider the heterogeneity of potential adopters, their socio-economic and biophysical characteristics, along with the features of the technologies being considered.
 - Farmer groups played an important role in the adoption of technologies. As farmers consider new technology with a degree of uncertainty and reservation, the role of learning from extension agents, social networks, input providers, and other farmers were important considerations. From a methodological perspective, it is important to consider the role of information provision and other activities by technology suppliers, be it private, public, government or non-government entities. For example, the use of marketing tools by those entities is likely to increase adoption.
 - The role of women in adoption decisions was also considered, but the results are mixed, implying the need for further investigation and in-depth understanding of gender roles at different stages and parts of the supply chain. As access to credit plays an important role, elimination of discrimination of women's access to credit, ownership of resources and access to activities should be considered as matters of priority.
 - The analysis is only based on cross-sectional data and hence does not consider the dynamic process of adoption. There is evidence in the literature that diffusion of technology is likely to be more rapid where technology is more beneficial or less costly and where farmers are able to evaluate its performance and where farmer networks are stronger. There is a need to also consider this in ongoing analyses of our data.
 - In our empirical analysis, we have only considered the drivers of adoption based on the past and current adoption decisions. There is a need to design a framework to allow prediction of adoption decisions. This could involve consideration of multiple decision criteria or alternately a framework that will predict adoption decisions and technology diffusion within a particular group of farmers, accounting for the relative benefits of technology for that group of farmers, the learnability and adaptability of the technology and the capacity and capability of farmers to learn. An expanded capacity to predict adoption decisions, both at the farmer and community level would increase the return to any policy, research or extension efforts and could assist in the selection of appropriate policy mechanisms for agricultural programs. An example, is to

- adapt the Smallholder Adoption and Diffusion Outcome Tool (Smallholder ADOPT (Llewellyn and Brown, 2020).
- The current findings around farm-household decision making did not have conclusive (nor sufficient) data and evidence to effectively differentiate the types of farm households, albeit we found there was a significant role of social factors and networking variables. There was also evidence that technologies such as IVMS have been dis-adopted and only partial components have sustained adoption outside the immediate program or project areas, even if they have demonstrated potential to improve productivity, profitability and farm-household incomes. In order to improve the understanding of the behavioural mechanisms of decision-making related to technology adoption, it is important for us to consider the integration of adoption research with behavioural economics, which will allow us to evaluate the role of human cognition and the manner in which tastes and preferences are formed to drive decision-making. Cognitive factors may include the use of shortcuts, reliance on biases and stereotypes, self-control problems and social preferences. Moreover, the roles of personality and self-efficacy among others, are worthy of consideration. The profiling of farm households (or main decision-makers) based on a set of behavioural and psychological constructs will allow us to identify what specific behaviours and bottlenecks are leading to, or constraining, the adoption/dis-adoption outcomes and examine their implications for extension and intervention designs. In a similar project in South Africa, (ACIAR-LS-2016-276), the behavioural profiling allowed us to obtain three profile of farmers and highlighted the ability of farmers to control and succeed in businesses. A similar survey in Indonesia would provide further behavioural insights into understanding farmer decision-making process.

Additional research in this component of the project identified the key drivers of adoption of the various components of IVMS by the farmers. Those drivers are summarised in the following tables.

Table 4.2.1. Drivers of diversity in IVMS adoption (using a count of all systems; 1 = supplementary feeding, 3 = natural mating, 4 = Artificial Insemination)

VARIABLES	(1) Full	(3) KALSEL	(4) Lombok/Sumbawa
<u>Socio-cultural</u>			
Farmer group member	0.248*** (0.068)	-0.085 (0.167)	0.195 (0.120)
Agric info	0.041 (0.060)	0.154 (0.167)	0.075 (0.093)
Muslim	-0.038 (0.134)		-0.125 (0.144)
<u>Financial</u>			
Access to credit	0.106* (0.063)	0.642*** (0.156)	0.085 (0.098)
Wealth index	0.023 (0.020)	0.061 (0.089)	0.031 (0.025)
Non-farm	0.178* (0.096)	0.222 (0.212)	0.477*** (0.138)
<u>Physical/farm-level</u>			
Mobile phone	0.011 (0.093)	-0.488** (0.196)	0.032 (0.322)
Land owned by house	-0.149 (0.098)	0.026 (0.255)	-0.126 (0.123)
Semi-intensive system	-0.175** (0.070)	-0.060 (0.222)	-0.245** (0.110)
Extensive system	-0.309*** (0.080)	-0.237 (0.356)	-0.415*** (0.127)
Farm labour	0.018** (0.008)	0.002 (0.023)	0.007 (0.010)
<u>Demographics/human</u>			
Age	0.032** (0.014)	0.054* (0.032)	0.022 (0.022)
Age squared	-0.002** (0.001)	-0.003** (0.001)	-0.001 (0.001)
Female	-0.035 (0.091)	-0.229 (0.166)	0.066 (0.157)
Educational level	0.012 (0.007)	0.036 (0.025)	0.014 (0.011)
Household Size	0.001 (0.024)	0.072 (0.061)	0.007 (0.041)
Kalsel	-0.488*** (0.095)	—	—
Lombok/Sumbawa	0.028 (0.077)	—	—
Constant	1.723*** (0.405)	0.121 (0.929)	2.077*** (0.589)
Observations	1,069	221	427
R-squared	0.096	0.169	0.083

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4.2.2. Drivers of IVMS adoption (Full sample): Probit models : KalSel

VARIABLES	(1) Supp. Feed	(2) Weaning	(3) Natural	(4) AI	(5) Body score	(6) Vaccination	(7) Weighing
<u>Socio-cultural</u>							
Farmer group member	0.003 (0.067)	-0.050 (0.076)	-0.026 (0.056)	-0.012 (0.037)	-0.033 (0.041)	0.042 (0.067)	
Agric info	-0.024 (0.072)	0.045 (0.079)	-0.088 (0.060)	0.016 (0.039)	0.079* (0.046)	0.121 (0.076)	
<u>Financial</u>							
Access to credit	0.139** (0.060)	0.129* (0.069)	0.094 (0.058)	-0.056 (0.040)	0.163*** (0.046)	0.214*** (0.065)	
Wealth index	0.067** (0.034)	0.018 (0.040)	0.038 (0.030)	-0.049** (0.023)	0.024 (0.021)	-0.047 (0.038)	0.001 (0.001)
Non-farm	0.119 (0.075)	-0.031 (0.095)	-0.072 (0.078)	0.188** (0.082)	-0.022 (0.052)	0.075 (0.084)	
<u>Physical/farm-level</u>							
Mobile phone	-0.024 (0.079)	-0.055 (0.100)	-0.104 (0.091)	0.064 (0.069)	-0.198** (0.086)	-0.316*** (0.104)	
Land owned by house	0.102 (0.107)	0.154 (0.134)	-0.041 (0.106)	-0.072 (0.073)	0.186** (0.077)	-0.254* (0.137)	
Semi-intensive system	0.025 (0.089)	-0.025 (0.100)	0.196*** (0.072)	-0.125** (0.049)	-0.075 (0.063)	-0.073 (0.099)	
Extensive system		0.082 (0.240)	-0.015 (0.194)	-0.075 (0.121)		-0.033 (0.225)	
Cost of labour	0.004 (0.009)	-0.004 (0.011)	0.001 (0.009)	0.009 (0.008)	0.004 (0.005)	-0.007 (0.011)	
<u>Demographics/human</u>							
Age	0.008 (0.014)	0.020 (0.019)	-0.022* (0.012)	0.026*** (0.008)	0.019 (0.012)	0.032* (0.017)	0.001 (0.001)
Age squared	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.003*** (0.001)	-0.001 (0.001)	-0.002* (0.001)	0.001 (0.001)
Female	-0.157** (0.077)	-0.068 (0.081)	0.011 (0.059)	0.032 (0.043)	-0.084* (0.051)	0.001 (0.075)	
Educational level	0.025*** (0.008)	-0.011 (0.010)	-0.001 (0.007)	0.005 (0.004)	0.003 (0.005)	0.013 (0.010)	0.001 (0.001)
Household Size	0.032 (0.021)	-0.013 (0.026)	0.006 (0.022)	-0.002 (0.013)	0.026* (0.015)	0.033 (0.024)	0.001 (0.001)
Observations	216	221	221	221	216	221	35

Table 4.2.3. Drivers of IVMS adoption (Full sample): Probit models: Lombok & Sumbawa

VARIABLES	(1) Supp. Feed	(2) Weaning	(3) Natural	(4) AI	(5) Body score	(6) Vaccination	(7) Weighing
<u>Socio-cultural</u>							
Farmer group member	0.006 (0.051)	0.018 (0.032)	-0.056 (0.067)	0.023 (0.071)	0.062 (0.040)	0.139** (0.068)	0.010 (0.015)
Agric info	0.079** (0.039)	-0.013 (0.025)	0.341*** (0.051)	-0.309*** (0.054)	0.057** (0.027)	-0.105** (0.051)	0.018 (0.013)
Muslim	0.037 (0.064)	-0.099*** (0.031)	-0.092 (0.081)	0.078 (0.085)		-0.001 (0.076)	-0.025 (0.017)
<u>Financial</u>							
Access to credit	0.085** (0.042)	-0.015 (0.025)	0.038 (0.054)	-0.106* (0.057)	0.050** (0.025)	-0.007 (0.054)	0.035** (0.016)
Wealth index	0.004 (0.011)	0.001 (0.006)	-0.020 (0.014)	0.031** (0.015)	0.013** (0.007)	-0.005 (0.014)	0.006* (0.003)
Non-farm	0.229** (0.090)	0.003 (0.041)	0.239*** (0.093)	-0.044 (0.088)	-0.013 (0.043)	0.144 (0.088)	0.028* (0.017)
<u>Physical/farm-level</u>							
Mobile phone		0.132 (0.118)	-0.282 (0.252)	0.106 (0.296)		-0.345 (0.268)	0.045 (0.039)
Land owned by house	0.045 (0.051)	-0.073*** (0.028)	0.123* (0.069)	-0.201*** (0.073)	0.015 (0.035)	-0.040 (0.069)	0.002 (0.017)
Semi-intensive system	-0.173*** (0.045)	-0.003 (0.027)	0.116** (0.059)	-0.059 (0.061)	-0.072** (0.028)	-0.017 (0.057)	-0.017 (0.014)
Extensive system	-0.164*** (0.054)	-0.053 (0.043)	-0.001 (0.068)	-0.052 (0.073)		-0.038 (0.070)	-0.027 (0.022)
Cost of labour	0.020* (0.011)	-0.004 (0.005)	0.001 (0.009)	0.004 (0.010)		0.003 (0.009)	
<u>Demographics/human</u>							
Age	-0.006 (0.011)	0.002 (0.005)	-0.013 (0.014)	0.020 (0.015)	0.012* (0.007)	0.005 (0.015)	0.009* (0.005)
Age squared	0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002** (0.001)
Female	0.046 (0.080)	-0.014 (0.051)	0.103 (0.091)	-0.168* (0.094)		0.179* (0.096)	0.010 (0.021)
Educational level	-0.001 (0.005)	-0.001 (0.003)	0.004 (0.006)	-0.001 (0.006)	0.003 (0.002)	0.009 (0.006)	0.002 (0.001)
Household Size	0.020 (0.017)	0.011 (0.010)	0.056** (0.024)	-0.038 (0.024)	-0.027** (0.013)	-0.016 (0.021)	-0.003 (0.005)
Observations	424	427	427	427	270	427	408

Output 4.3: A detailed value chain development plan including goals, benefits, challenges, activities and a time scale needed to establish a new beef value chain supplying beef from smallholder farmers in NTB to high-end markets in Indonesia.

As outlined in Objective 3, it was not possible during this project to identify private- or government-sector investors willing to develop the proposed new value chain in NTB. Hence it was difficult to understand the incentives and drivers that would be important to new investors. It was also difficult to undertake an economic evaluation of the proposed value chain as both costs and returns on investment will vary significantly depending on the number of cattle slaughtered per week, the volumes of beef sold, the distance to

markets and a range of other variables. Hence a post-graduate student enrolled at UNE has been engaged to undertake research aimed at simulating a range of possible scenarios, based on a detailed evaluation of changes that will be needed across all sectors of the current beef supply chains in NTB to the proposed new beef value chain. He will model those changes from an economic perspective based on actual cattle production data from past research projects in NTB and simulated data across the potential range of values for the new value chain sectors. Ongoing attempts to secure commitment from potential investors to develop the new value chain will be underpinned by the student's results of the economic modelling and ex-ante analyses based on the different value chain sector stakeholders.

Despite not being able to undertake a detailed plan of the actual value chain proposed for NTB, research by a PhD.I student associated with the project did undertake a detailed and directly-relevant evaluation of "A system for driving innovation enhanced business models in the Indonesian smallholder cattle value chain." The abstract from the student's final portfolio is copied below.

Increasing demand for beef in Indonesia is reflected in heightened policy emphasis on domestic production. Local cow and calf production is being supported by a number of government programs. The great majority of Indonesian beef production, and cows and calves in particular, is in the hands of smallholder producers. A variety of constraints, however, limit the extent to which smallholders are accessing and using improved management and marketing approaches. Smallholder producers are a diverse group, thus advancing their participation in the value chain is likely to require a variety of approaches. The current study discusses these constraints and proposes changes that will accelerate the future uptake of new management approaches and technology. This study therefore aims to produce a positive impact on the livelihoods of smallholder beef farmers through innovation interventions that help overcome constraints to economic progress. It identifies distinguishing features of smallholder producers by characterising these features in terms of business models — a process of identifying and actioning change to improve profitability for smallholder beef producers — and presents the identified business models as innovation-based mechanisms for engaging beef smallholders to improve their operational efficiency. This allows for effective targeting of innovation interventions according to needs and aspirations, rather than taking a broad-brush approach. Theories of business models are synthesised to provide an empirical classification method, identifying value proposition, value architecture and financing mechanism. Therefore, the innovation project describes a system for driving innovation enhanced business models in the Indonesian smallholder cattle value chain.

A survey of smallholder beef producers was conducted in two districts of the Indonesian island of Sumbawa in Nusa Tenggara Barat Province. Data collected included: households' production and marketing systems and performance; indicators of innovations; and intentions about implementing innovations. The innovations are then used to cluster smallholder producers. Alignment between observed innovation behaviour and the essential elements of business models allows identification of three distinct business models currently being applied by the smallholders. Those business models offer different entry points for extension services, and for technology adoption to address business model-specific constraints. The innovation is designed to serve smallholder farmers and is facilitated by policy and assistance from the Government of Indonesia, extension and government agencies, and buyers of cattle to facilitate farmers' practice

change. An *ex-ante* simulation model is used to project gains in smallholder production and profits, associated with management and marketing change appropriate to the separate models. This is an alternative mechanism to the feedback mechanism from smallholder farmers, which could not be implemented due to mobility restrictions during the Covid-19 pandemic. The *ex-ante* simulation model is employed to project benefits from adoption scenarios for targeted business models, avoiding expensive and inefficient more generalised extension solutions. The *ex-ante* has provided evidence regarding each business model: one business model does not include sales of animals, and this might be avoided by buyers and by extension agencies trying to commercialise smallholders. The *ex-ante* simulation, therefore, can also offer some insight to the interests of those users — extension and government agencies, and buyers of cattle, and the results have been discussed with representatives of advisory services and government agency. Those users should be able to use the study's results about the innovation project and around interventions that lead to improvements in productivity. These actors could scale up interventions and generate further impacts.

