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Agriculture based emission-reduction options to support NDCs in Viet Nam and Fiji

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1 Acknowledgments

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2 Executive summary

Climate change is a global phenomenon which requires a global response. The Paris Agreement (COP21) is core to that response. The centrepiece of the Agreement is a set of voluntary national commitments (Nationally Determined Contributions, NDCs) to reduce greenhouse gas (GHG) emissions with these reduction targets increasing over time. Many of these commitments, particularly from developing countries, include agriculture. At present, many nations in the Asia-Pacific region are not able to deliver on these commitments in cost-effective and sustainable ways as: locally appropriate agricultural emission-reduction options have not been identified, there is a lack of accounting methods that can capture emission reductions from various options, and there are shortfalls in capacity to measure and report emission reductions in a transparent and robust manner.

This project identified locally appropriate mitigation pathways in agriculture that will also support poverty reduction, sustainable productivity increase, improved income, and food security. The project therefore recognises the central importance of delivering mitigation co-benefits to promote uptake at a local level by farmers. The project also identified the institutional and governance frameworks required to deliver these mitigation options and highlighted where further capacity development is required.

Our process was grounded in inclusive participatory decision making that brought a range of stakeholders together to ensure the alignment of national NDC goals with local realities. The process also included mechanisms for feedback and revisions of the 'living documents' to recognise that the process of identifying suitable mitigation options is an iterative and non-linear process.

The main research methods used to gather information were (1) in-country stakeholder workshops, (2) regular communication and interviews with key experts, and (3) a review of literature. Initial reports were drafted using the literature to create the baseline 'living document' that was revised and updated on an on-going basis according to feedback from workshops and interviews.

In Vietnam, the greatest contribution agricultural GHG mitigation will be from the rice sector (which contributes to >50% of agricultural emissions). Mitigation options in the rice sector are well developed including many regional studies relevant to country specific (Intergovernmental Panel on Climate Change (IPCC) Tier 2) estimates of GHG emissions. For example, alternative wetting and drying has the potential to reduce CH_4 emissions, whilst delivering various co-benefits e.g. greater yield and profit (through reduced pumping costs). Other promising mitigation options in cropping include agroforestry and the use of organic amendments, as they represent relatively low-cost options for delivering GHG emission reductions and co-benefits such as income diversification and ecological

Livestock mitigation options are less established in Viet Nam, but a range of suitable options were identified based on whether the technology is currently available, is economically viable and is suited to the farming systems where it will be implemented. Viable options included: animal feed and diet manipulation, animal health, genetics and breeding, manure management and aspects of farm management e.g. grazing management and the adoption of silvopastural systems.

In Fiji, the greatest contribution to agricultural GHG mitigation will be delivered through mitigation in the livestock sector, which contributes to ~90% of emissions. The available mitigation options are similar to those listed for Viet Nam, although the governance and application of options will vary according to local context. Cropping systems will have a less significant impact (in terms of GHG mitigation) than livestock due to their relatively small contribution to GHG emissions. However, this should not preclude the inclusion of low-cost options that represent a return to traditional forms of agriculture that promote diversified incomes and resilient soils (e.g. agroforestry and intercropping).

There are several capacity gaps that must be addressed prior to the implementation of mitigation options that can be undertaken in the next phase of the project. These include; greater capacity building of local experts to calculate the National Inventory and greater transparency of methods for calculating the National Inventory; more locally specific data to calculate GHG emissions - especially in the measurement of emissions from livestock; training and development of best practice for measuring GHG emissions; development of central data repository to hold all available data on GHG emissions; and better communication and collaboration between relevant ministries, universities and other relevant stakeholders involved in the measurement, reporting and verification (MRV) of GHG emissions. Therefore, the next phase of the project must advance to a more detailed assessment of mitigation options (e.g. co-benefits and cost-benefit analysis) combined with continued capacity development, particularly in the measurement and reporting of GHG emissions.

3 Background

Climate change is a global phenomenon which requires a global response. The Paris Agreement (COP21) is core to that response. The centrepiece of the Agreement is a set of voluntary national commitments (Nationally Determined Contributions) to reduce greenhouse gas (GHG) emissions that will be ramped up over time. Many of these commitments, particularly from developing countries, include agriculture.

