Action Research on Climate-resilient Livelihoods for Land-poor and Land-less People

Integrated Community-based Adaption in the Mekong Delta (ICAM)
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About CARE

CARE is a leading humanitarian organization fighting global poverty. We place special focus on working alongside poor women because, equipped with the proper resources, women have the power to help whole families and entire communities escape poverty. Women are at the heart of our community-based efforts to improve basic education, prevent the spread of disease, increase access to clean water and sanitation, expand economic opportunity and protect natural resources. We also deliver emergency aid to survivors of war and disasters, and help people rebuild their lives. In fiscal year 2013, CARE worked in 86 countries around the world, implementing long-term programs to fight poverty, responding to humanitarian emergencies, and advocating for policy change to improve the lives of the poorest populations.

As Vietnam emerges as a middle-income country, CARE international in Vietnam is focusing on ensuring long-term positive change for marginalised groups, especially women, by tackling the underlying causes of poverty, vulnerability and social injustice. CARE in Vietnam focuses on empowering remote ethnic minority women, socially marginalised people and people who are at risk from the negative impacts of climate change, so that they are able to benefit equitably from development.

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The full report from the ICAM Project Action Research on Climate Resilient Livelihoods for Land-poor and Land-less People was developed by Tine Rossing, International Consultant and translated by Mai Thi Kim Hoang, national consultant. This version is a summarised version of the report for wider dissemination.

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Table of Contents

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Acronyms

ADB	Asian Development Bank
AusAID	Australian Government Overseas Aid Program
CBA	Community-based Adaptation
CCRD	Centre for Rural
CSOs	Civil Society Organisations
CVCA	Climate Vulnerability & Capacity Analysis
CCWG	Climate Change Working Group
DARD	Department of Agriculture and Rural Development
DFID	Department for International Development
DONRE	Department of Natural Resources and Environment
DRR	Disaster Risk Reduction
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft fur Internationale Zusammenarbeit
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit
INGOS	International Non-Governmental Organisation
IPCC	Intergovernmental Panel on Climate Change
ICAM	Integrated Community-based Adaptation in the Mekong
ICEM	International Centre for Environmental Management
i.e.	id est(latin for 'that is')
IUCN	International Union for Conservation of Nature
Ha	Hectare
HCMC	Ho Chi Minh City
HH	Household
MDR	Mekong Delta Region
mm	milimeter
MoNRE	Ministry of Natural Resource & Environment
NGO	Non-Governmental Organisation
PWD	People with disabilities
SLR	Sea Level Rise
TIR	Terms of Reference
UN_ISDR	United Nations Office for Disaster Risk Reduction
USAID	The United States Agency for International Development
VND	Vietnamese Dong
WWF	World Wildlife Fund

0. Executive Summary

The densely populated, low-lying Mekong Delta Region (MDR) is one of the most vulnerable areas to climate change in the world. Climate change is likely to result in temperature, precipitation and storm changes, which will contribute to further land and ecosystem degradation, saline intrusion, drought, flooding, and changes to human and animal disease patterns. These climate changes and physical impacts will have serious consequences for existing and future livelihoods in Viet Nam, particularly for the agriculture and aquaculture sectors and for land-less and land-poor, women and ethnic minorities.

In order to assist the vulnerable communities in Viet Nam to adapt to the emerging climate change effects and improve their climate resilience, CARE in Vietnam is implementing the AusAID-funded *Integrated Community-based Adaptation in the Mekong* (ICAM) Project. The Project is focused on three poor communes in An Phu District (An Giang Province) and two poor Communes in Vinh Chau District (Soc Trang Province). The project is specifically targeting the most vulnerable in the two provinces, namely land-less and land-poor households, with a special emphasis on women, ethnic minorities and people with disabilities (PWD) through livelihood, disaster risk reduction and capacity building support.

A '**climate resilient livelihood'**, in this research, is defined as *a livelihood which when exposed to climate shocks and stresses, has the capacity to resist, absorb, accommodate to and recover from the effects of the shocks and stresses in a timely and efficient manner, including through the preservation, restoration and where possible, improvement of its essential basic structures and functions*. This entails that the livelihood be compatible not only with the *current* but also *future* context within which it is operating.

Taking the definition and context into account, a set of criteria has been developed to help the Project identify livelihood options that are climate resilient. These 'unpack' livelihoods in terms of their sustainability and climate resilience.