The context-based research presented in this study and its findings make important and original contributions to knowledge of business organisation theory, in four key ways. First, we observed innovation via a survey of small farmers. Second, we used these innovations to identify business models. Third, we demonstrated how business models can be used to make considerable progress towards achieving the objectives of national policy, including the promotion of market-oriented farming, the promotion of innovation and the improvement of the organization and livestock integration. Fourth, understanding the behaviour of interested parties when promoting innovation will (a) help establish the business models by overcoming constraints, and (b) make the business models more productive by boosting adoption.

7.5 Objective 5

Output 5.1: WELI survey data collection completed amongst at least 200 selected farmers and market chain participants in NTB and KalSel

- Surveys were undertaken using the Women's Empowerment in Livestock Index (WELI) tool which was modified by ILRI from the initial Women's Empowerment in Agriculture (WEIA) tool developed by IFPRI.
- Household level data from 500 respondents in NTB and 254 respondents in KalSel were collected, edited and analysed. The survey was conducted for male and female respondents in randomly selected households.
- A carefully designed survey instrument (WELI) adapted from ILRI was used to elicit information regarding the different dimensions in livestock production focusing on areas such as animal health, breeding and feeding and on use of livestock products, such as animal-source-food processing and marketing.

Output 5.2: A detailed report on areas of inequity that impact on women farmers and market chain participants in NTB and KalSel, together with recommendations on possible ways to overcome these inequities, ultimately resulting in peer review publication(s) in an international journal(s)

Outputs and lessons learned

- Results of analysis using the WELI data have been presented in scientific publications and presented at international conferences. The papers are under review by relevant journals, while others are being finalised for submission (see list of project publications in Section 9.2).
- The focus of Paper 1 is on the use of the WELI data, which was prepared as the first empirical application of the use of this instrument in the Asian region.
 - The paper was selected as part of the Gender Stream of the 66th Annual Australasian Agricultural and Resource Economics Conference.
 - The purpose of the paper was to measure women's empowerment in the livestock sector of Indonesia. Farm-level surveys were conducted in selected districts in West Nusa Tenggara (NTB) and South Kalimantan, Indonesia. Information from women respondents was extracted to generate the index encompassing decisions about agricultural production; decisions related to nutrition; access to and control over resources; control and use of income; access to and control of opportunities; and workload and control over own time.
 - Using the threshold of 0.80, overall, 3.6% of the women respondents considered themselves empowered in livestock production, while 33.34% were considered empowered in overall agricultural production systems. We observed that women's empowerment in livestock was highest in Sumbawa in NTB (5.7%), followed by South Kalimantan (4.6%) and Lombok (1.1%).
- The focus of Paper 2 was using the WELI data and initial analysis to investigate possible areas correlated to the estimated measures of empowerment and selected welfare indicators, as obtained in Objective 4.1. In the absence of quantitative measures of welfare, we used an alternative and subjective measure using life satisfaction scale.
 - This paper was selected as part of the Gender Stream of the 66th Annual Australasian Agricultural and Resource Economics Conference. Currently it is under review in the Journal of Development Studies.
 - It examines the link between women's empowerment in livestock and life satisfaction in Indonesia, using data collected from 239 women operating in integrated crop-cow farming systems.
 - Women's empowerment was measured using the multidimensional women's empowerment in livestock index. Life satisfaction was captured using three separate indicators from that survey that provided an overall score of life satisfaction with reference to different time horizons.
 - Employing a suite of micro-econometric methods, our endogeneity-corrected results indicated that women's empowerment in livestock was positively associated with life satisfaction. This result was consistent across alternative measures of life satisfaction and robust to different approaches used in addressing endogeneity. The biggest effect of women's empowerment on

- subjective wellbeing was when women's empowerment was projected on life satisfaction within the past five years.
 - Among all empowerment indicators, women's ownership and control of livestock assets showed most consistency in its positive association with life satisfaction followed by their ability to control non-farm income.
- Paper 3 focused on investigating the role of women in integrated farming systems in Indonesia. The main aim was to develop a thorough understanding of women's roles and their influence in decision-making and labour contributions to integrated cattle-farming systems and maintenance of household livelihoods. The paper also explored the implications of COVID experience as far as gender aspects were concerned.
 - The paper is being currently being revised and will be prepared for submission to a journal. A copy of the abstract is provided below:

Narrowing the gender gap and promoting gender equality is one of the core principles of the sustainable development goals. This paper examines the roles of men and women in integrated cattle-farming systems in Indonesia. Specifically, the aim is to develop a thorough understanding of women's roles and their influence in decision-making and labour contributions to integrated cattle-farming systems and maintenance of household livelihoods. Household-level data comprising 500 observations from selected households in Lombok and Sumbawa districts of West Nusa Tenggara, Indonesia were collected using a customised instrument adapted from the Women Empowerment in Livestock Index tool. Most senior male and female members from 250 households were interviewed. We examined the contribution of men and women in key domains of empowerment including roles in decision-making in agricultural production, access to and decision making about productive resources; control and use of income; leadership in society and allocation of time. Results showed the varying nature of the role of women in aspects of cattle production. Some tasks were inherently male-dominated while women assisted in the day-to-day operations of the farming activities. Finally, we evaluated the implications of COVID-19 in gender dynamics and domains of empowerment.
- Paper 4: Assessing the significance of women in managing cattle business in Eastern Indonesia and its implications for technology dissemination.
 - This paper has been accepted for presentation in the upcoming Tropentag2022 conference to be held in September 2022.
 - Results presented in the paper show that almost 85% of women are involved in collecting and providing feeds and taking care of cattle. Women participate in decisions such as determining how much to spend for feeds (40.8%); animal health (39.4%); determining what cattle breed to raise (93.9%) and which cattle to sell (36.6%).
 - Women respondents indicated that almost 56% had access to capital from non-formal lenders and approximately 40% from village cooperatives but none of them had access to a bank loan as that had to be approved by their husbands.
 - Women were confident to independently achieve cattle business objectives (57.3%), to deal with difficult tasks (57.2%), to be successful in the cattle business (52.1%), to overcome challenges (54.9%) and to conduct multi-tasking (51.6%).

- Some implications and key lessons learned include:

On the role of women and empowerment in cattle production

- The results imply that there is very high active participation by women in cattle farming business in Eastern Indonesia. They have significant roles in cattle production, have access to finance and actively participate in farm decision making processes and have shown and built self-confidence to independently manage the cattle business successfully.
- Results showed the varying natures of the role of women in aspects of cattle production. Some tasks were inherently male-dominated while women assisted in the day-to-day operations of the farming activities.
- Women's participation is not about the quantity of their involvement related to cattle management, but how to include women in agricultural value-addition activities. At the individual or household level, strategies to improve individual capabilities and intra-household relations are crucial for promoting women's participation and leadership. Therefore, new strategies are needed to increase women's participation, consisting of technical and managerial skills.
- From the technical aspect side, the strategies to increase women's participation may include strengthening cattle management skills, complete feed processing skills, organic fertilizer processing skills, and risk mitigation skills. From the managerial aspects, women's participation can be optimized by developing entrepreneurial skills, linking networks, bonding networks, and bridging networks. Thus, creating a platform that will support and facilitate women in optimizing their participation is critical in enhancing, increasing and empowering women's participation in livestock value chains. For example, the support system includes increasing credit access and utilization, extension service access, technology access, technology adoption, and strengthen social capital.
- The key driver of empowerment is women's control and use of income followed equally across all sites by 'access to and control over resources' and 'extent and control of work time'.
- Our results highlight the need to develop and tailor capacity building strategies and interventions to target women's specific needs and interests, thereby providing pathways to improve and accelerate the uptake of production technologies and ultimately households' well-being.
- Most of the women have limited access to assets related to the ownership of assets used on behalf of the family's head. The implementation of palm cattle integration requires financial support. However, there are several obstacles to accessing formal financial institutions faced by rural women, such as time allocation, autonomy in decision making, and limited information. Thus, elimination of discriminated access to credit, ownership of resources, access to activities that they can perform and education should be policy priorities.
- Finally, as there is a positive association between women's empowerment and life satisfaction, the results imply that considering all the women's empowerment indicators across the different measures of life satisfaction, women's ownership and control of livestock assets, we can deduce that initiatives geared at enhancing women's empowerment in livestock can improve their subjective well-being. In times of resource constraints, specific emphasis can be placed

on the promotion of initiatives that enhance empowerment indicators such as women's ownership and control of livestock assets and their ability to control non-farm income. Nevertheless, our study is limited by our focus on a wide range of sites in just two provinces, so future studies should broaden the scope to embark on a nationwide survey.

On the use of the WELI instrument

- Our project's main contribution to the use of the WELI instrument was to provide the first evidence-based account of women's empowerment in livestock production in the Asian region. While logistically difficult to implement, and coupled with the need to complete and have accurate data responses, we were able to demonstrate the effectiveness of the use of this instrument.

In addition to the WELI survey results per sé, the project also conducted Focus Group Discussions (FGDs) amongst selected respondents to supplement the findings from the women's empowerment index. Those FGDs considered two different aspects:

1. FGD on the WELI survey

Key findings

- Women (wives) have access to agriculture's resources and are actively involved with men (their husbands) in important decisions made related to crops and cattle production. However, they do not yet have control or power over the enterprise's overall management. Thus, women also have not received maximum benefit.
- A number of cases show that women have not been fully involved in decision making regarding cattle sale, cattle slaughter, and determining the provision of cattle for household consumption.
- There is still no clear division of roles between men (husbands) and women (wives) in rural cattle farming under site-research conditions. The involvement of women is still considered only as supporters of men's work or is often interpreted only as a substitute for men's roles when the husband is not around.
- Gender related violent behaviour is still evident especially by men (husbands) against women (wives) but the trend is decreasing as public awareness about the values of gender equality and justice in the household is increased.
- Local norms related to restrictions on the women's (wives') activities have loosened along with the behaviours of men (husbands) who allow their wives to do activities outside or do not mind if their wives leave the house without their permission. In other words, men and women have the same opportunity and space to participate in various social activities at the community level.

Conclusions

Women have been involved in various cattle farming-related activities, such as feeding, health maintenance, etc. In addition, women also participate in important decision-making in their household cattle farming, for example: choosing the type of cattle to be raised, slaughtering, selling, determining cattle for household consumption, etc. However, men still have the majority control and the ultimate decision-making power.

Lessons learned

- Women's empowerment is an “ongoing process” that requires continuous external facilitation through implementation of an empathetic approach as a way of working in order to understand the situations and conditions that surround women's lives.
- Basically, women's empowerment has the ultimate target to change the “position” and “condition” of women themselves. So far, the position of women who are always subordinate to men must be changed to ensure they have an equal position. Furthermore, changes in the "position" of women will generate changes in women's "condition" delivering her a better quality of life.
- Building women's self-confidence is the first step of empowerment for them. Women's self-confidence must be built by providing more space or opportunities for them to speak out and express their thoughts based on the principles of adult learning. Women also have many rich and valuable life experiences that should be used as learning materials for policy formulation.

2. FGD on the impact of Covid-19 on gender roles and empowerment

Key findings

- Cattle farming was impacted most by Covid-19 in the decline in cattle prices because outside buyers could not operate within the farmers' localities due to the implementation of "social/physical distance" requirements. Meanwhile, the prices of cattle production inputs increased due to limited availability/stocks. Restrictions on social activities also impacted by delaying social gatherings (group meetings, visits between farmers, etc.). Overall, Covid-19 had a very significant impact on the decline of farmers' income.
- Cattle farmers did not experience difficulty in providing cattle feed because the location for planting or taking forage as their feed source was around their homes, especially for those who have grown *Leucaena*. In addition, cattle farmers indicated that the rules of social restrictions during Covid-19 did not apply if they looked for feed around mountains (hills).
- Farmers used liquid fertilizer from livestock manure to replace chemical fertilizers, which became scarce and expensive.
- The production costs of food crop farming or cattle farming increased due to the increased prices of production factors/inputs (tractor rental, labour costs, etc.).
- For women, their workloads increased due to Covid-19 because they needed to take on additional duties such as accompanying their children to study during the implementation of online learning (school from home); the frequency of cooking increased and the volume of it also increased when all family members spent all day at home; and they also had to find extra outside work to find additional income as the prices of basic necessities increased.
- Increased household expenditures that were not matched by adequate income were overcome by taking loans from neighbours or relatives. In addition, some farmers pawned jewelry and sold agricultural stock at low prices. However, the women asked the men (husbands) not to sell livestock prematurely in terms of age and price. The money from the loans and pawning the jewelry was used as production costs for food farming or cattle farming.

Conclusions

The Covid-19 pandemic increased the workload of women as housewives as follows: maintaining household economic resilience through extra efforts to find additional income when sources of household income were decreased; taking on the role as a 'teacher' for their children when online learning was implemented; extra effort to find strategies for maintaining food and nutrition security for their family; and they were also involved in important household decision making, especially to ensure their husbands did not sell cattle prematurely.

Lessons learned

Under shock/crisis situations such as those experience through the Covid-19 pandemic, women take the leading role in building and maintaining household resilience by utilizing the available resources around them using various strategies, while minimizing family vulnerability factors. However, their position as women is still under the ordination of men (husbands). In other words, their vulnerability as a result of the pandemic is further exacerbated by marginalization due to gender factors. Therefore, social safety net efforts/programs to overcome the impact of the pandemic on rural families must account for the characteristics of vulnerability and differences in capacity between men and women.

8 Impacts

8.1 Scientific impacts – now and in 5 years

There are three components of this project expected to yield significant scientific impacts over the next five years, including:

- Alternative methods for engaging public and private sector scaling institutions – despite the multiple disruptions experienced by the project since inception, the project was able to provide strong evidence that use of non-traditional methods to engage scaling institutions will stimulate behavioural change within those institutions. This has been demonstrated in both NTB and KalSel. As a result, many of those institutions are now using their own, rather than project, resources to successfully engage with farmers needing to adapt and adopt proven technologies in their own cattle businesses. The 'how and why' of this impact poses important and interesting ongoing research questions that have application more broadly within Indonesia and other developed and developing countries;
- Farm household surveys – results from the project's farm household surveys will provide baseline indicators of a very wide range of animal performance, farming practices, productivity and profitability of farm businesses and farmer decision-making processes not previously available for smallholder farmers in Indonesia. It is expected that many future research projects targeting improved productivity and profitability of smallholder farmers will use the results from these surveys as the basis to monitor and evaluate changes resulting from their projects.
- Women's Empowerment in Livestock Index (WELI) surveys – the project's use of the WELI survey tool is the first time the tool has been used outside Africa. Results will enable comparisons and recommendations for women's empowerment to be made across very diverse cultural groups of people.