At present, many nations in the Asia-Pacific region are not able to deliver on these commitments in cost-effective and sustainable ways as:

- locally appropriate agricultural emission-reduction options are yet to be identified;
- there is a lack of accounting methods that can recognise and capture these emission-reduction options, and;
- there are shortfalls in capacity, inventory information and systems.

Despite clear acknowledgment that many developing countries in the Asia-Pacific region are not able to address their NDC commitments for emission reductions, this has not been formally explored and evaluated for most of those countries. It is recognised that mitigation options must be aligned with other priorities (e.g. poverty reduction, sustainable productivity increase, income and food security) to establish effective mitigation pathways, which also include incentives downstream for farmers (i.e. co-benefits of mitigation options for farmers).

The implementation of mitigation options that address multiple objectives requires collaboration and integration across multiples agencies – which is lacking in many countries. Therefore, this project is focused on developing a realistic plan for implementing mitigation options that optimise emission reductions, while maintaining smallholder income and food security. The project has the potential to expand to other countries dependent on subsequent funding opportunities.

4 Objectives

The aim of this project was to identify mitigation options and key capacity development needs in the agricultural sector to support both Vietnam and Fiji in meeting their NDC commitments. This overarching project aim can be broken down into three main objectives:

- To assess the potential to apply a range of agricultural mitigation options, drawing on experience from Australia and internationally, appropriate to developing countries in the Asia-Pacific.
- To develop a governance checklist enabling user countries to identify and capture locally appropriate emission-reduction options towards their NDC commitments.
- To provide a more detailed analysis of potential co-benefits and existing capacity gaps in relation to emission-reduction options in Fiji and Vietnam.

5 Methodology

The main research methods used to collect data were (1) in-country stakeholder workshops, (2) regular communication and interviews with key experts, and (3) a review of the literature. Initial reports were drafted using literature to create the baseline 'living document' (Appendix: Background Document) that was revised and updated on an on-going basis according to feedback from workshops and interviews.

Our process was grounded in inclusive participatory decision making that brought a range of stakeholders together to ensure the alignment of national NDC goals with local realities. The process also included mechanisms for feedback and revisions of the 'living document' to recognise that the process of identifying suitable mitigation options is an iterative and non-linear process.

An initial list of appropriate mitigation options was determined by Australian scientists prior to in-country workshops. Further input on mitigation options and their co-benefits was gained at in-country workshops through participatory engagement (e.g. the use of multi-criteria ranking exercise for mitigation options). This information was used to further revise a list of 'most-promising' mitigation options for partner countries.

In addition to the stakeholder workshop, each mitigation option was assessed by Australian scientists to determine their potential to deliver co-benefits. This was approached using a multi-criteria decision-making framework. This was based on the CCASF-CIAT Climate Smart Agriculture prioritisation framework (CSA-PF).

This framework is divided into four phases: (1) Initial assessment of CSA options, (2) Identification of top CSA options, (3) A more in-depth calculation of costs and benefits of top CSA options, (4) Development and evaluation of barriers to implementation of selected options. It was beyond the scope of our project to extend to phase (3) and (4) of this framework, but we used this framework to structure our initial assessment, with the view that the partner countries can progress to phase 3 and 4 of the framework given the necessary support and funding.

The list of mitigation options from the initial stakeholder workshop was further refined by a desktop review and consultation with in-country experts (including an online workshop September 2020), which analysed mitigation options in terms of their mitigation potential and delivery of co-benefits.

Co-benefits metrics considered for cropping included: productivity (increased yields and greater food security)[1], (2) profitability (e.g. reduced input costs for farmer), (3) soil health, (4) soil water retention, and (5) reduced soil erosion. In livestock, the co-benefit metric included: (1) increased animal production, (2) animal production efficiency, (3) resource use efficiency, (4) cost efficiency, (5) food security, (6) animal welfare, (7) nutrient reuse, (8) soil health, (9) renewable energy production, (10) product diversification, (11) decreased nitrogen pollution, and (12) decreased odours from waste.

Our multi-criteria analysis also considered ease of implementation, an ex-ante assessment of cost (if available) and gender considerations. Our evidence-based approach recognises that there is an absence of 'perfect information', but the decision-making process must advance despite data and resource constraints.

From our multi-criteria analysis, we were able to identify 'most-promising' mitigation options that will form the basis of more in-depth analysis moving forward in the project. The

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[1] *The 1996 World Food Summit defined food security as the state "when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active, healthy life" (FAO, 1996).*

most promising mitigation options were those that not only delivered GHG mitigation, but also scored highly on a range of co-benefits.