Overview of Climate-resilient Livelihood Selection Criteria (abbreviated version) *(Source: Tine Rossing)*

Criteria category	Criteria
I. Sustainable Livelihoods Criteria	
1. Economic Compatibility	1.1. Market Demand & Access
	1.2. Financial Investment & Risk
	1.3. Skills and Technology
2. Institutional Compatibility	2.1. Regulations
	2.2. Fiscal Policy
	2.3. Program Assistance
3. Socio-cultural Compatibility	3.1. Local/Indigenous Knowledge
	3.2. Suitability for the poor
	3.3. Suitability for Women
	3.4. Suitability for Ethnic Minorities
	3.5. Suitability for People with Disabilities
	3.6. Location
II. Climate Resilient Livelihood Criteria	
4. Climate Compatibility	4.1. Resilience to *Existing* Climate Change & Impacts
	4.2. Resilience to *Future* Climate Change & Impacts
	4.3. CO^2 Emission Impacts

Criteria category	Criteria
5. Environmental Compatibility	5.1. Biodiversity Impacts
	5.2. Sustainable Resource Use
	5.3. Suitability for Ecosystem Shifts

The analysis carried out in this research indicates that a large majority of the existing livelihood options for the land-poor and land-less would not be climate resilient in the longer run without any major changes to techniques and practices or to the way they are carried out. All the existing *natural resource-based* livelihood sectors are already negatively impacted by climate change and will get hit increasingly harder in the future. More particularly, the agriculture, animal husbandry and aquaculture sectors already are and will likely continue to suffer, depending on the local context, such as location, crop/animal mix variety, etc. Upstream in **An Giang**, increases in temperature, flooding and river erosion, coupled with a decrease in freshwater (both in terms of surface and groundwater) will constitute the biggest challenges to the vital rice and vegetable production and freshwater fish farming. Downstream by the coast in **Soc Trang**, saline intrusion, coastal erosion and drought will impact on both soil and water resources, jeopardizing the important saltwater shrimp farms and onion production, regardless of whether production is carried out at commercial/ large-scale or subsistence/ small-scale. In addition, some of the key industrial sectors, such as the timber/wood processing and garment industries, are also depending on natural resources, so they will suffer from climate change impacts as well. As a result, the negative impacts from climate change will reach beyond the 'traditional' natural resource-based livelihoods.

A number of existing but also new agriculture, aquaculture, animal husbandry, handicraft and other livelihood options were reviewed to apply the selection criteria against. They were rated and ranked in detail according to the criteria and the information available from the research. The top four ranked livelihood options were in the agriculture and handicraft sectors.

At first glance, the most suitable, quickest and easiest livelihood options on the list appear to be:

- **Azolla production**: azolla production had a long production history in Viet Nam before chemical fertilizers were adopted. It was used to fertilize rice production and can be grown in paddies during the wet season. The plant grows quickly and is highly nutritious animal feed or plant fertilizer. This option would likely only be accessible to households with land and water.
- **Floating vegetable gardens** (onion & squash): floating vegetable gardens are easy and inexpensive to develop and are very suitable for the landless poor, provided they have secure access to public freshwater bodies.
- **Organic mushroom production**: mushroom production is also easy and inexpensive to develop and provides a great use for livestock waste and field crop waste. Again, it is most appropriate for households with land since an enclosed space away from the home is required. They can also be grown under stilt houses but in limited quantity.
- **Water hyacinth and embroidery handicraft business** among the Cham people: both handicraft livelihood options are suitable for the land-less and land-poor and even PWD but they require design, craft and/or marketing skills, which may take time to develop. These skills are already developed to some extent among the Cham people, so the livelihoods may develop quickly.

The remaining livelihood options are agriculture, livestock or aquaculture based. These options require more land, water, money and time to develop and so may not provide a "*quick win*" for many land-less or land-poor.

However, again this conclusion is situational, since some farmers may already be undertaking some aspect of these livelihoods (e.g. fish farming) and hence may be able to adopt the incremental activities (integrated duck-fish farming) fairly easily.

Perhaps the most difficult or risky venture could be the mangrove nursery, which will depend on government or NGO funding to develop demand for mangrove seedlings, since it will be these organizations who are likely funding the restoration of mangrove areas in Viet Nam. However, if a medium-term or long-term contract can be obtained by a household or group of households, this venture might be feasible or if a connection can be established with an ongoing programme.

A number of specific recommendations for future planning and implementation of each proposed resilient livelihood option has been provided in Annexes 1.1-1.11. Each annex provides a short description of the proposed livelihood and the rationale for promoting this particular livelihood option, information about best practices/ lessons learned from implementing this livelihood elsewhere, and also recommendations for implementation of the proposed options by the ICAM project and its partners in An Giang and/or Soc Trang provinces.