8.2 Capacity impacts – now and in 5 years

The greatest impact from this project is the successful and wide-ranging capacity building of multiple sectors of organisations tasked with creating the conditions necessary to significantly improve the productivity and profitability of Indonesia's smallholder beef enterprises. As described particularly in the Key Results sections of Objective 1 and 2 of this report, effective capacity building occurred across farmers, farmer groups, field officers, extension and research officers, scaling institutions and several additional public- and private-sector agencies. All participants of the project's capacity building were trained in facets of the IVMS model, whilst the field officers, extension and research officers and the scaling institutions were trained in technical cattle production knowledge, facilitation skills and adult learning methods. The field officers were also trained to administer a range of different survey instruments used by the project's researchers. Indonesian researchers have also been trained in both quantitative and qualitative data analysis methodologies applicable to the household and WELI surveys and adoption and scaling narratives derived from farmer node and outscaling groups, farmer scaling institutions, women's farmer groups and Dinas staff as scaling institutions.

8.3 Community impacts – now and in 5 years

In general, community impacts only become apparent several years after initial impacts at individual farmer level are achieved. However, the success of the project's use of alternative methods to engage public and private sector scaling institutions means that the project has already significantly changed the methods that scaling institutions are using to more effectively achieve practice change amongst smallholder farmers and their communities and this is expected to continue well into the future.

8.3.1 Economic impacts

Assuming the public and private sector scaling institutions continue to operate using the new methods provided by the project's adoption and scaling research teams, it is highly likely that sizeable economic impacts will be achieved by the project's collaborating farmers and their communities. However, the likely extent of these impacts is still being evaluated as part of ongoing data analyses beyond the life of this SRA.

8.3.2 Social impacts

There is already strong evidence of an increase in the social infrastructure and strengthened cohesion of production and marketing efforts by collaborating smallholder beef farming communities, particularly those in NTB collaborating with the project's adoption and scaling research component.

As data from the household and WELI surveys continue to be analysed over coming months, the project will derive a very clear understanding of women's roles and influence in decision-making and their labour contribution to the household farm business.

8.3.3 Environmental impacts

Soil fertility is a major constraint on the productivity of crops, forages and pasture, so the project's demonstrations of improved farming systems is also improving soil fertility. Planting perennial forage grasses and tree legumes will also, over time, contribute to soil organic matter, microbiology, and sequestration of carbon and nitrogen.

The project has also encouraged greater use of higher quality feeds to improve productivity. This in turn impacts on greenhouse gas emissions both directly (with cattle fed higher quality feeds producing less methane per day than cattle fed high fibre diets) and indirectly through lower emissions per kg of beef produced (through higher growth rates and reduced age of turn-off to slaughter and fewer non-productive breeding cattle).

8.4 Communication and dissemination activities

Until the announcement in December 2019 that *IndoBeef* projects were to be terminated prematurely, *CropCow*'s communication and dissemination activities were successfully undertaken in conjunction with *PalmCow*. However, the subsequent discordant messages being delivered to the project across Australia and Indonesia meant communication activities largely ceased at that time, as it was not clear what messages could be communicated publicly. During this SRA, no formal communication activities targeting external stakeholders were undertaken other than specific communication activities designed to achieve project outputs described in this report.

9 Conclusions

Despite major disruptions to both the CropCow project (as described in the CC final report) and this SRA (due to the Covid-19 pandemic), the project was able to achieve virtually all of its planned outputs. The only output unable to be achieved was the identification of new investors in the proposed new beef value chain in NTB and the workshop planned to be hosted by Meat Standards Australia in Brisbane for those investors. Work is ongoing to provide additional information to assist those potential investors in their decision making.

As a result of the project, clear economic and social baselines were established around the profitability and profitability of smallholder farmers' beef enterprises as well as their own social and economic indicators. The adoption and scaling research has demonstrated the effectiveness of more suitable extension methodologies and approaches, particularly through their direct engagement with all key stakeholder organisations. It also achieved outstanding capacity building across a range of project contributors and collaborators. That research was strongly supported by socio-economic and gender specialists who were able to identify the key drivers of on-farm productivity and profitability as well as the impediments to on-farm practice changes and scaling out to improve smallholder cattle production systems more generally. Results from the household and WELI survey data in particular have established the first known baseline performance indicators for a wide range of productivity and profitability indicators in Indonesia, thereby providing underpinning information required for researchers, governments and policy makers to monitor and evaluate their own progress in future.

10 References

10.1 References cited in report

Bryman A (2016) *Social Research Methods*. Oxford University Press.

Krippendorff K (2018) *Content analysis: an introduction to its methodology*. Sage Publications.

Thompson JM, Polkinghorne R, Gee A, Motiang D, Strydom P, Mashau M, Ng'ambi J, de Kock R and Burrow HM (2010) Beef palatability in the Republic of South Africa: implications for niche-marketing strategies. *ACIAR Report No. 72*, available online at <http://aciar.gov.au/publication/tr72>

Waldron S, Ngongo J and Utami SK (2016) Economic analysis of cattle fattening systems based on forage tree legume diets in eastern Indonesia. *Report submitted to ACIAR*.

10.2 List of publications produced by project

10.2.1 Refereed papers and book chapters

Antari R, Ginting S, Anggraeny YN and McLennan SR (2022) The potential role of *Indigofera zollingeriana* as a high-quality forage for cattle in Indonesia. *Tropical Grasslands* (submitted).

Asikin Zenal, Baker Derek, Villano Renato and Daryanto Arief (2020) Business models and innovation in the Indonesian smallholder beef value chain. *Sustainability* 12: 2020. <https://doi.org/10.3390/su12177020>

Asikin Zenal, Baker Derek, Villano Renato and Daryanto Arief (2022) Innovation uptake and its application in business model identification in the Indonesian smallholder cattle and beef value chain. *Journal of Agribusiness in Developing and Emerging Economies* (submitted).

Burrow Heather M, Mans Ben J, Cardoso Fernando F, Birkett Michael A, Kotze Andrew C, Hayes Ben J, Mapholi Ntanganedzeni, Dzama Kennedy, Marufu Munyaradzi C, Githaka Naftaly W and Djikeng Appolinaire (2019) Towards a new phenotype for tick resistance in beef and dairy cattle: a review. *Animal Production Science* 59, 1401-1427. <https://doi.org/10.1071/AN18487>

Burrow Heather (2020) Strategies for increasing beef cattle production under dryland farming systems. *Indonesian Bulletin of Animal and Veterinary Sciences* 29:4 DOI: [10.14334/wartazoa.v29i4.2452](https://doi.org/10.14334/wartazoa.v29i4.2452)

Burrow Heather M, Mrode Raphael, Mwai A Okeyo, Coffey, Mike P and Hayes Ben J (2021) Challenges and opportunities in applying genomic selection to ruminants owned by smallholder farmers. *Agriculture Special Issue: 'Genetics and Genomics Applied to Livestock Production'* 11: 1172 <https://doi.org/10.3390/agriculture11111172>

Burrow Heather (2022) Overcoming major environmental and production challenges in cattle owned by smallholder farmers in the tropics. *Caraka Tani: Indonesian Journal of Sustainable Agriculture* 37: 161-170. <https://jurnal.uns.ac.id/carakatani/article/view/56566>

Cardoso Fernando Flores, Matika Oswald, Djikeng Appolinaire, Mapholi Ntanganedzeni, Burrow Heather M, Yokoo Marcos Jun Iti, Campos Gabriel Soares, Gullias-Gomes Claudia Christina, Riggio Valentina, Pong Wong Ricardo, Engle Bailey, Porto Neto Laercio, Maiwashe Azwihangwise and Hayes Ben J (2021) Multiple country and breed genomic prediction of tick resistance in cattle. In "*Ticks and Host Immunity – New Strategies for Controlling Ticks and Tick-Borne Pathogens*" (eds. Ala Tabor, Isabel

Kinney, Ferreira de Miranda Santos and Nathalie Boulanger), *Frontiers in Immunology* <https://www.tropentag.de/notify.php?code=mGRHAX6H>

- Koomson I, Villano RA, Thei S and Burrow HM (2022) Women's empowerment in livestock and life satisfaction in Indonesia. *Journal of Development Studies* (submitted).
- Widyas Nuzul, Widi Tri Satya Mastuti, Prastowo Sigit, Sumantri Ika, Hayes Ben J and Burrow Heather M (2022) Promoting sustainable utilization and genetic improvement of Indonesian local cattle breeds: a review. *Agriculture Special Issue: 'Genetics and Genomics Applied to Livestock Production'* (submitted).
- Valerio E, Hilmiati N, Prior J and Dahlanuddin (2022) Analysis of agricultural innovation system in Indonesia: a case study of beef sector in Nusa Tenggara Barat. *Agricultural Systems* (submitted).
- Villano Renato A, Koomson Isaac, Thei Stella, Taqiuddin Moh, Prameswari Febrina, Fachry Anwar, Fatah Luthfi, Sumantri Ika, Yanti Nuri Dwi, Hamdan Akhmad and Burrow Heather M (2022) Women's empowerment in integrated cattle-crop farming systems in Indonesia. *MDPI Agriculture* (submitted).

10.2.2 Conference proceedings

- Burrow Heather (2019) Strategies for increasing beef cattle production under dryland farming systems. *Proceedings Seminar Nasional Teknologi Peternakan dan Veteriner*, University of Jember, East Java, Indonesia, 15-17 October 2019.
- Burrow Heather M (2021) Opportunities and challenges to increasing productivity in cattle farmed by smallholders in Asia and Africa. *Indonesian Journal of Animal and Veterinary Sciences, Proceedings 4th International Seminar on Livestock Production and Veterinary Technology*, Virtual Seminar 6-7 September 2021 (<https://medpub.litbang.pertanian.go.id/index.php/proceedings/article/view/2937>)
- Burrow Heather (2021) Tropical cattle breeding programs under climate change. Keynote presentation *International Conference on Livestock in Tropical Environments* (https://drive.google.com/drive/folders/1oXZ309aK57KbC_alR_OIUkrIfKy0_OiA)
- Hamdan A, Sumantri I, Hadi SN, Rohaeni ES, Yanti ND and Chang C (2019) A market chain analysis of inter-island cattle trade into South Kalimantan, Indonesia. *Proceedings 8th International Seminar on Tropical Animal Production (ISTAP)*
- Hermansyah, Taqiuddin Moh, Sutaryono Yusuf Akhyar, Fachry Anwar, Thei Ruth Stella and Dahlanuddin (2022) The changing land use and its impact on the traditional cattle production system in Sumbawa Island, eastern Indonesia: current situation and the way forward. *Poster Presentation at Tropentag 2022 "Can agroecological farming feed the world? Farmers' and academia's views"* Czech University of Life Sciences, Prague, 14-16 September 2022. <https://www.tropentag.de/notify.php?code=koAgwcOV>
- Koomson I, Villano RA, Thei S and Burrow HM (2022) Women's empowerment in livestock and life satisfaction in Indonesia. *Presentation in the Gender Stream of the 66th Annual Conference of the Australasian Agricultural and Resource Economics Society*, February 2022.
- Rohaeni ES, Sumantri I, Yanti ND, Hadi SN, Hamdan A and Chang C (2019) Understanding the farming systems and cattle production in Tanah Laut, South Kalimantan. *Proceedings 8th International Seminar on Tropical Animal Production (ISTAP)*
- Sumantri Ika and Chang Christie (2020) Impact of Indian buffalo meat imported on beef supply and demand in Kalimantan Selatan. *Proceedings National Seminar of PB ISPI (Indonesian Society of Animal Sciences)*
- Sutaryono Yusuf Akhyar, Dahlanuddin, Supriadi Dedi, Putra Ryan Aryadin and Thei Ruth Stella (2022) Assessing biomass production and crude protein content of leucaena as

cattle feed under different land types in eastern Indonesia. *Poster Presentation at Tropentag 2022 "Can agroecological farming feed the world? Farmers' and academia's views"* Czech University of Life Sciences, Prague, 14-16 September 2022.
<https://www.tropentag.de/notify.php?code=QIIZnhym>

Taqiuddin Mohammad, Dahlanuddin, Sutaryono Yusuf Akhyar, Hermansyah, Thei Ruth Stella, Fachry Anwar and Villano Renato (2022) Institutional innovation for improving food security based on agroecological integrated farming in developing countries: evidence from Indonesia. *Oral Presentation at Tropentag 2022 "Can agroecological farming feed the world? Farmers' and academia's views"* Czech University of Life Sciences, Prague, 14-16 September 2022.
<https://www.tropentag.de/notify.php?code=mGRHAX6H>

Thei Ruth Stella, Fachry Anwar, Taqiuddin Moh, Hermansyah, Sutaryono Yusuf Akhyar, Koomson Isaac and Villano Renato (2022) Assessing the significance of women in managing cattle business in eastern Indonesia: implications for technology dissemination. *Poster Presentation at Tropentag 2022 "Can agroecological farming feed the world? Farmers' and academia's views"* Czech University of Life Sciences, Prague, 14-16 September 2022. <https://www.tropentag.de/notify.php?code=qqSASx0Y>

Villano Renato A, Koomson Isaac, Thei Stella, Taqiuddin Moh, Prameswari Febrina, Fachry Anwar, Fatah Luthfi, Sumantri Ika, Yanti Nuri Dwi, Hamdan Akhmad and Burrow Heather M (2022) Women's empowerment in in integrated cattle-crop farming systems in Indonesia. *Presentation in the Gender Stream of the 66th Annual Conference of the Australasian Agricultural and Resource Economics Society*, February 2022.