In terms of the governance of mitigation options in agriculture, literature and in-country consultations were used to develop a 'governance checklist' (Appendix A2). This checklist consolidated the work of many organisations that have focused on institutional requirements for the measurement, reporting and verification of GHG emissions to generate a National GHG Inventory (e.g. US-EPA 2011; UNDP 2015; GIZ 2017; Wilkes *et al.* 2017; Bakhtiari *et al.* 2018).

The checklist used these documents as a foundation to provide more detailed guidance on governance requirements for the implementation of mitigation options in agriculture, which has not been outlined elsewhere in the literature. The checklist also provided a basis for countries to audit their existing capacity and identify gaps for future development.

6 Achievements against activities and outputs/milestones

Objective 1: To assess the potential to apply a range of mitigation options, drawing on experience from Australia and internationally, appropriate to developing countries in the Asia-Pacific

no.	activity	outputs/ milestones	completion date	comments
1.1	Draft review report by Australian scientists on mitigation options in target countries as precursor to initial stakeholder workshop.	Review report on mitigation options was prepared prior to in-country workshops (Appendix: Background Document).	Initial draft report submitted December 2018. Updated version submitted June 2020.	An initial draft assessment of mitigation options and agricultural systems in target countries was presented to ACIAR in December 2018. This document was used as a 'living document' and updated continually as the project progressed to include information gained from the in-country workshops, literature, and key experts. The updated report was re-submitted to ACIAR in June 2020 (Appendix: Background Document).
1.2	Workshop and consultation with key in-country experts and NGO stakeholders in Fiji and Vietnam to identify mitigation options. Development of methodology and reporting framework for determining mitigation options for both in-country and Australian support staff. Identification of measurements (or their surrogates) required for the quantification of emissions from the agricultural sector.	Workshop and consultation conducted in Fiji and Vietnam (Suva, Fiji, August 2019 and Hanoi, Viet Nam, September 2019).	Fiji - August 2019 Viet Nam - September 2019	
1.3	A review report of the key agricultural systems in the target countries against known mitigation options as a context for incorporating governance, capacity building and gender considerations.	A contextual review report of the key agricultural systems of target countries was prepared (Appendix: Background Document).	Initial draft report submitted December 2018. Updated version submitted June 2020.	

PC = partner country, A = Australia

Objective 2: To develop a governance checklist enabling user countries to identify and capture locally appropriate emission-reduction options towards their NDC commitments.

no.	activity	outputs/ milestones	completion date	comments
2.1	Draft review report by Australian and in-country scientists on governance options in target countries as precursor to stakeholder consultation.	A scoping review of the status of the institutional and legal governance settings for climate change mitigation in PCs (Appendices A3 and A4).	Initial review completed December 2018, updated report completed November 2020.	An initial draft review of PC governance was submitted to ACIAR in December 2018.
2.2	Consultation with project in-country support staff experts, collaborators and NGOs at ACIAR in Canberra. Development of methodology and reporting framework for PC and Australian support staff.	Report on existing capacity gaps in PC for MRV (Appendix A1).	Not completed in its entirety due to COVID-19 restrictions (see comment). However, significant progress made in the identification of existing capacity gaps for MRV development in PCs.	Planning had commenced in the current phase of the project to allow our in-country partners from Fiji and Viet Nam to visit Canberra and learn additional skills on emissions accounting from the Australian National Inventory team. Unfortunately, the onset of COVID-19 and associated travel restrictions prevented this trip from occurring.
2.3	A review report of the institutional and governance settings required, including inventory and MRV protocols, in Fiji and Vietnam, to capture agricultural mitigation towards their NDC commitments.	A review of the institutional and governance setting required is captured in Governance checklist (Appendix A2).	November 2020	The governance checklist was sent to PCs for comments in August 2020. The document was updated according to comments.

PC = partner country, A = Australia

Objective 3: To provide a more detailed analysis of potential benefits and existing capacity gaps in relation to emission-reduction options in Fiji and Vietnam.

no.	activity	outputs/ milestones	completion date	comments
1.1	Draft review report by Australia and in-country scientists on potential co-benefits, capacity building needs, gender considerations and implementation options in target countries as precursor to stakeholder consultation	Draft review report.	December 2018	
1.2	Consultation with key in-country experts, collaborators and NGOs in Fiji and Vietnam in relation to co-benefits, capacity building, gender considerations and implementation of mitigation options. Development of methodology and reporting framework for in-country and Australian support staff.	On-going consultation with key in-country experts. Identification of MRV capacity gaps to address moving forward (Appendix A1).	On-going	The development of GHG accounting and reporting framework is an on-going process that has been initiated in phase 1 of this project. This foundation work will be built on in Phase 2 of the project to implement robust MRV frameworks for selected mitigation options.
1.3	A review report integrating the potential co-benefits of mitigation options to food security and its relationship to capacity building, gender and implementation.	Appendices A5, A6, A7, A8.	November 2020	
1.4	Final synthesis presentation to stakeholders.	Presentation of project outcomes to all stakeholders.	24th November 2020	

PC = partner country, A = Australia

7 Key results and discussion

7.1 Agricultural mitigation options suitable for Fiji and Viet Nam

An in-depth analysis of mitigation options was undertaken for Fiji and Viet Nam. There were several suitable emission reduction strategies which are prioritised below in Table 1. Additionally, full details of these mitigation options are contained in the separate reports – (Appendices A6, A5, A8, A7).

In Fiji the key issues were:

- Uncertainty on the integrity of data feeding into the National Inventory (this needs to be addressed before mitigation options can be implemented).
- Lack of local/regional data to calculate GHG emissions (IPCC Tier 2), especially in the measurement of emissions from livestock.

In Viet Nam the key findings were:

- An increased focus required on livestock industries and a greater connection with livestock scientists (government and universities in Ho Chi Minh).
- Need for Cost Benefit Analysis of various mitigation options.

The mitigation of GHG emissions from livestock production was a priority in both countries (Appendices A6 and A8). This was particularly evident in Fiji where livestock accounts for ~90% of agricultural GHG emissions (Appendix A6). However, there are some low-cost 'win-win' approaches in cropping that should not be overlooked. For example, agroforestry and intercropping systems will deliver emission reductions, while improving food security, productivity, soil health, and general ecosystems resilience to the impending impacts of climate change (Appendix A5).

GHG emissions from rice production are substantial in Viet Nam (Appendix 7). However, GHG mitigation in rice is currently being implemented by international organisation such as IRRI, CCAFS, CCAC, CIAT; AgResults; the World Bank; CIRAD etc). As such, it was determined that a focus on livestock would hold greater value for future research and investment and this was confirmed by our Vietnamese in-country partners.

7.1.1 Co-benefits of mitigation options

The early stages of decision making around mitigation options in partner countries was supported through an analysis of the co-benefits of emission reduction strategies. Co-benefits are important because changing farm practices to reduce GHG emissions in the absence of other benefits does not incentivize farmers to alter their practices. Table 1 provides are summary of co-benefits and the mitigation options that are most suitable in Fiji and Viet Nam. Details of co-benefits in livestock and cropping are provided in Appendices 5-8.

Table 1: Co-benefits for livestock and cropping farms in Fiji and Viet Nam

Livestock farm co-benefits	Priorities for Fiji	Priorities for Viet Nam
1. Increased animal production 2. Animal production efficiency 3. Resource use efficiency 4. Cost efficiency 5. Food security 6. Animal welfare 7. Nutrient reuse 8. Soil health 9. Renewable energy production 10. Product diversification 11. Decreased nitrogen pollution 12. Decreased odours from waste	1. Silvopasture (carbon sequestration) 2. Animal feed and diet manipulation 3. Animal health and breeding (detect, prevent and remove disease, remove unproductive animals, breed efficient and healthy animals) 4. Grazing management 5. Manure management (biogas facilities, storage facilities, manure deposition/ application) 6. Soil management	1. Grazing management 2. Animal feed and diet manipulation 3. Silvopasture (carbon sequestration) 4. Animal health and breeding (detect, prevent and remove disease, remove unproductive animals, breed efficient and healthy animals) 5. Manure management (biogas facilities, storage facilities, manure deposition/ application) 6. Soil management
Cropping farm co-benefits	**Priorities for Fiji**	**Priorities for Viet Nam**
1. Profitability 2. Productivity (food security, soil health, water retention, reduced soil erosion). 3. Ex-ante assessment of cost (if available), ease of implementation 4. Gender implications.	1. Organic amendments 2. Agroforestry 3. Intercropping (promote diversity and resilience) 4. Non-burning of sugar cane residue.	1. Rice: AWD, residue retention, non-burning of rice residue. 2. Organic amendments 3. Agroforestry

7.1.2 Surrogate measures to quantify GHG emissions

The use of surrogate measures to quantify emissions reduction were considered. Surrogate measures can potentially use emission factors (EFs) from a similar climate or farming system instead of using IPCC Tier 1 default values. For example, Australia has researched local EFs for sugarcane in tropical systems that are likely suitable for Fijian sugarcane farming systems.