11 Appendixes

11.1 Appendix 1: Progress of scaling site groups

Progress of scaling site groups in Dompu

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
1	UPTD Livestock and Animal Health Sub-district. Hu'u	Tim UPTD Hu'u CP : Fahrudin Akbar (082340050654)	FG : Bina Baru Membership : 20 Village : Adu Sub-district : Hu'u CP : Abidin/Bedo (085337948630) Cattle enterprise : Fattening and production	FG : Bina Baru Membership : 20 Village : Adu Sub-district : Hu'u CP : Abidin/Bedo (085337948630) Cattle enterprise : Fattening and production		<ol style="list-style-type: none"> 1. Feed management - Planting forage 2. Fattening - Feeding Leucaena
2	UPTD Livestock and Animal Health Sub-district. Woja	Tim UPTD Woja CP : drh. Agus Mulyadi (082340590058)	FG : Doro Luba Membership : 20 Village : Kelurahan Kandai 2 Sub-district : Woja CP : - Cattle enterprise : Fattening and production		<ul style="list-style-type: none"> - UPTD recommended the group without field verification - Already inactive group 	
3				FG : Pali Ntanah Membership : 15 Village : Baka Jaya Sub-district : Woja CP : Wawan (085238591549) Cattle enterprise : Fattening and production	<ul style="list-style-type: none"> - Cooperative - Responsive to information and new innovation like planting forage. - Motivated UPTD staff to monitor and visit group regularly 	<ol style="list-style-type: none"> 1. Feed management: - planting forage such as odot and Leucaena - establishing Leucaena nursery

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
4				FG : Sumber jaya Membership : 20 Village : Baka Jaya Sub-district : Woja CP : Lukman (085237243774) Cattle enterprise : Fattening and production	<ul style="list-style-type: none"> - Cooperative - Responsive to information and new innovation like planting forage. - Motivated UPTD staff to monitor and visit group regularly 	2. Feed management: <ul style="list-style-type: none"> - planting forage such as odot and Leucaena
5				Individu Village : Riwo Sub-district : Woja CP : Ir. Muis (082235782139) Cattle enterprise : Fattening and Production	<ul style="list-style-type: none"> - have capital and infrastructure - developed good communication with senior team 	1. Feed management <ul style="list-style-type: none"> - Planting forage 2. Fattening using tree legume <ul style="list-style-type: none"> - Feeding Leucaena
6	UPTD Livestock and Animal Health Sub-district. Pajo	Tim UPTD Pajo CP : Suparto (082341922677)	FG : So Doro Huni Membership : 12 Village : Tembalae Sub-district : Pajo CP : Junaidin (085253728327) Cattle enterprise : Fattening and production	FG : So Doro Huni Membership : 12 Village : Tembalae Sub-district : Pajo CP : Junaidin (085253728327) Cattle enterprise : Fattening and production		1. Feed management <ul style="list-style-type: none"> - Planting forage 2. Fattening <ul style="list-style-type: none"> - Feeding Leucaena
7			FG : Sonco Temba Membership : 20 Village : Woko Sub-district : Pajo CP : Harmoko (085339348836) Cattle enterprise : Fattening and production	FG : Sonco Temba Membership : 20 Village : Woko Sub-district : Pajo CP : Harmoko (085339348836) Cattle enterprise : Fattening and production		1. Feed management <ul style="list-style-type: none"> - Planting forage 2. Fattening <ul style="list-style-type: none"> - Feeding using Leucaena

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
8	UPTD Livestock and Animal Health Sub-district. Dompu	Tim UPTD Dompu CP : Iwan jaya (085239025353)	FG : Kenanga Membership : 10 Village : Dorebara Sub-district : Dompu CP : Khaerudin (085333120509) Cattle enterprise : Fattening	FG : Kenanga Membership : 10 Village : Dorebara Sub-district : Dompu CP : Khaerudin (085333120509) Cattle enterprise : Fattening		<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> - Planting forage Leucaena 2. Fattening <ul style="list-style-type: none"> - Feeding using Leucaena
9				FG : Bersama Membership : 10 Village : Mangge Asih Sub-district : Dompu CP : Sudirman (082359319308) Cattle enterprise : Fattening and production		<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> - Planting Leucaena 2. Fattening <ul style="list-style-type: none"> - Feeding using Leucaena
10	UPTD Livestock and Animal Health Sub-district. Kempo	Tim UPTD Kempo CP : Abdul Haris S.Pt (082339813258)	FG : Taurus Mandiri Membership : 15 Village : Ta'a Sub-district : Kempo CP : Aruji (085205255666) Cattle enterprise : Fattening and production		<ul style="list-style-type: none"> - Difficult to collaborate with - Aid oriented - Inactive group - Group has no vision, just routine cattle work 	
11			FG : Bina Bersama Membership : 20 Village : Tolokalo Sub-district : Kempo CP : Jati (082340742274) Cattle enterprise : Fattening		<ul style="list-style-type: none"> - Difficult to collaborate with - Aid oriented - Inactive group - Group has no vision, just routine cattle work 	

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
12			FG : Tolo Lenti Membership : 10 Village : Ta'a Sub-district : Kempo CP : Burhanudin (082293601746) Cattle enterprise : Production	FG : Tolo Lenti Membership : 10 Village : Ta'a Sub-district : Kempo CP : Burhanudin (082293601746) Cattle enterprise : Production	-	1. Feed management - Planting forage Leucaena, indigovera, odot grass, king – elephant - Pakchong grass.
13				FG : Buana sari Membership : 20 Village : Tolokalo Sub-district : Kempo CP : Wayan Agus Wijaya (081237612006) Cattle enterprise : Fattening		1. Feed management - Establishing Leucaena nursery - Planting Leucaena 2. Fattening - Feeding Leucaena
14				FG : Family Membership : 16 Village : Konte Sub-district : Kempo CP : Kasbiono (085237209504) Cattle enterprise : Fattening and Production		1. Feed management - Planting Leucaena, rumput odot 2. Fattening - Feeding Leucaena 3. Group organisation being able to access Bank for KUR scheme at BNI
15				FG : So Pinda Membership : 10 Village : Kempo Sub-district : Kempo CP : Sudirman (085337948702) Cattle enterprise : Fattening and Production		1. Feed management - Planting Leucaena, odot 2. Fattening - Feeding Leucaena

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
16				FG : Doro Cafa Membership : 20 Village : Kempo Sub-district : Kempo CP : Ihwanudin (085238016747) Cattle enterprise : Fattening and Production		<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> - Planting Leucaena, indigovera and odot 2. Fattening <ul style="list-style-type: none"> - Feeding Leucaena 3. Group organisation being able to access Bank for KUR scheme at BNI
17				FG : Kengge sori Membership : 15 Village : Ta'a Sub-district : Kempo CP : Andry Ardyans (085338952504) Cattle enterprise : Fattening		<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> - Planting Leucaena 2. Fattening <ul style="list-style-type: none"> - Feeding Leucaena 3. Group organisation being able to access Bank for KUR scheme at BNI
18				FG : Mandiri Membership : 20 Village : Soro Barat Sub-district : Kempo CP : Ilyas (085238908371) Cattle enterprise : Fattening		<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> - Planting forage Leucaena, turi and rumput odot 2. Fattening <ul style="list-style-type: none"> - Feeding Leucaena, turi and rumput odot 3. Group organisation being able to access Bank for KUR scheme at BNI
19				FG Safahu Membership : 12 Village : Tolokalo Sub-district : Kempo CP : Ikhlas (085338101763) Cattle enterprise : Fattening		<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> - Planting Leucaena 2. Fattening <ul style="list-style-type: none"> - Feeding Leucaena 3. Group organisation being able to access Bank for KUR scheme at BNI

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
20	UPTD Livestock and Animal Health Sub-district. Pekat	Tim UPTD Pekat CP : drh. Noer Syaiful Hakim (081353836066)		FG Toti Mori Membership : 10 Village : Pekat Sub-district : Pekat CP : Jul (0853333171551) Cattle enterprise : Fattening		1. Feed management - Planting Leucaena, indigovera and rumput odot 2. Fattening - Feeding Leucaena
21				FG Taman Sari Membership : 10 Village : Kadindi barat Sub-district : Pekat CP : Lalu Suhaidi (081237125564) Cattle enterprise : Fattening		1. Feed management - Planting Leucaena, indigovera and rumput odot 2. Fattening - Feeding Leucaena
22				FG Nanga Camba Membership : 10 Village : Sori Tatanga Sub-district : Pekat CP : Syam (082339860100) Cattle enterprise : Fattening		1. Feed management - Planting Leucaena, indigovera and rumput odot 2. Fattening - Feeding Leucaena
23				FG Bina Ternak Membership : 10 Village : Sori Tatanga Sub-district : Pekat Cp : Andi (085238001281) Cattle enterprise : Fattening and Production		1. Feed management - Planting Leucaena, indigovera and rumput odot 2. Fattening - Feeding Leucaena

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
24				FG Tanjung Harapan Membership : 10 Village : Calabai Sub-district : Pekat Cp : Iwan Juardi (085337804774) Cattle enterprise : Fattening and Production		1. Feed management - Planting Leucaena, indigovera and rumput odot 2. Fattening - Feeding Leucaena
25				FG Calabai Mandiri Membership : 10 Village : Calabai Sub-district : Pekat Cp : Syarifudin (082340740726) Cattle enterprise : Fattening and Production		1. Feed management - Planting Leucaena, indigovera and rumput odot 2. Fattening - Feeding Leucaena
26	UPTD Livestock and Animal HealthSub-district. Kilo	Tim UPTD Kilo CP : drh. Anton Efendi (085333766617)		FG Bahagia So Panihi Membership : 16 Village : Mbuju Sub-district : Kilo Cp : Alamsyah (082359121377) Cattle enterprise : Fattening and Production		1. Feed management - Planting Leucaena, indigovera and rumput odot 2. Fattening - Feeding Leucaena
27				Village Mpolo Membership : 3 Village : Mpolo Sub-district : Kilo Cattle enterprise : Fattening and Production		

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
28				Village Kiwu Membership : 1 Village : Kiwu Sub-district : Kilo Cattle enterprise : Fattening and Production		
29				Village Taropo Membership : 1 Village : Taropo Sub-district : Kilo Cattle enterprise : Fattening and Production		
30				Village Keramat Membership : 2 Village : Keramat Sub-district : Kilo Cattle enterprise : Fattening and Production		

Progress of scaling site groups in Sumbawa

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
1.	UPTD. Plampang	<ul style="list-style-type: none"> • drh. Zaidun / KUPT Plampang (0812-3732-8158) • Juliar Ardiansyah / Insminator (0812-3750-7326) • Hisyadi / Stap UPTD 	FG . Mekar Hijau Membership : 12 Orang Village : Prode SP4 Sub-district : Plampang CP: Badaruddin/ Ketua Kelompok (0823-4078-2695	FG . Mekar Hijau Membership : 12 Orang Village : Prode SP4 Sub-district. : Plampang CP: Badaruddin/ Ketua Kelompok (0823-4078-2695 Cattle enterprise: Fattening and production		<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> • Planting Leucaena and improved grass • Penyimpanan pakan kering 2. Fattening using tree legume (Leucaena and Gliricidia)

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
			Cattle enterprise: Fattening and production			
2.			FG. Ai Beat Membership : 30 Orang Village : Sepakat Sub-district. Plampang CP. Ahmat/Ketua Kelompok (0852-3889-3613) Cattle enterprise: Production	FG. Ai Beat Membership : 30 Orang Village : Sepakat Sub-district. Plampang CP. Ahmat/Ketua Kelompok (0852-3889-3613) Cattle enterprise: Production		1. Feed management <ul style="list-style-type: none"> Planting Leucaena and grass unggul 2. Fattening using tree legume (Leucaena and Gliricidia)
3.	KPH. Empang and UPTD Plampang	<ul style="list-style-type: none"> Juliar Ardiansyah / Insminator (0812-3750-7326) Hisyadi / Stap UPTD YusWanto / Stap KPH Empang (0852-3708-4240) 		FG. Gunung Lestari Membership : 17 Orang Village : Sepayung Dalam Sub-district. Plampang I Komang Buda / Ketua Kelompok (0853-3770-5326) Cattle enterprise: Fattening and production		1. Feed management <ul style="list-style-type: none"> Planting Leucaena and grass unggul 2. Fattening using tree legume (Leucaena and Gliricidia) 3. Animal health management <ul style="list-style-type: none"> Pen construction based on recommended innovation
4.	UPTD Utan	M. Saleh, S.Pt / KUPT Utan (0812-3722-5434)	FG. Mekar Jaya Membership : 15 Orang Village : Setoe Brang Sub-district. : Utan I Nengah Arta/Ketua Kelompok (0852-0560-8499) Jenis Usaha ternak sapi: Peggemukan and production	FG. Mekar Jaya Membership : 15 Orang Village : Setoe Brang Sub-district. : Utan I Nengah Arta/Ketua Kelompok (0852-0560-8499) Jenis Usaha ternak sapi: Peggemukan and production		1. Feed management <ul style="list-style-type: none"> Planting forage (Leucaena and improved grass) 2. Fattening using tree legume (Leucaena and Gliricidia) 3. Animal health management <ul style="list-style-type: none"> Pen construction based on recommended innovation

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
5.	UPTD. Labangka	<ul style="list-style-type: none"> Hermasyah, S.Pt / KUPT (0853-3324-8593) Mahdi, S.Pt / Paramedis UPTD (0852-5362-4720) 	<p>FG. Taman Kerti Membership: 14 Orang Village; Jaya Makmur Sub-district. Labangka CP: Jumadi / Ketua Kelompok (0853-3342-4004) Jenis usaha ternak sapi: Fattening and production</p>	<p>FG. Taman Kerti Membership: 14 Orang Village; Jaya Makmur Sub-district. Labangka CP: Jumadi / Ketua Kelompok (0853-3342-4004) Jenis usaha ternak sapi: Fattening and production</p>		<ol style="list-style-type: none"> Group organisation <ul style="list-style-type: none"> Completing group admin Routine group activity (meeting) Social innovation : gotongroyong Feed management <ul style="list-style-type: none"> Planting feed Leucaena and grass odot Dry feed conservation Fattening using tree legume (Leucaena and Gliricidia) Animal health management : Pen construction based on recommended innovation Compost processing
6.			<p>FG. Pendi Rara Membership : 12 Orang Village : Sekokat Sub-district. Labangka CP: Lalu Ramli/Ketua Kelompok (0823-4135-2661) Jenis Usaha sapi: Fattening and production</p>	<p>FG. Pendi Rara Membership : 12 Orang Village : Sekokat Sub-district. Labangka CP: Lalu Ramli/Ketua Kelompok (0823-4135-2661) Jenis Usaha sapi: Fattening and production</p>		<ol style="list-style-type: none"> Feed management <ul style="list-style-type: none"> Planting feed Leucaena and grass odot Dry feed conservation Fattening using tree legume (Leucaena and Gliricidia) Animal health management : Pen construction based on recommended innovation