Surrogate measures in Viet Nam are unlikely to be required due to the extensive body of research that exists on national and regional EFs. However, Viet Nam must focus on incorporating and expanding this body of knowledge into the National Inventory.

7.2 The Governance of mitigation options in agriculture

7.2.1 Review of existing governance capacity

The existing institutional, governance and policy settings were assessed in Fiji and Viet Nam. The countries' capacity to implement agricultural mitigation options as part of their NDC was also examined and is detailed in Appendices A3 and A4. Fiji has implemented a direct regulation in the *Climate Change Bill 2019* which will require operators of farms that emit above a certain level of emissions pollution (determined by the Ministry) to maintain records and report on emission levels. Viet Nam has a strong agricultural sector policy and NDC agricultural sectoral targets, but currently no policy levers in place that require engagement or compliance.

7.2.2 Governance checklist

A major output from this project was the creation of a governance checklist (Appendix A2), which is a list of requirements that enables institutions to deliver emission-reduction options in the agricultural sector as part of NDC commitments. In addition to outlining the institutional framework required, this checklist provides guidance on how institutions can deliver effective governance that will provide equitable outcomes for smallholders and women.

This checklist was developed in consultation with in-country experts from Fiji and Vietnam. While cognisant that there is no one-size-fits-all approach to mitigation governance, it is hoped that a generic governance checklist would provide a starting point for countries to audit their existing institutional capacity and identify areas for future improvement in mitigation governance in the agriculture sector.

The Governance Checklist included the following sections:

- Assessing current climate change governance and building an appropriate policy framework.
- The relationship between the National GHG inventory and mitigation actions in agriculture.
- Measurement, Reporting and Verification (MRV) in agriculture.
- Governance and Stakeholder Engagement.
- Inclusive Governance for Smallholders that Delivers Co-Benefits.
- Embedding a Gender- Aware Approach.
- Financial Governance; and
- Continual Cycle of Governance Improvement.

7.2.3 Incentives and policy levers required for engagement in mitigation options

Several policy tools can be utilised to engage farmers in mitigation action. Relevant regulation includes:

- Direct Regulation involves the introduction of a new piece of legislation which requires individuals or industry to comply with an emission reduction standard.
- Market Regulation involve incentivising reductions in agricultural practices through the provision of funding to encourage a change in practice.
    - Market-based approaches: involves a system where carbon credits are created by regulatory process and then sold within a market structure to either public or private bodies;
    - Fund-based approach: where payments for emission reduction in the agriculture sector are disbursed by GOF or an international climate finance body.
- Third Party Regulation (for example certification schemes) which involve a third party accrediting certain farm operations as fulfilling certain standards.

7.2.4 Measurement, Reporting and Verification (MRV)

MRV governance is required for countries to track the impact of mitigation actions in agriculture, to ensure transparency and the credibility of results. MRV requirements for the

national GHG inventory and mitigation actions in agriculture are closely interconnected. For example, to track progress towards an emissions reduction goal, an inventory is needed to determine base year emissions. Countries need to identify areas of overlap between their different MRV processes and explore ways of increasing synergies to improve the efficiency of the overall MRV system.

The measures that are required to capture, account, verify and report emissions reductions towards the countries' NDC are:

- Robust national inventory for determining baseline emissions.
- Clear communication between MRV of agriculture and national inventory.
- Robust database and data management systems with all stakeholders responsible for data collection.
- Business As Usual (BAU) scenario versus project/NAMA scenario using credible methods
- Establishing quality assurance and quality control of data.
- Review and improvement cycle (e.g. improvement in measurements related to activity data, emissions factors etc.)

For further details see Appendix A2.

7.3 Capacity gaps

Although Fiji and Viet Nam are at different stages in terms of accounting for GHG emissions and the mitigation of emissions, there were several common capacity gaps. This is an important finding because it highlights a common need that may exist in other emerging economies in the implementation of NDCs and mitigation options. These common areas represent a starting point for additional research projects which could be directed to fill this gap. The full explanation of the capacity gaps below is in provided in Appendix A1.

1. Capacity building of local experts to calculate the National Inventory.
2. Greater transparency of methods for calculating the National Inventory.
3. Lack of local data required to calculate GHG emissions, especially in the measurement of emissions from livestock and local emission factors.
4. Training and development of best practice for measuring GHG emissions (e.g. use of GHG chamber measurements).
5. Publication of local research data and guidelines relevant to GHG emissions and emissions factors.
6. Development of a central data repository to hold all available data (local, regional, national) on greenhouse gas emissions.
7. Cost Benefit Analyses and co-benefit estimation of mitigation options.
8. Better communication and collaboration between relevant ministries and universities, institutes and other relevant stakeholders in GHG mitigation.
9. Funding to improve the transfer of knowledge between universities, extension officers and organisations (local, regional and national).
10. Identify barriers to adoption.

Additional capacity gaps relating to climate financing and gender issues were:

1. Translation of policy into action on the ground
2. Access to and climate finance (Fiji)
   a. Staff not able to dedicate time to preparing funding proposals

   b. Underdeveloped private sector that limits financial opportunities through private participation.
   c. Dependence on aid to fund mitigation projects.
3. Difficulty embedding mainstream gender into climate policy (Viet Nam).
4. Need for gender-responsive climate action (Viet Nam).

7.4 Gender considerations

Gender has been addressed across most areas of the project because the impact of mitigation action on women is a relatively new area of research. Therefore, gender implications are important outcomes of the project to add to the existing science *(see* Appendices A3 and A4*)*. The extent to which gender is incorporated into policy and climate change decision making in agriculture was examined.

There are two key gender concepts within the UNFCCC: gender balance, which considers issues of representation, and gender-responsive climate policy, which considers issues around the design and implementation of climate policy. Gender balance is defined in the Gender Action Plan as: sustaining the full, equal and meaningful participation of women in the UNFCCC processes. This definition has been criticised for failing to include a target percentage or time-bound goal (Maguire and Lewis, 2018).

Gender Responsive Climate policy has been defined by the International Union for the Conservation of Nature as: "identifying, understanding, and implementing interventions to address gender gaps and overcome historical gender biases in policies and interventions. Gender-responsiveness in application contributes, pro-actively and intentionally, to the advancement of gender equality. More than 'doing no harm', a gender-responsive policy, programme, plan or project aims to do better". These two key concepts – gender balance and gender-responsive climate policy – are found within the Lima Work Program on Gender 2014, The Paris Agreement 2016 and The Gender Action Plan 2017.

7.4.1 Addressing gender issues in Fiji

One of the key achievements at COP23 chaired by Fiji was the launch of the Gender Action Plan. This plan is seen as a priority for the Fijian Presidency who is determined to leave 'no one behind' in the battle against climate change. As a small island state, Fiji is particularly geographically vulnerable to climate change and the vulnerable segments within Fijian communities such as women, elderly and children need to be considered in the design of climate-smart agricultural policies to ensure food security and household resilience to natural disasters.

Gender has been mainstreamed across the NCCP, LEDS and Climate Change Bill. There is potential to raise the profile of gender-responsive climate policies by working to ensure that gender is mentioned in future NDC commitments of Fiji. The NCCP 2018 has three key concepts acting as central pillars of the policy which should shape all actions taken to deliver NCCP strategic objectives: human-rights-based, gender-responsive and evidence-based. The NCCP also recognises the mutual benefits of empowering women in national climate change response strategies. The Fijian Government recognises that climate change disproportionately impacts women and exacerbates gender inequalities and gender-based violence. Concurrently, women are also 'powerful actors of change' and the NCCP highlights that women's voices in leadership positions is essential to Fiji's climate change response. This gender-responsive approach to climate governance is operationalised by requiring future national responses to adhere to a series of gender-responsive requirements.

7.4.2 Gender in Viet Nam

In rural areas of Viet Nam, more than 63% of working women are engaged in agricultural production compared to 57% of working men. Researchers have acknowledged the feminization of agriculture in rural Viet Nam has arisen from economic migration as men move to urban areas in search of paid work (United Nations Women, 2016).