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
7.			FG. Maju Bersama Membership : 12 Orang Village : Labangka Sub-district. Labangka CP.: Arbi Johan / anggota Kelompok (0823-4197-5695) Jenis Usaha Sapi : Fattening and production	FG. Maju Bersama Membership : 12 Orang Village : Labangka Sub-district. Labangka CP.: Arbi Johan / anggota Kelompok (0823-4197-5695) Jenis Usaha Sapi : Fattening and production		<ol style="list-style-type: none"> Group organisation <ul style="list-style-type: none"> Completing group admin Routine group activity (meeting) Social innovation : gotongroyong Feed management <ul style="list-style-type: none"> Planting feed Leucaena and grass odot Dry feed conservation Silage making Fattening using tree legume (Leucaena and Gliricidia) Animal health management : Pen construction based on recommended innovation Compost processing
8.	UPTD. Empang	<ul style="list-style-type: none"> Ari Rendra, S.Pt / KUPT (0812-3761-1857) Adi Nirwansyah / Staf UPTD (0823-4064-1046) Maman Eriadi / Insminator (0813-3889-0930) 	FG. Untir Tinggi Membership : Jotang Beru Sub-district. : Empang CP.: Jenis Usaha Sapi: Production	FG. Soko Mas Membership : 21 Orang Village; Jotang Sub-district. Empang CP.: Dodi Kosuma / Ketua Kelompok (0823-4272-5424) Jeni usaha Sapi : Fattening and production	<ul style="list-style-type: none"> Less respond from FG Untir Tinggi Aid oriented Less active group Majority of group member has no dry land to plant Leucaena 	<ol style="list-style-type: none"> Feed management <ul style="list-style-type: none"> Forage planting (Leucaena and improved grass) Fattening using tree legume (Leucaena)
9.			FG. Dewa Bombe Membership : 15 Orang Village : Banda Sub-district. :Tarano CP. : Ismail / Ketua Kelompok (0823-5904-8324) Jenis Usaha sapi : Fattening and Production	FG. Dewa Bombe Membership : 15 Orang Village : Banda Sub-district. :Tarano CP. : Ismail / Ketua Kelompok (0823-5904-8324) Jenis Usaha sapi : Fattening and Production		<ol style="list-style-type: none"> Feed management <ul style="list-style-type: none"> Melakukan Planting pakan ternak (Leucaena and grass unggul) Fattening using tree legume (Leucaena)

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
10.				FG. Maris Gama Membership : 12 Orang Village : kerongkeng Sub-district. Tarano CP : Mahmuddin / Ketua Kelompok (0812-3737-8939) Jenis usaha yang dijalankan : Production	1. Good respond and eager to try (forage Planting). 2. One UPTD staff become group member	1. Feed management <ul style="list-style-type: none"> Feed Planting (Leucaena and improved grass)

Progress of scaling site groups in Central Lombok

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
1	UPTD Jonggat	Marta Tiohoi PPL CP : 081803799203	FG Bawak Nyiur Membership : 29 Village : Nyerot Sub-district: Jonggat CP : H. Saupi (081937041272) Cattle enterprise: Fattening	FG Bawak Nyiur Membership : 29 Village : Nyerot Sub-district: Jonggat CP : H. Saupi (081937041272) Cattle enterprise:Sapi : Fattening		1. Fattening : using Sesbania
2	UPTD Jonggat		FG Ingin Maju Membership : 40 Village : Nyerot Sub-district: Jonggat CP : H. Akub (081946709492) Cattle enterprise: Fattening	FG Ingin Maju Membership : 40 Village : Nyerot Sub-district: Jonggat CP : H. Akub (081946709492) Cattle enterprise: Fattening		1. Fattening : using Sesbania
3	UPTD Jonggat		FG Pade Angen Membership : 28 Village : Nyerot Sub-district: Jonggat CP : Munakip (81916066674) Cattle enterprise: Fattening	FG Pade Angen Membership : 28 Village : Nyerot Sub-district: Jonggat CP : Munakip (81916066674) Cattle enterprise: Fattening		1. Fattening : Using Sesbania

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
4	UPTD Praya Barat Daya,	Febri Indobeef Cp : 082340831213 Isnan PPL CP : 081917474670	FG Maju Sejahtera Membership : 26 Village : Batu Jangkih Sub-district: Praya Barat Daya CP : Aq. Suhartini (082340996712) Cattle enterprise: Production	FG Maju Sejahtera Membership : 26 Village : Batu Jangkih Sub-district: Praya Barat Daya CP : Aq. Suhartini (082340996712) Cattle enterprise: Production		<ol style="list-style-type: none"> 1. Feed Management <ul style="list-style-type: none"> - Planting Leucaena 2. Mating Management <ul style="list-style-type: none"> - Weaning 3. Cattle management and Animal health <ul style="list-style-type: none"> - Cattle Posyandu
5	UPTD Praya Barat Daya	Isnan PPL CP : 081917474670	FG Lakar Tunggal Membership : 50 Village : Batu Jangkih Sub-district: Praya Barat Daya CP : Jumand (082339030806) Cattle enterprise: Production	FG Lakar Tunggal Membership : 50 Village : Batu Jangkih Sub-district: Praya Barat Daya CP : Jumand (082339030806) Cattle enterprise: Production		
6	UPTD Praya Barat Daya		FG Jagiran Membership : 65 Village : Batu Jangkih Sub-district: Praya Barat Daya CP : Aq. Supar (085337042441) Cattle enterprise: Production	FG Jagiran Membership : 65 Village : Batu Jangkih Sub-district: Praya Barat Daya CP : Aq. Supar (085337042441) Cattle enterprise: Production		
7	UPTD Pujut	Suparlan PPL CP : 081907981727	FG Maju Terus Membership : 29 Village : Sukaanda Sub-district: Pujut CP : Jumarni (0818548764) Cattle enterprise: Fattening	FG Maju Terus Membership : 29 Village : Sukaanda Sub-district: Pujut CP : Jumarni (0818548764) Cattle enterprise: Fattening		<ol style="list-style-type: none"> 1. Fattening : using Gliricidia and Sesbania 2. Group organisation <ul style="list-style-type: none"> - Interaction with Node group members

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
8	UPTD Pujut		FG Mele Pacu Membership : 34 Village : Sukaanda Sub-district: Pujut CP : Sabarudin (081936761483) Cattle enterprise: Fattening	FG Mele Pacu Membership : 34 Village : Sukaanda Sub-district: Pujut CP : Sabarudin (081936761483) Cattle enterprise: Fattening		1. Fattening : using Gliricidia and Sesbania 2. Group organisation - Interaction with Node group members
9	UPTD Pujut	H. Nurahman PPL CP : 087865981240	FG Tandur Jajar Membership : 73 Village : Mertak Sub-district: Pujut CP : Aq. Riman (082340021457) Cattle enterprise: Production	FG Tandur Jajar Membership : 73 Village : Mertak Sub-district: Pujut CP : Aq. Riman (082340021457) Cattle enterprise: Production		1. Feed Management - Planting Leucaena - Leucaena nursery - Feeding Leucaena for cows
10	UPTD Pujut		FG Asik Gamak Membership : 63 Village : Mertak Sub-district: Pujut CP : Aq. Saban (085338128701) Cattle enterprise: Production	FG Asik Gamak Membership : 63 Village : Mertak Sub-district: Pujut CP : Aq. Saban (085338128701) Cattle enterprise: Production		1. Feed Management - Planting Leucaena - Feeding Leucaena, Gliricidia
11	UPTD Pujut		FG Kelekuh Jaya Membership : 70 Village : Mertak Sub-district: Pujut Cattle enterprise: Production CP : Lanum (082340539150)	FG Kelekuh Jaya Membership : 70 Village : Mertak Sub-district: Pujut Cattle enterprise: Production CP : Lanum (082340539150)		2. Feed Management - Planting Leucaena - Feeding Leucaena, Gliricidia

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
12	UPTD Pujut	Parhaini PPL CP : 081703991537		FG Dui Urip Membership : 54 Village : Bangket Parak Sub-district: Pujut Cattle enterprise: Production and Fattening CP : Senun (081917160704) Amak Ema : (087865089334)		1. Feed Management - Planting Leucaena, grass pakchong - Feeding Leucaena 2. Group organisation - Group meeting
13	UPTD Pujut	H. Nurahman PPL CP : 087865981240		FG Setia Kawan Membership : 24 Village : Mertak Sub-district: Pujut Cattle enterprise: Production CP : Andrum (0823399755401)		1. Feed Management Planting Leucaena, Pembibitan grass pakchong, Zanzibar and odot
14	UPTD Praya Barat Daya	Ir. Hasanudin Dinas Kabupaten CP : 082340067572 Isnain PPL CP : 081917474670		FG Renseng Membership : 24 Village : Batu Jangkih Sub-district: Praya Barat Daya Cattle enterprise: Production CP : Bagie (085238146976)		1. Feed Management Planting Leucaena, Planting grass odot 2. Group organisation
15	UPTD Praya Barat Daya			FG Patuh Angen Membership : 28 Village : Batu Jangkih Sub-district: Praya Barat Daya Cattle enterprise: Production CP : Muhtar (082341362249)		1. Feed Management Planting Leucaena

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
16	UPTD Praya Barat Daya	Ir. Hasanudin Dinas Kabupaten CP : 082340067572		FG Pade Mele Membership : 30 Village : Kabul Sub-district: Praya Barat Daya Cattle enterprise: Production and Fattening CP : Sahand (087861551946)		1. Feed Management - Planting Leucaena 2. Group organisation - Monthly meeting and levy
17	UPTD Pujut	Siman PPL CP : 087721035245		FG Tunas Karya II Membership : 70 Village : Teruwai Sub-district: Pujut Cattle enterprise: Production and Fattening CP : Sumardi (087860072500)		1. Feed Management - Planting Leucaena - Feeding Leucaena
18	UPTD Pujut	H. Nurahman PPL CP : 087865981240		FG Mekar Jati Membership : 54 Village : Mertak Sub-district: Pujut Cattle enterprise: Production and Fattening CP : Kalap (085337055400)		1. Feed Management - Planting Leucaena - Construct simple silage bunker - Feeding Leucaena 2. Cattle management and Animal health - Cattle Posyandu 3. Manure processing - Compost processing & selling
19	UPTD Pujut	Syukur PPL CP : 082341376961		FG Tandur Desi Membership : 57 Village : Pengangat Sub-district: Pujut Cattle enterprise: Production and Fattening CP : Bamin (087864551657)		1. Feed Management - Planting Leucaena - Feeding Leucaena
20	UPTD Pujut	Suparlan PPL CP : 081907981727		FG Mele Maju Membership : 52 Village : Sukaanda Sub-district: Pujut Cattle enterprise: Production and Fattening CP : Salim (085338577769)		1. Feed Management - Planting Leucaena

No	SI	Facilitator SI	Initial scaling Site groups	Actual Scaling Site Groups	Contributing factors to changing scaling site groups	Implemented technology
21	UPTD Praya Barat Daya	Ir. Hasanudin Dinas Kabupaten CP : 082340067572 Isnan PPL		FG Panand Wangi Membership : 41 Village : Batu Jangkih Sub-district: Praya Barat Daya Cattle enterprise: Production CP : Sarjan (085337042405)		1. Feed Management - Planting Leucaena - Feeding Leucaena for cows
22	UPTD Praya Barat Daya	CP : 081917474670		FG Patuh Pacu Membership : 44 Village : Batu Jangkih Sub-district: Praya Barat Daya Cattle enterprise: Production CP : Rupan (082340758068)		1. Feed Management - Planting Leucaena - Feeding Leucaena for cows

Progress of scaling site groups in North Lombok

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
1	UPTD Gangga	Nurul Hajat PPL Segara Katon CP: 082359003232	FG: Silaq Ngiring Membership: 56 Village: Segara Katon Sub-district: Gangga CP: Sahaprianto 082359006251 Cattle enterprise: Breeding		<ul style="list-style-type: none"> • Less motivated ext. staff to facilitate FG • Business oriented ext staff • Lack sense of belonging over the project • Ext. staff lack of confidence in facilitating FG • UPTD staff do not understand their roles at scaling site groups • Job distribution between ext staff and technical staff peternakan • Work demand and unstructured work from Dinas at District level • Lack of visit to scaling site group • Not all UPTD staff got interested to be involved in IndoBeef program. • Leadership change at sub-district level 	<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> • Planting legume Sesbania and Leucaena

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
2		Nurul Hajat PPL Segara Katon CP: 082359003232	FG: Mekar Sari Membership: 49 Village: Segara Katon Sub-district: Gangga CP: Jafar 085333019810 Cattle enterprise: Breeding		<ul style="list-style-type: none"> • Less responsive group toward innovation • Staff business oriented attitude • No courage from the Head of UPTD to facilitate FG 	<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> • Planting legume: Sesbania and Leucaena
3		Tarmizi PPL Ganggalang CP:08339939515	FG: Ria Cangg Membership: 19 Village: Ganggalang Sub-district: Gangga CP: Harno 085337332597 Cattle enterprise : Breeding		<ul style="list-style-type: none"> • Far location • Not performing group leader (serves as hamlet leader) • Less active group • Aid oriented 	<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> • Planting legume: Sesbania and Leucaena
4		lin PPL Village Gonandg CP: 087757154971	FG: Kompak Merenten Membership: 21 Village: Gonandg Sub-district: Gangga CP: 082339103995 Cattle enterprise : Breeding		<ul style="list-style-type: none"> • Livestock staff did not consider IndoBeef as an important program to be directly correlate to their duty • Change of facilitating ext. staff • Less visit • Group intern conflict 	<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> • Planting legume Sesbania Leucaena 2. Waste management <ul style="list-style-type: none"> • Compost processing
5	UPTD Gangga	Yogi PPL Sambik Bangkol CP: 081805749844	FG: Tunas Baru Membership:18 Village: Sambik Bangkol Sub-district: Gangga CP: Sumiadi 085333601106 Cattle enterprise: Breeding		<ul style="list-style-type: none"> • Ext. staff used FG • Livestock staff only came when District people visit • Less responsive group 	<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> - Planting legume Sesbania Leucaena
6		Artadi PPL Rempek CP:085338592857	FG: Montong Gitak Membership: 27 Village: Rempek Sub-district: Gangga CP: Fendi 085237700120 Cattle enterprise: Breeding		<ul style="list-style-type: none"> - Terdapat konflik intern kelompok - Less responsive group 	<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> - Planting legume Sesbania Leucaena

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
7		Artadi PPL Rempek CP:085338592857	FG: Sinar Utara Membership: Village: Rempek Sub-district: Gangga CP: Cattle enterprise: Breeding		<ul style="list-style-type: none"> - Less responsive group - Focus on animal health services 	<ul style="list-style-type: none"> 1. Feed management - Planting legume Sesbania Leucaena
8	UPTD Kayangan	Suaedi PPL Pendua CP:085936555497	FG: Erat Sana Membership: 28 Village: Pendua Sub-district: Kayangan CP: Sukarna 85253926565 Cattle enterprise: Breeding and fattening		<ul style="list-style-type: none"> - Group feels better than the node group - Ext. staff focus on crops and agriculture - Livestock staff focus on animal health services 	<ul style="list-style-type: none"> 1. Feed management - Planting legume Sesbania and Leucaena
9		Burhan PPL Sesait CP:087864816454	FG: Bina Bersama Membership: 36 Village: Sesait Sub-district: Kayangan CP: 087864707522 Cattle enterprise: Breeding		<ul style="list-style-type: none"> - Saturated group - Intern conflict - Less responsive group 	-
10		Burhan PPL Sesait CP:087864816454	FG: Tetu Tanta Tunaq Membership: 46 Village: Sesait Sub-district: Kayangan CP: Riwandi 085333121968 Cattle enterprise: Breeding		<ul style="list-style-type: none"> - Livestock staff only came during visit from District Dinas - Ext staff focus on crops and agriculture 	<ul style="list-style-type: none"> 1. Feed management - Planting legume: Sesbania - Penggunaan legume: Sesbania and Leucaena 2. Waste management - Compost processing
11		Kardianto Koordinator PPL UPTD Kayangan CP:085935221650	FG: Titiq Sama Guna Membership: 26 Village: Santong Sub-district: Kayangan CP: Rumadi 081917027255 Cattle enterprise: Breeding		<ul style="list-style-type: none"> - Livestock staff only came during visit from District Dinas - Ext staff focus on crops and agriculture 	<ul style="list-style-type: none"> 1. Feed management • Planting legume: Leucaena