Viet Nam's climate policy framework lacks a gender-responsive approach (FAO, 2015). The National Strategy on Climate Change seeks to guarantee gender equality (Socialist Republic of Viet Nam, 2011), but does not provide any guidance on the relationship between gender and climate change within Viet Nam. Similarly, in the National Target Program to Respond to Climate Change, lists 'gender equality as one of the principles to be followed when responding to climate change (Government of the Socialist Republic of Viet Nam, 2008) but does not provide any further guidance on what this requires. Women and gender equality are not mentioned in the National Green Growth Strategy (Socialist Republic of Viet Nam 2012).

Gender considerations have not been mainstreamed within Viet Nam's Climate policies with such policies failing to articulate the substantive steps required to ensure gender-responsive climate action and programming (Thi Xuan Son, 2017). The climate policies lack specific targets to address women's disproportionate vulnerabilities and exposure to climate change, nor do they address women's differential adaptive capabilities (Thi Xuan Son, 2017). These findings from the literature align with feedback from in-country partners who explained that gender has not been integrated adequately within agricultural climate policies. In-country partners requested support during Phase 2 to consider how gender can be better integrated into agricultural mitigation policy and programs.

8 Impacts

8.1 Scientific impacts – now and in 5 years

The acquisition of local research data with respect to GHG emissions is a priority for Pacific Island Nations. There is the opportunity for future research to measure country-specific emissions and gather the data required to transition towards Tier 2 EFs. In order for the IPCC to accept country-specific EFs, local research needs to be published in peer-reviewed journals. The impact of mitigation options can more accurately be determined when local EFs are used.

In Viet Nam, where a greater amount of research has been undertaken into Tier 2 and Tier 3 EFs, there is the opportunity to create a pathway between research and the incorporation of local EFs into the National Inventory.

8.2 Capacity impacts – now and in 5 years

This project has helped to improve communication between government ministries and universities. The communication between people working in areas of research and policy is of great importance when establishing good governance of agricultural mitigation options. The analysis on governance and policy settings (Appendix A3 and A4), along with the Governance Checklist (Appendix A2) provide a roadmap to successfully build the governance structures required to implement agricultural mitigation options in the future.

The project identified numerous capacity gaps that can be targeted for additional training and research in the future (Appendix A1). Addressing the capacity gaps below will generate measurable change within the partner countries and have numerous flow-on effects for climate policy and independent emissions research.

1. Capacity building of local experts to calculate the National Inventory.
2. Greater transparency of methods for calculating the National Inventory.
3. Lack of local data required to calculate GHG emissions, especially in the measurement of emissions from livestock and local emission factors.
4. Training and development of best practice for measuring GHG emissions (e.g. use of GHG chamber measurements).
5. Publication of local research data and guidelines relevant to GHG emissions and emissions factors.
6. Development of a central data repository to hold all available data (local, regional, national) on greenhouse gas emissions.
7. Cost Benefit Analyses and co-benefit estimation of mitigation options.
8. Better communication and collaboration between relevant ministries and universities, institutes and other relevant stakeholders in GHG mitigation.
9. Funding to improve the transfer of knowledge between universities, extension officers and organisations (local, regional and national).
10. Identify barriers to adoption.
11. Translation of policy into action on the ground.
12. Access to climate finance (Fiji)
    a. Training and dedicated time to preparing funding proposals.
    b. Development of private sector to expand financial opportunities through private participation.
13. Training around gender issues and how to mainstream gender into climate policy (Viet Nam).
14. Need for gender-responsive climate action (Viet Nam).

8.3 Community impacts – now and in 5 years

8.3.1 Economic impacts

Both Fiji and Viet Nam are widely cited as countries that are extremely vulnerable to climate change. The combined impact of changes in sea-level, saltwater intrusion, variability in rainfall and temperature will directly impact on agriculture and food security.

Climate change mitigation and adaptation options must be integrated into existing farming practices to allow farmers to remain profitable and productive. The mitigation options identified as suitable for implementation in Fiji and Viet Nam had economic or risk management co-benefits such as improved profitability, increased cost efficiency or product diversification. Other mitigation options improved the efficiency of the farming system, which is correlated with increased profitability (see Appendices A6, A5, A8, A7). These options will increase the economic resilience of farming systems in the face of impending climatic changes.