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
12	UPTD Bayan	Najamudin Inseminator Village Sambik Elen CP: 08175723416	FG: Sambik Elen Maju Membership: 43 Village: Sambik Elen Sub-district: Bayan CP: Ihsan 087754134743 Cattle enterprise: Breeding	FG: Sambik Elen Maju Membership: Village: Sambik Elen Sub-district: Bayan CP: Ihsan 087754134743 Cattle enterprise : Breeding		<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> - Planting legume: Sesbania and Leucaena - Pemberian legume: Sesbania and Leucaena 2. Waste management <ul style="list-style-type: none"> - Compost processing 3. Cattle management and animal health <ul style="list-style-type: none"> - Pembuatan kanandg yang standar 4. Group organisation <ul style="list-style-type: none"> - Monthly meeting - Levy
13		Najamudin Inseminator Village Sambik Elen CP: 08175723416	FG: Bina Warga Membership: 7 Village: Sambik Bangkol Sub-district: Gangga CP: Cattle enterprise: Breeding		<ul style="list-style-type: none"> • Less responsive group • Aid oriented • Dissolved group 	-
14	UPTD Gangga	Yogi PPL Sambik Bangkol CP: 081805749844	FG: Mpolan Lo Membership: 95 Village: Sambik Bangkol Sub-district: Gangga CP: Suhaemi 087765105388 Cattle enterprise: Breeding			<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> • Planting Leucaena
15		Artadi PPL Rempek CP:085338592857	FG: Beriuk Tangi Membership: 32 Village: Rempek Sub-district: Gangga CP: Sabar 085239139970 Cattle enterprise: Breeding			<ol style="list-style-type: none"> 1. Feed management <ul style="list-style-type: none"> - Planting Leucaena and Sesbania

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
16	UPTD Kayangan	Suaedi PPL Pendua CP:085936555497	FG: Berkah Sabar Membership: 15 Village: Pendua Sub-district: Kayangan CP: Cattle enterprise: Breeding	FG: Berkah Sabar Membership: 15 Village: Pendua Sub-district: Kayangan CP: Cattle enterprise: Breeding		1. Feed management - Planting legume: Sesbania and Leucaena
17		Saehun PPL Salut CP: 085338628793	FG: Sambik Rinandg Membership: 21 Village: Salut Sub-district: Kayangan CP: Masjudin 087766918474 Cattle enterprise: Breeding	FG: Sambik Rinandg Membership: 21 Village: Salut Sub-district: Kayangan CP: Masjudin 087766918474 Cattle enterprise: Breeding		1. Feed management - Planting legume: Sesbania and Leucaena
18		Saehun PPL Salut CP: 085338628793	FG: Beriuk Maju Membership: 8 Village: Salut Sub-district: Kayangan CP: Sahand 087811479639 Cattle enterprise: Breeding	FG: Beriuk Maju Membership: 8 Village: Salut Sub-district: Kayangan CP:Sahand 087811479639 Cattle enterprise: Breeding		1. Feed management - Planting legume: Sesbania and Leucaena
19		Suaedi PPL Pendua CP:085936555497	FG: Daur Alam Membership: 33 Village: Pendua Sub-district: Kayangan CP: Cattle enterprise: Breeding	FG: Daur Alam Membership: 33 Village: Pendua Sub-district: Kayangan CP: Cattle enterprise: Breeding		1. Feed management - Planting legume: Sesbania and Leucaena

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
20		Suharno PPL Andgiang CP:082339943288	FG: Beriuk Bangkit Membership: 20 Village: Andgiang Sub-district: Kayangan CP: Istiadi Heryanto 0852370335526 Cattle enterprise: Breeding	FG: Beriuk Bangkit Membership: 20 Village: Andgiang Sub-district: Kayangan CP: Istiadi Heryanto 0852370335526 Cattle enterprise : Breeding		1. Feed management - Planting legume: Sesbania and Leucaena
21		Saehun PPL Salut CP: 085338628793	FG: Antih Ujan 1 Membership: 20 Village: Salut Sub-district: Kayangan CP: Zubairi 081993028691 Cattle enterprise: Breeding	FG: Antih Ujan 1 Membership: 20 Village: Salut Sub-district: Kayangan CP: Zubairi 081993028691 Cattle enterprise: Breeding		1. Feed management - Planting legume: Sesbania and Leucaena
22		Saehun PPL Salut CP: 085338628793	FG: Karya Bersatu Membership: 22 Village: Salut Sub-district: Kayangan CP: Harjan 081999585095 Cattle enterprise: Breeding	FG: Karya Bersatu Membership: 20 Village: Salut Sub-district: Kayangan CP: Harjan 081999585095 Cattle enterprise: Breeding		1. Feed management - Planting legume: Sesbania and Leucaena
23		Agus PPL Village Pansor CP:085333843813	FG: Sambik Pantoan Membership: 20 Village: Pansor Sub-district: Kayangan CP: Istiadi Heryanto 0852370335526 Cattle enterprise: Breeding	FG: Sambik Pantoan Membership: 20 Village: Pansor Sub-district: Kayangan CP: Istiadi Heryanto 0852370335526 Cattle enterprise: Breeding		1. Feed management - Planting legume: Sesbania and Leucaena

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
24		Kardianto Koordinator PPL UPTD Kayangan CP:085935221650	FG: Darmisan Sangiang Membership: Village: Santong Sub-district: Kayangan CP:Paizin 081999152323 Cattle enterprise : Breeding	FG: Darmisan Sangiang Membership: Village: Santong Sub-district: Kayangan CP:Paizin 081999152323 Cattle enterprise : Breeding		1. Feed management - Planting feed Sesbania and Leucaena
25	UPTD Bayan	Nengah Koordinator UPTD Bayan CP:085337329736	FG: Subur Tani Membership: 25 Village: Anyar Sub-district: Bayan CP: Raden Ariadi 081803750562 Cattle enterprise: Breeding	FG: Subur Tani Membership: 25 Village: Anyar Sub-district: Bayan CP: Raden Ariadi 081803750562 Cattle enterprise: Breeding		1. Feed management - Planting legume: Sesbania and Leucaena
26		Nirani PPL Sukaanda CP:081937365082	FG: Cemoh Lalok Membership: 20 Village: Sukaanda Sub-district: Bayan CP: Ismail Hasanudiin 081907196179 Cattle enterprise: Breeding	FG: Cemoh Lalok Membership: 20 Village: Sukaanda Sub-district: Bayan CP: Ismail Hasanudiin 081907196179 Cattle enterprise: Breeding		1. Feed management - Planting legume: Sesbania and Leucaena
27		Dewi PPL Senaru CP:081907416136	FG: Maju Sejahtera Membership: 15 Village: Senaru Sub-district: Bayan CP: Musanip 081937146575 Cattle enterprise: Breeding	FG: Maju Sejahtera Membership: 15 Village: Senaru Sub-district: Bayan CP: Musanip 081937146575 Cattle enterprise: Breeding		1. Feed management - Planting legume: Sesbania and Leucaena

Progress of scaling site groups in West Sumbawa

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
1	UPTD Gangga	Nurul Hajat PPL Segara Katon CP: 082359003232	FG: Silaq Ngiring Membership: 56 Village: Segara Katon Sub-district: Gangga CP: Sahaprianto 082359006251 Cattle enterprise: Breeding		<ul style="list-style-type: none"> • Less motivated ext. staff to facilitate FG • Business oriented ext staff • Lack sense of belonging to project • Ext. staff lack confidence in facilitating FG • UPTD staff do not understand their roles at scaling site groups • Job distribution between ext staff and technical staff peternakan • Work demand and unstructured work from Dinas at District level • Lack of visit to scaling site group • Not all UPTD staff got interested to be involved in IndoBeef program. • Leadership change at sub-district level 	2. Feed management <ul style="list-style-type: none"> • Planting legume Sesbania and Leucaena
2		Nurul Hajat PPL Segara Katon CP: 082359003232	FG: Mekar Sari Membership: 49 Village: Segara Katon Sub-district: Gangga CP: Jafar 085333019810 Cattle enterprise: Breeding		<ul style="list-style-type: none"> • Less responsive group toward innovation • Staff business oriented attitude • No courage from the Head of UPTD to facilitate FG 	2. Feed management <ul style="list-style-type: none"> • Planting legume: Sesbania and Leucaena
3		Tarmizi PPL Genggelang CP:08339939515	FG: Ria Cangu Membership: 19 Village: Genggelang Sub-district: Gangga CP: Harno 085337332597 Cattle enterprise : Breeding		<ul style="list-style-type: none"> • Far location • Not performing group leader (serves as hamlet leader) • Less active group • Aid oriented 	2. Feed management <ul style="list-style-type: none"> • Planting legume: Sesbania and Leucaena

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
4		lin PPL Village Gonandg CP: 087757154971	FG: Kompak Merenten Membership: 21 Village: Gonandg Sub-district: Gangga CP: 082339103995 Cattle enterprise : Breeding		<ul style="list-style-type: none"> • Livestock staff did not consider IndoBeef as an important program to be directly correlate to their duty • Change of facilitating ext. staff • Less visit • Group intern conflict 	3. Feed management <ul style="list-style-type: none"> • Planting legume Sesbania Leucaena 4. Waste management <ul style="list-style-type: none"> • Compost processing
5	UPTD Gangga	Yogi PPL Sambik Bangkol CP: 081805749844	FG: Tunas Baru Membership:18 Village: Sambik Bangkol Sub-district: Gangga CP: Sumiadi 085333601106 Cattle enterprise: Breeding		<ul style="list-style-type: none"> • Ext. staff used FG • Livestock staff only came when District people visit • Less responsive group 	2. Feed management <ul style="list-style-type: none"> - Planting legume Sesbania Leucaena
6		Artadi PPL Rempek CP:085338592857	FG: Montong Gitak Membership: 27 Village: Rempek Sub-district: Gangga CP: Fendi 085237700120 Cattle enterprise: Breeding		<ul style="list-style-type: none"> - Terdapat konflik intern kelompok - Less responsive group 	2. Feed management <ul style="list-style-type: none"> - Planting legume Sesbania Leucaena
7		Artadi PPL Rempek CP:085338592857	FG: Sinar Utara Membership: Village: Rempek Sub-district: Gangga CP: Cattle enterprise: Breeding		<ul style="list-style-type: none"> - Less responsive group - Focus on animal health services 	2. Feed management <ul style="list-style-type: none"> - Planting legume Sesbania Leucaena
8	UPTD Kayangan	Suaedi PPL Pendua CP:085936555497	FG: Erat Sana Membership: 28 Village: Pendua Sub-district: Kayangan CP: Sukarna 85253926565 Cattle enterprise: Breeding and fattening		<ul style="list-style-type: none"> - Group feels better than the node group - Ext. staff focus on crops and agriculture - Livestock staff focus on animal health services 	2. Feed management <ul style="list-style-type: none"> - Planting legume Sesbania and Leucaena

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
9		Burhan PPL Sesait CP:087864816454	FG: Bina Bersama Membership: 36 Village: Sesait Sub-district: Kayangan CP: 087864707522 Cattle enterprise: Breeding		<ul style="list-style-type: none"> - Saturated group - Intern conflict - Less responsive group 	-
10		Burhan PPL Sesait CP:087864816454	FG: Tetu Tanta Tunaq Membership: 46 Village: Sesait Sub-district: Kayangan CP: Riwandi 085333121968 Cattle enterprise: Breeding		<ul style="list-style-type: none"> - Livestock staff only came during visit from District Dinas - Ext staff focus on crops and agriculture 	<ol style="list-style-type: none"> 2. Feed management <ul style="list-style-type: none"> - Planting legume: Sesbania - Penggunaan legume: Sesbania and Leucaena 2. Waste management <ul style="list-style-type: none"> - Compost processing
11		Kardianto Koordinator PPL UPTD Kayangan CP:085935221650	FG: Titiq Sama Guna Membership: 26 Village: Santong Sub-district: Kayangan CP: Rumadi 081917027255 Cattle enterprise: Breeding		<ul style="list-style-type: none"> - Livestock staff only came during visit from District Dinas - Ext staff focus on crops and agriculture 	<ol style="list-style-type: none"> 2. Feed management <ul style="list-style-type: none"> • Planting legume: Leucaena
12	UPTD Bayan	Najamudin Inseminator Village Sambik Elen CP: 08175723416	FG: Sambik Elen Maju Membership: 43 Village: Sambik Elen Sub-district: Bayan CP: Ihsan 087754134743 Cattle enterprise: Breeding	FG: Sambik Elen Maju Membership: Village: Sambik Elen Sub-district: Bayan CP: Ihsan 087754134743 Cattle enterprise : Breeding		<ol style="list-style-type: none"> 2. Feed management <ul style="list-style-type: none"> - Planting legume: Sesbania and Leucaena - Pemberian legume: Sesbania and Leucaena 2. Waste management <ul style="list-style-type: none"> - Compost processing 3. Cattle management and animal health <ul style="list-style-type: none"> - Pembuatan kanandg yang standar 4. Group organisation <ul style="list-style-type: none"> - Monthly meeting - Levy

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
13		Najamudin Inseminator Village Sambik Elen CP: 08175723416	FG: Bina Warga Membership: 7 Village: Sambik Bangkol Sub-district: Gangga CP: Cattle enterprise: Breeding		<ul style="list-style-type: none"> • Less responsive group • Aid oriented • Dissolved group 	-
14	UPTD Gangga	Yogi PPL Sambik Bangkol CP: 081805749844	FG: Mpolan Lo Membership: 95 Village: Sambik Bangkol Sub-district: Gangga CP: Suhaemi 087765105388 Cattle enterprise: Breeding			2. Feed management <ul style="list-style-type: none"> • Planting Leucaena
15		Artadi PPL Rempek CP:085338592857	FG: Beriuk Tangi Membership: 32 Village: Rempek Sub-district: Gangga CP: Sabar 085239139970 Cattle enterprise: Breeding			2. Feed management <ul style="list-style-type: none"> - Planting Leucaena and Sesbania
16	UPTD Kayangan	Suaedi PPL Pendua CP:085933655497	FG: Berkah Sabar Membership: 15 Village: Pendua Sub-district: Kayangan CP: Cattle enterprise: Breeding	FG: Berkah Sabar Membership: 15 Village: Pendua Sub-district: Kayangan CP: Cattle enterprise: Breeding		2. Feed management <ul style="list-style-type: none"> - Planting legume: Sesbania and Leucaena
17		Saehun PPL Salut CP: 085338628793	FG: Sambik Rinandg Membership: 21 Village: Salut Sub-district: Kayangan CP: Masjudin 087766918474 Cattle enterprise: Breeding	FG: Sambik Rinandg Membership: 21 Village: Salut Sub-district: Kayangan CP: Masjudin 087766918474 Cattle enterprise: Breeding		2. Feed management <ul style="list-style-type: none"> - Planting legume: Sesbania and Leucaena