8.3.2 Social impacts

This project has provided greater awareness of the gender implications of climate action and the implementation of mitigation options. There is a need for climate governance to mainstream gender across various policies and to become more gender-responsive when working towards NDC commitments (see Appendices A3 and A4).

The project acknowledged the unique vulnerability of farming communities to climate change that have a low capacity to adopt mitigation strategies that potentially impact productivity and income security. The physical impacts of climate change will be compounded by the limited adaptive capacity of farming communities. The assessment of mitigation options therefore recognised the need to aid the transition to more resilient food production systems that support food security and livelihoods of smallholder farmers and women (see Appendices A6, A5, A8, A7).

8.3.3 Environmental impacts

This project was under ACIAR's ~~Climate~~ Change theme. The mitigation options that were considered have a direct environmental impact by reducing GHG emissions, but also indirectly through the provision of a range of ecosystem services. For example, measures to increase soil organic matter will also result in improvements in soil health, water retention and general ecosystem resilience. In livestock systems, when farmers adopt Best Management Practices (BMPs) and improve the efficiency of their farm systems, they reduce the emissions intensity of product (kg CO_2e/kg) and reduce waste of farms. The adoption of BMPs also improves resource use efficiency, generates renewable energy, improves nutrient reuse, decreases nitrogen pollution, decreases odours from waste, and improves soil health. Therefore, this project has identified mitigation options that will have positive environmental co-benefits in the future (see Appendices A6, A5, A8, A7).

8.4 Communication and dissemination activities

Throughout the project there was consultation with our in-country partners in Fiji and Viet Nam and feedback was sought from our partners on each component of the project. This project produced several reports for Fiji and Viet Nam covering GHG mitigation options, governance, gender issues, capacity gaps and the co-benefits of emissions reduction options (Appendices A1-8). These reports will be publicly available through the ACIAR website for the dissemination of information to the public, particularly researchers and policymakers.

9 Conclusions and recommendations

9.1 Conclusions

The project has identified locally appropriate mitigation pathways in agriculture for Fiji and Viet Nam, that will also support poverty reduction, sustainable productivity increase, improved income and food security. The identification of mitigation options with associated co-benefits recognises that farmers must see a clear advantage of deviating from a 'business as usual' approach.

More broadly, countries must invest in mitigation options that will promote sustainability and resilience of food production systems in the face of impending climate change. There are several capacity gaps that must be addressed prior to the implementation of mitigation options that can be undertaken in the next phase of the project. These include; greater capacity building of local experts to calculate the National Inventory and greater transparency of methods for calculating the National Inventory; more locally specific data to calculate GHG emissions (Tier 2 and potentially Tier 3) - especially in the measurement of emissions from livestock; training and development of best practice for measuring GHG emissions (e.g. the use of GHG chamber measurements); development of central data repository to hold all available data on GHG emissions; and better communication and collaboration between relevant ministries, universities and other relevant stakeholders involved in the MRV of GHG emissions. The next phase of the project must advance to a more detailed assessment of mitigation options (e.g. cost-benefit analysis) combined with continued capacity development, particularly in the MRV of GHG emissions.

9.2 Recommendations

Additional funding is required to address the capacity gaps identified in this project. Fiji and Viet Nam are at different stages in compiling their NDCs in agriculture, but both require additional institutional and MRV capacity development. The commonality of capacity gaps identified (see Appendix A1) in Fiji and Viet Nam demonstrates that other developing countries are likely to have similar requirements. Therefore, the outcomes of this project can used to inform a framework to govern and mitigate agricultural GHG emissions that can be applied across a range of developing countries.

10 References

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11 Appendixes

11.1 Appendix A1: Capacity Gaps in the Implementation of Emission Reduction Options in Fiji and Vietnam

11.2 Appendix A2: Governance Checklist

11.3 Appendix A3: Governance Report, Fiji

11.4 Appendix A4: Governance Report, Viet Nam

11.5 Appendix A5: Co-benefits of Mitigation Options in Cropping, Fiji

11.6 Appendix A6: Co-benefits of Mitigation Options in Livestock, Fiji

11.7 Appendix A7: Co-benefits of Mitigation Options in Cropping, Viet Nam

11.8 Appendix A8: Co-benefits of Mitigation Options in Livestock, Viet Nam

11.9 Appendix: Background Documents for Fiji and Viet Nam