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
18		Saehun PPL Salut CP: 085338628793	FG: Beriuk Maju Membership: 8 Village: Salut Sub-district: Kayangan CP: Sahand 087811479639 Cattle enterprise: Breeding	FG: Beriuk Maju Membership: 8 Village: Salut Sub-district: Kayangan CP:Sahand 087811479639 Cattle enterprise: Breeding		2. Feed management - Planting legume: Sesbania and Leucaena
19		Suaedi PPL Pendua CP:085936555497	FG: Daur Alam Membership: 33 Village: Pendua Sub-district: Kayangan CP: Cattle enterprise: Breeding	FG: Daur Alam Membership: 33 Village: Pendua Sub-district: Kayangan CP: Cattle enterprise: Breeding		2. Feed management - Planting legume: Sesbania and Leucaena
20		Suharno PPL Andgiang CP:082339943288	FG: Beriuk Bangkit Membership: 20 Village: Andgiang Sub-district: Kayangan CP: Istiadi Heryanto 0852370335526 Cattle enterprise: Breeding	FG: Beriuk Bangkit Membership: 20 Village: Andgiang Sub-district: Kayangan CP: Istiadi Heryanto 0852370335526 Cattle enterprise : Breeding		2. Feed management - Planting legume: Sesbania and Leucaena
21		Saehun PPL Salut CP: 085338628793	FG: Antih Ujan 1 Membership: 20 Village: Salut Sub-district: Kayangan CP: Zubairi 081993028691 Cattle enterprise: Breeding	FG: Antih Ujan 1 Membership: 20 Village: Salut Sub-district: Kayangan CP: Zubairi 081993028691 Cattle enterprise: Breeding		2. Feed management - Planting legume: Sesbania and Leucaena

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
22		Saehun PPL Salut CP: 085338628793	FG: Karya Bersatu Membership: 22 Village: Salut Sub-district: Kayangan CP: Harjan 081999585095 Cattle enterprise: Breeding	FG: Karya Bersatu Membership: 20 Village: Salut Sub-district: Kayangan CP: Harjan 081999585095 Cattle enterprise: Breeding		2. Feed management - Planting legume: Sesbania and Leucaena
23		Agus PPL Village Pansor CP:085333843813	FG: Sambik Pantoan Membership: 20 Village: Pansor Sub-district: Kayangan CP: Istiadi Heryanto 0852370335526 Cattle enterprise: Breeding	FG: Sambik Pantoan Membership: 20 Village: Pansor Sub-district: Kayangan CP: Istiadi Heryanto 0852370335526 Cattle enterprise: Breeding		2. Feed management - Planting legume: Sesbania and Leucaena
24		Kardianto Koordinator PPL UPTD Kayangan CP:085935221650	FG: Darmisan Sangiang Membership: Village: Santong Sub-district: Kayangan CP:Paizin 081999152323 Cattle enterprise : Breeding	FG: Darmisan Sangiang Membership: Village: Santong Sub-district: Kayangan CP:Paizin 081999152323 Cattle enterprise : Breeding		2. Feed management - Planting feed Sesbania and Leucaena
25	UPTD Bayan	Nengah Koordinator UPTD Bayan CP:085337329736	FG: Subur Tani Membership: 25 Village: Anyar Sub-district: Bayan CP: Raden Ariadi 081803750562 Cattle enterprise: Breeding	FG: Subur Tani Membership: 25 Village: Anyar Sub-district: Bayan CP: Raden Ariadi 081803750562 Cattle enterprise: Breeding		2. Feed management - Planting legume: Sesbania and Leucaena

	SI	Fasilitator SI	Rencana Sites	Aktual Site	Faktor-faktor penyebab perubahan site	Teknologi yang diterapkan
26		Nirani PPL Sukaanda CP:081937365082	FG: Cemoh Lalok Membership: 20 Village: Sukaanda Sub-district: Bayan CP: Ismail Hasanudiin 081907196179 Cattle enterprise: Breeding	FG: Cemoh Lalok Membership: 20 Village: Sukaanda Sub-district: Bayan CP: Ismail Hasanudiin 081907196179 Cattle enterprise: Breeding		2. Feed management - Planting legume: Sesbania and Leucaena
27		Dewi PPL Senaru CP:081907416136	FG: Maju Sejahtera Membership: 15 Village: Senaru Sub-district: Bayan CP: Musanip 081937146575 Cattle enterprise: Breeding	FG: Maju Sejahtera Membership: 15 Village: Senaru Sub-district: Bayan CP: Musanip 081937146575 Cattle enterprise: Breeding		2. Feed management - Planting legume: Sesbania and Leucaena

11.2 Appendix 2: Analysis of the nodes by district

Dompu district

Initial	Actual Node	Factors causing nodes not performing/functioning	IVMS Introduced
<p>Farmer Group : Ni'u Monca Members : 31 Village : Dorebara Subdistrict : Dompu CP : Sopan sopian (082339159350) Type: Breeding and Fattening</p>		<ul style="list-style-type: none"> - No one wants to grow lamtoro because there are many wild lamtoro around - Institutional : group meetings occurred when FO attend the meeting - There was no practice change to admit IVMS into the system to improve production and institutional performance - FO does not find ways to motivate and improve group performance - The targeted scaling sites to visit is relatively far from the target node there is good group with closer distances 	<ol style="list-style-type: none"> 1. Fattening <ol style="list-style-type: none"> a. Feed lamtoro supplemented with small amount rice bran 2. Husbandry and health <ol style="list-style-type: none"> a. Improved housing b. Regular weighing and health inspection 3. Market Chain <ol style="list-style-type: none"> a. Fatten bull price determined by body condition b. Farm gate sale 4. Institutional <ol style="list-style-type: none"> a. Group meeting b. Access to Bank c. Collect member dues
<p>Farmer Group : Pete Jaya Members : 20 Village : Songgajah Subdistrict : Kempo CP : Mangku (082340102924) Type : Fattening</p>		<ul style="list-style-type: none"> - Recommended by LO - Part of ongoing project IFSCA-New Zaeland, potential overlapping with IFSCA interest 	
<p>Farmer Group : Mandiri Member : 20 Village : Soro Barat Subdistrict : Kempo CP : Ilyas (085238908371) Type : Fattening</p>	<p>Farmer Group : Mandiri Member : 20 Village : Soro Barat Subdistrict : Kempo CP : Ilyas (085238908371) Type : Fattening</p>		<ol style="list-style-type: none"> 1. Forage management : <ol style="list-style-type: none"> a. Establishing lamtoro integrated to mott grass 2. Fattening <ol style="list-style-type: none"> a. Feed Lamtoro supplemented with small amount rice bran 3. Husbandry and health : <ol style="list-style-type: none"> a. Improved housing 4. Market Chain <ol style="list-style-type: none"> a. Fatten bull price determined by body condition b. Farm gate sale

Initial	Actual Node	Factors causing nodes not performing/functioning	IVMS Introduced
Farmer Group: KTT Safahu Members : 12 Village : Tolokalo Subdistrict : Kempo CP : Ikhlas (085338101763) Type : Fattening	Farmer Group: KTT Safahu Members : 12 Village : Tolokalo Subdistrict : Kempo CP : Ikhlas (085338101763) Type : Fattening		<ol style="list-style-type: none"> 1. Forage management : <ol style="list-style-type: none"> a. Establisihing lamtoro 2. Fattening with lamtoro <ol style="list-style-type: none"> a. Feed Lamtoro up to 100% 3. Husbandry and health : <ol style="list-style-type: none"> a. Improved housing 4. Market Chain <ol style="list-style-type: none"> a. Fatten bull price determined by body condition b. Farm gate sale

Sumbawa district

Initial	Actual Node	Factors causing nodes not performing/functioning	IVMS Introduced
Group . Berkembang Member: 14 Orang Village : Prode SP1 Subdistrict. : Plampang Type : Fattening and breeding	Group . Berkembang Member: 14 Orang Village : Prode SP1 Subdistrict. : Plampang Type : Fattening and breeding		<ol style="list-style-type: none"> 1. Weaning at 5-6 month 2. Forage management <ul style="list-style-type: none"> • Establishing lamtoro integrated with mott grass and pakchong • Feed preservation: mungbean and peanut hay 3. Fattening <ul style="list-style-type: none"> • Fattening with legume: Lamtoro dan Gliricidia 4. Husbandry and Health <ul style="list-style-type: none"> • Vitamin and worm control • Improved housing to meet animal welfare • Regular weighing 5. Market Chain <ul style="list-style-type: none"> • Farm gate sale • Price determined by size and body condition 6. Institutional <ul style="list-style-type: none"> • Complete administration book • Set routine activities through regular meeting • Collect member dues • Manage group cash • Rotating investment to improve/build cattle house • Social innovation: communal work

Initial	Actual Node	Factors causing nodes not performing/ functioning	IVMS Introduced
<p>Group: Banyu Urip Member: 28 Village : Suka Damai Subdistric: Labangka Type : Breeding and Fattening</p>		<ul style="list-style-type: none"> • Group organization is not going well • The group has not been able to be independent in carrying out every activity and decision making • The group does not like change from what has been conducted routinely to new things • The motivation to take new management offered to receive aid and compensation • Other group surrounding who adopts new management improved performance better than the node group 	<ol style="list-style-type: none"> 1. Weaning at 5-6 months old 2. Forage management <ul style="list-style-type: none"> • Established lamtoro, mott and pakchong grass • Feed preservation: mungbean dan peanut hay 3. Fattening with legume; lamtoro and Gliricidia 4. Husbandry and Health <ul style="list-style-type: none"> • Vitamin and worm control • Improved cattle housing to meet animal welfare • Regular weighing 5. Market chain <ul style="list-style-type: none"> • Farm gates sale • Price determined by size and body condition 6. Institutional <ul style="list-style-type: none"> • Complete administration book • Set of group routine activities through regular meeting • Group dues • Social innovation: communal work
<p>Group: Mampis Rungan I Member : 20 Orang Village : Sabedo Subdistrict : Utan Type: fattening</p>		<ul style="list-style-type: none"> • The distance between the Node location and the FO's residence is very far so that the FO cannot visit and support the group in a regular manner • Internal conflict within the group due to government aid • Fattening management really good but access to the location is not reliable and the location is less strategic to be used as a Node • Institutional and group management are not working well • Group activities decision dominated by the group leader without consultation of the members 	<ol style="list-style-type: none"> 1. Forage management <ul style="list-style-type: none"> • Established lamtoro and mott grass 2. Fattening using lamtoro and Gliricidia 3. Husbandry and health: <ul style="list-style-type: none"> • Build good cattle house to meet fattening standard

West Sumbawa district

Initial	Actual Node	Factors causing nodes not performing/ functioning	IVMS Introduced
Group: Ai Boro Σ Member: 8 Village: Senayan Subdistrict: Poto Tano CP: Abdul Muin (0852 5336 8421) Type: Fattening		<ul style="list-style-type: none"> • Acces to the location during rainy season not reliable • Group leader lacks ability to drive members of the group • The existence of internal conflicts and the group became vacuum and disbanded and some members formed a new group • Group leader no longer doing fattening • All fattening activities in communal housing stop 	
Group: Ai Amit Σ Member: 10 Village: Tapir Subdistrict: Seteluk CP: M. Ali (0852 5336 7749) Type: Fattening		<ul style="list-style-type: none"> • The group member has no land available to grow lamtoro no expansion since the first lamtoro established • Members are less enthusiastic about new innovations • Willing to join the program in the hope of getting aid from the government • The group binding not strong and some members come out to form a new group 	
Group: Lang Glampok Σ Member: 10 Village: Beru Subdistrict: Jereweh CP: M. Ali Uba (0823 4227 0432) Type: Breeding		<ul style="list-style-type: none"> • The cattle herd manage personally by the leader and member not involved in cattle management • Less welcome to new information and technologies that can improve production • Access to toward the site not realible • The group is recommended by dinas since the group received aid and assistance from Dinas 	
Group: Basai Ate Σ Member: 8 Village: Kemuning Subdistricts: Sekongkang CP: Abdul Gayum (0813 3753 8952) Type: Breeding and Fattening		<ul style="list-style-type: none"> • New form group • The cattle house relatively far from forage area • Most of the group member work on mining company and have to follow quarantine procedure during the covid-19 pandemic thus hold up the group activities. 	

Initial	Actual Node	Factors causing nodes not performing/ functioning	IVMS Introduced
<p>Group: Sagena Indah Σ Member: 18 Village: Kiantar Subdistrict: Poto Tano CP: Alfian (0852 5373 4352) Type: Breeding and fattening</p>		<ul style="list-style-type: none"> • Group formed in order to join social forestry program • Less welcome to new information and technologies that can improve production • Need more time to change the mindset to become cattle farmer 	
	<p>Group: Tengkal Talutu Σ member: 10 Village: Senayan Subdistrict: Poto Tano CP: Kusmiran, S.Pt (0821 4750 3636) Type: Breeding and Fattening</p>		<ol style="list-style-type: none"> 1. Weaning <ul style="list-style-type: none"> • Weaning at 6-8 months old 2. Forage management <ul style="list-style-type: none"> • Lamtoro paddock 5 Ha • Lamtoro integrated with improved forage • Preserved lamtoro by making dried lamtoro 3. Fattening based on Lamtoro <ul style="list-style-type: none"> • Bull fed lamtoro at all time • Lamtoro offered up to 100% 4. Husbandry and Animal Health <ul style="list-style-type: none"> • Regular weighing • Improved cattle housing to meet welfare 5. Market Chain <ul style="list-style-type: none"> • Farm gate sale • Price determined by body weight

East Lombok district

Initial	Actual Node	Factors causing nodes not performing/ functioning	IVMS Introduced
<p>1. Group : Kebon Telaga Member : 17 Village : Pringgasela Timur Subdistrict : Pringgasela Type : Breeding CP : M. Sareh (087783929546) CP : Muhammad Arifin (087755271711)</p>	<p>1. Group : Kebon Telaga Member : 17 Village : Pringgasela Timur Subdistrict : Pringgasela Type : Breeding</p>		<p>1. Natural mating</p> <ul style="list-style-type: none"> • Selected Bull <p>2. Weaning</p> <ol style="list-style-type: none"> a. Weaning at 5-6 months old <p>3. Forage management</p> <ul style="list-style-type: none"> • Established : Sesbania, pakchong dan elephant grass • Using Sesbania and Gliricidia as protein sources feed • Preservation: silage in small bunker • Silage feed <p>4. Waste management</p> <ul style="list-style-type: none"> • Composting manure, planting media dan biourine • Use compost for crop (rice, maize, avocado, durian, vegetables) • Sell compost and planting media <p>5. Husbandry and health</p> <ul style="list-style-type: none"> • Improved cattle housing to meet welfare requirement • Regular weighing <p>6. Institutional</p> <ul style="list-style-type: none"> • Montly meeting • Meber dues @ IDR 5,000/month • Bull service @ IDR 30,000 (IDR 25,000 to bull manager and IDR 5,000 to the group) • Retribution for cattle sell @IDR 50,000/head to the group) • Levies IDR 750,000/member to buy bull <p>7. Market chain</p> <ul style="list-style-type: none"> • Farm gate sale • Price determined by age and size

Initial	Actual Node	Factors causing nodes not performing/ functioning	IVMS Introduced
<p>2. Group : Harrik Yadak Turzak member : 34 Village: Karang Baru Subdistrict : Wanasaba Type : Breeding CP : Hafiz Hartozi (087763349086) CP : Mawar (087854903823)</p>		<p>a. Group institutions have not gone well b. There is unsolved problem between group leader and the member c. Some member not participate actively in group activities d. Member prefer to raise exotic cattle e. IVMS not fully implemented, FTL adaptation very limited and member prefer to use AI to get crosbreed offspring</p>	<p>1. Weaning</p> <ul style="list-style-type: none"> • Bali cattle at 5-6 month old • Exotic cattle at 6 month for sale <p>2. Forage management</p> <ul style="list-style-type: none"> • Established : Sesbania, pakchong and elephant grass • Sesbania use as protein source feed <p>3. Waste management</p> <ul style="list-style-type: none"> • Composting manure • Utilise compost for corn and vegetables • Compost sell <p>4. Husbandry and health</p> <ul style="list-style-type: none"> • Regular weighing <p>5. Institutional</p> <ul style="list-style-type: none"> • Monthly meeting • Member dues @ IDR 5,000/member • Retribution for selling cattle @ IDR 50,000 for the group <p>6. Market chain</p> <ul style="list-style-type: none"> • Farm gate sale coordinate by group marketing section • Price for cow and heifer determined by age and size • Price for bull determined by body weight

Initial	Actual Node	Factors causing nodes not performing/ functioning	IVMS Introduced
<p>3. Group : Muda Berkarya Member : 20 Village : Aikdewa Subdistrict : Pringgasela Type : Fattening CP : M. Zohri (081997793066) CP : Mustofa Bakri (087764729649)</p>		<p>a. Fattening scattered around the community area b. Members and group leader communication limit by distance and different activities as some of the member are casual labor c. Land ownership to grow forage very limited d. The scale of fattening difficult to increase due to limited land ownership and cattle houses exist in residential areas</p>	<p>1. Forage management</p> <ul style="list-style-type: none"> • Established : Sesbania, pakchong and elephant grass • Sesbania use as protein source feed • Preservation: dried forage/hay, silage • Complete feed <p>2. Fattening : lamtoro, sesbania and complete feed</p> <p>3. Husbandry and health</p> <ul style="list-style-type: none"> • Regular weighing <p>4. Institutional</p> <ul style="list-style-type: none"> • Monthly meeting • Member dues @ IDR 5,000/month • Retribution to cattle sale @ IDR 50,000/head <p>5. Market chain</p> <ul style="list-style-type: none"> • Farm gate sale • Price determined by body weight
<p>4. Group Ridho Ilahi Member : 20 orang Village : Tanak Mira Subdistrict : Wanasaba Type: Breeding CP : Tarmizi (087763291665)</p>		<p>a. Group received many support and aid for various government program b. The group member saturated with various programs from provincial and central government c. Group loss interes to new program offered</p>	<p>1. Forage management</p> <ul style="list-style-type: none"> • Sesbania establishment • Sesbania as protein sources feed • Feed preservation and complete feed

Initial	Actual Node	Factors causing nodes not performing/ functioning	IVMS Introduced
5. Group : Sambuk Manis Member : 51 Village : Berirjarak Subdistrict : Wansaba Type: Breeding CP : Samsul Falah (087850873169)		a. Location is not suitable for learn and visit b. Group leader is not active c. Limited land to fully implement the technology component	1. Natural mating with selected bull 2. Weaning at 5-6 months old 3. Forage management <ul style="list-style-type: none"> • Established: Sesbania, pakchong and elephan grass • Use sesbania and gliricidia as protein siurces feed 4. Waste management <ul style="list-style-type: none"> • Composting manure
6. Group : Sabilal Muhtadin Member: 85 orang Village : Kalijaga Selatan Subdistrict : Aikmel Type: Breeding CP : H. M. Yakub (Kepala Desa) CP : Salwi (087763191312)		a. Collective comunal cattle housing b. No group instutuion c. Government aid oriented d. Number of cattle and farmer to big to be menaged into one node	
7. Group: Tembere Kokoh Member : Village : Dasan Lendang Subdistrict: Lenek Type : Breeding CP : Zainudin		a. Members are manager that received monthly payment to manage the cattle b. Member of the group has less interest new program offered c. Production system interventions are not a priority	

Central Lombok district

Initial	Actual Node	Factors causing nodes not performing/ functioning	IVMS Introduced
1. Group: Bumbang Wetan Member: 48 Village : Mertak Subdistrict: Pujut Type : Breeding and Fattening	Group: Bumbang Wetan Member: 48 Village : Mertak Subdistrict: Pujut Type : Breeding and Fattening		<ul style="list-style-type: none"> - Control Mating <ul style="list-style-type: none"> o Mating season from April to October o Selected bull o Bull replaced every year - Weaning at 5-6 months old - Forage management <ul style="list-style-type: none"> o Established: Lamtoro, Sesbania, Pakchong dan Elephant grass o Gliricidia, Sesbania and Lamtoro use as protein sources feed o Wet (silage) and dry (hay) preservation o Cornstover storage - Fattening : Feed with lamtoro, gliricidia and Sesbania - Waste managemen : <ul style="list-style-type: none"> o Composting manure o Compost use for vegetables, grasses and corn o Compost sale - Husbandry and health <ul style="list-style-type: none"> o Improved cattle house to meet welfare o Regular cattle weighing - Institutional <ul style="list-style-type: none"> o Weekly regular meeting o Member dues @IDR 2,000/week o Save and borrow (interest 2%/month) o Rotating investment to improve/build cattle house o Bull service fee @IDR 20,000 (IDR 10,000 for bull manager, IDR 10,000 for the group) o Retribution for cattle sale @IDR 10,000/head for group - Market chain <ul style="list-style-type: none"> o Farm gate sale o Price determined by age and size

Initial	Actual Node	Factors causing nodes not performing/ functioning	IVMS Introduced
<p>2. Group: Lestari Bawak Bunut Member : 24 Village : Batu Jangkih Subdistrict: Praya Barat Daya Type: Breeding</p>		<ul style="list-style-type: none"> - Location far from other place and road access not reliable - Group less response to new management system - Group chosen by senior extension staff for other reason/motive - Group loss trust to dinas who promised to provide aid but fail to fulfill. Indobeef assumed similar to dinas program that causing members reluctant to participate in the activities - The group organisation not working well - Monthly meeting not working and hold up communication between member and group leader - Extension staff less active to visit the site - IVMS intervention not implemented at all including forage establishment have been stop 	<ol style="list-style-type: none"> 1. Forage management <ol style="list-style-type: none"> a. Established lamtoro, pakchong, mott and elephant grass b. Gliricidia offered to cow 2. Husbandry and health <ol style="list-style-type: none"> a. Regular weighing b. Improved cattle house to meet welfare 3. Institutional <ol style="list-style-type: none"> a. Monthly meeting b. Member dues @IDR 10,000/month 4. Market Chain <ol style="list-style-type: none"> a. Farm gate sale b. Price determined by age and size

Initial	Actual Node	Factors causing nodes not performing/ functioning	IVMS Introduced
<p>3. Group: Iye Gati Member : 24 Village : Batu Jangkih SUBdistrict: Praya Barat Daya Type: Breeding</p>		<ul style="list-style-type: none"> - Location in the hilly area difficult to access for learn and visit - Cattle housing scattered set up next to the house - The room to increase cattle number very limited - Meeting place to host visitor not available 	<ol style="list-style-type: none"> 1. Forage management <ol style="list-style-type: none"> a. Established: Lamtoro, sebania, pakchong and elephant grass b. Utilise rice field during dry season to grow grasses c. Legume inclusion for feed offered 2. Fattening : Sesbania, gliricidia and lamtoro 3. Waste management <ol style="list-style-type: none"> a. Composting manure b. Use compost for grass and water spinach 4. Husbandry and health <ol style="list-style-type: none"> a. Regular weighing b. Improved cattle house to meet welfare 5. Market chain <ol style="list-style-type: none"> a. Purchase feeder from livestock market b. Farm gate and market sale c. Price determined by age and size 6. Institutional <ul style="list-style-type: none"> - Regular meeting - Member dues @ IDR 5,000/month - Save and borrow with interest rate of 2%/month
<p>4. Group: Pantang Mundur Member : 24 Village: Batu Jangkih Subdistrict: Praya Barat Daya Type: Breeding</p>		<ul style="list-style-type: none"> - Member loss trust to the leader - Farmer organisation not working - Regular meeting can't run - Group leader very dominant group so that group members cannot express opinions - FO could not find a way to fix communication problem between leader and member - Waste management cannot work despite good facilities installed by government 	<ol style="list-style-type: none"> 1. Forage management <ul style="list-style-type: none"> - Established sesbania and elephant grass 2. Fattening use sesbania 3. Husbandry and animal health <ul style="list-style-type: none"> - Regular weighing - Improve feeding trough 4. Market chain <ul style="list-style-type: none"> - Farm gate sale and cattle market - Purchase feeder stock in the cattle market

North Lombok district

Initial	Actual Node	Factors causing nodes not performing/ functioning	Technology Implemented
<p>1. Group: Ngiring Datu Member: 90 Village : Segara Katon Subdistrict: Gangga Type : Breeding and fattening</p>	<p>2. Group: Ngiring Datu Member : 90 Village : Segara Katon Subdistrict: Gangga Type : Breeding and fattening</p>		<ol style="list-style-type: none"> 1. Control mating <ol style="list-style-type: none"> a. Mating calendar from June to December b. Selected bull and replaced every year 2. Weaning at 6 moth old 3. Forage management <ol style="list-style-type: none"> a. Established : Sesbania, lamtoro, mott and elephant grass b. Storage for dry season feed: Rice and peanut straw c. Lamtoro hay 4. Waste management <ol style="list-style-type: none"> a. Composting manure b. Use compost for vegetables, forage and rice field 5. Fattening with lamtoro, Sesbania, Moringa and Gliricidia as protein sources 6. Husbandry and animal health <ol style="list-style-type: none"> a. Regular weighing 7. Institutional <ol style="list-style-type: none"> a. Monthly meeting b. Member dues c. Cattle sale redistribution @ IDR. 25,000/head d. Bull service redistribution IDR 30,000r (bull manager received IDR. 20,000, group IDR. 10,000) e. Save and borrow cooperation 8. Market chain <ol style="list-style-type: none"> a. There is a middleman as member of the group who has wide net-working b. Price determined by bodyweight, frame, and body condition c. Farm gate sale d. Member purchase heifers, cows, feeders stock facilitated by cooperation

Initial	Actual Node	Factors causing nodes not performing/ functioning	Technology Implemented
			<ul style="list-style-type: none"> e. Cooperation provide loan with profit share 70% manager and 30% cooperation f. Compost and manure sale coordinate by cooperation with profit sharing between group and cooperation
<p>Group: Bukit Tunggal Membera: 34 Village: Sambik Bangkol Subdistrict: Gangga Type: Breeding</p>		<ul style="list-style-type: none"> a. Institutional and group management less function b. Focus on crossbred breeding with AI c. IMVS implementation not working well 	<ul style="list-style-type: none"> 1. Forage management <ul style="list-style-type: none"> a. Established and utilise: lamtoro, sesbania, gliricidia, Indigofera, mott dan pakcong b. Preservation : lamtoro hay and powder c. Feed storage for dry feeding: peanut and rice straw 2. Husbandry and Health <ul style="list-style-type: none"> a. Regular weighing b. Improved cattle house 3. Waste management <ul style="list-style-type: none"> a. Composting manure b. Use compost for dry land, yard and to grow vegetables by women group 4. Market chain <ul style="list-style-type: none"> a. Compost sale and manure sale @ IDR 150,000/tract b. Farm gate sale 5. Institutional <ul style="list-style-type: none"> a. Monthly meeting b. Member dues c. communal work

Initial	Actual Node	Factors causing nodes not performing/ functioning	Technology Implemented
<p>Group: Bagenda Maju Member: 37 Desa: Pendua Subdistrict: Kayangan Type : Breeding and Fattening</p>	<p>Group: Bagenda Maju Member: 37 Desa: Pendua Subdistrict: Kayangan Type : Breeding and Fattening</p>		<ol style="list-style-type: none"> 1. Control mating <ol style="list-style-type: none"> a. Mating calendar from June to December b. Preferred with AI and backup using natural mating with unselected bull 2. Weaning at 5-6 months old 3. Forage management <ol style="list-style-type: none"> a. Established: Sesbania, lamtoro, gliricidia, pakcong dan mott grass b. Feed storage for dry season feeding; peanut , rice and corn straw c. Dried lamtoro 4. Fattening with Sesbania, lamtoro and moringga 5. Husbandry and health <ol style="list-style-type: none"> a. Improved communal cattle housing to meet animal welfare b. Regular cattle weighing 6. Waste management <ol style="list-style-type: none"> a. Composting manure b. Utilise for vegetables growing around the house by women group 7. Market chain <ol style="list-style-type: none"> a. Fatten bull sale based on weight, frame and size b. Farm gate sale c. Compost sale 8. Institutional <ol style="list-style-type: none"> a. Cattle recording b. Monthly meeting c. Member dues d. Save and borrow with interest of 2%

Initial	Actual Node	Factors causing nodes not performing/ functioning	Technology Implemented
<p>Group: Bina Karya Member: 18 Village: Sambik Elen Subdistrict: Bayan Type: Breeding</p>	<p>Group: Bina Karya Member: 18 Village: Sambik Elen Subdistrict: Bayan Type: Breeding</p>		<ol style="list-style-type: none"> 1. Mating <ol style="list-style-type: none"> a. Natural mating with unselected bull and combine with AI 2. Weaning at 6 month old 3. Forage management <ol style="list-style-type: none"> a. Established : Sesbania, lamtoro, pakcong dan mott b. Feed storage for dry season: peanut and rice straw 4. Husbandry and Health <ol style="list-style-type: none"> a. Build new communal cattle housed to improve animal welfare b. Regular weighing 5. Waste management <ol style="list-style-type: none"> a. Composting manure b. Use for cashew and vegetables 6. Institutional <ol style="list-style-type: none"> a. Communal work b. Monthly meeting c. Member dues d. Save and borrow with interest rate 3%