Specific recommendations include:

- Fill information gaps regarding the proposed climate resilient livelihood options during the ICAM CBA planning process and planned Value Chain and other technical analyses.
- Continue to explore how to make existing climate-vulnerable livelihoods more resilient to climate change.
- Continue to explore how to make the proposed climate resilient livelihood options more gender-responsive.
- Advocate for more flexibility and customization of loan programs for various target groups through the Social Policy Bank and local mass organizations, like the Women's Union and Farmers' Union.
- Establish connection between livelihood implementers, climate scientists and relevant departments in DARD and DONRE.
- Enhance knowledge and practice of DARD's agricultural extension services on climate change and climate resilient livelihoods.
- Increase information on climate change, its impacts and how these affect livelihoods.
- Increase information on market supply and demand and prices.
- Support both registered and informal farmers' and handicraft community groups.
- Monitor and evaluate the resilience of a given livelihood regularly.
- Further fine-tune the climate resilient livelihood criteria

Introduction and project background

1. Introduction and project background

The densely populated, low-lying Mekong Delta Region (MDR) is one of the most vulnerable areas to climate change in the world. Climate change is contributing to land degradation, saline intrusion, ecosystem degradation, hotter weather, abnormal drought, irregular flooding, and changes to human and animal disease patterns. A rapid participatory assessment carried out during the design of this project confirmed that climate change is already significantly affecting the lives and livelihoods of the people in the MDR. This assessment and previous studies confirmed that poor households, ethnic minorities, disabled people and women are among the most vulnerable to disasters and climate change.

To assist these vulnerable communities to adapt to the emerging climate change effects and improve their climate resilience, CARE in Vietnam is implementing the AusAID-funded *Integrated Community-based Adaptation in the Mekong* (ICAM) Project. The Project is being implemented in three poor Communes in An Phu District (An Giang Province) and two poor Communes in Vinh Chau District (Soc Trang Province) from August 2012 until December 2014.

Implementation is conducted in partnership with the Women's Union of An Giang and Soc Trang provinces and technical departments. The project implementation also involves other civil society partners, namely the Centre for Rural Communities Research and Development (CCRD).

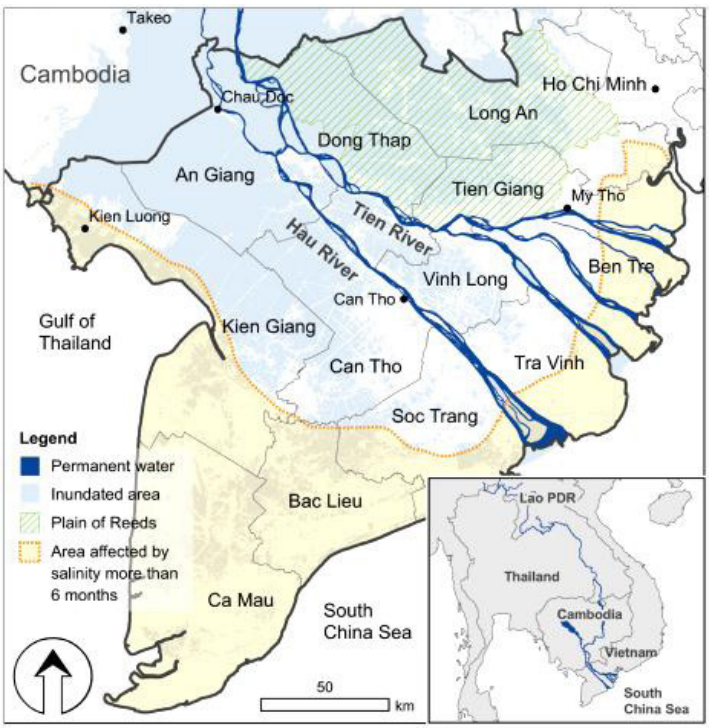


Figure 1-1: Map of the Mekong Delta with An Giang and Soc Trang provinces, indicating water flows
(*source: MoNRE 2009*)

The project is specifically targeting the most vulnerable in the two target provinces, namely land-less and land-poor households, with a special emphasis on women, ethnic minorities and other vulnerable groups, through achieving the following three expected outcomes:

1. Communities and local authorities have improved capacity to undertake gender-sensitive analysis and planning for community-based adaptation (CBA) and disaster risk reduction (DRR);
2. Improved community resilience through the implementation of sustainable, community-level, integrated CBA and DRR interventions that benefit vulnerable people, particularly women; and
3. A strong evidence base and strengthened civil society provide a foundation for the scale up of community-based, equitable and gender-sensitive adaptation in the MDR.

In 2012, the ICAM Project carried out a rapid Climate Vulnerability and Capacity Analysis (CVCA) as part of the project design and the baseline study. The project has developed the methodology and tools for broader CBA planning in the two provinces, and trained the trainers and facilitators for this process. The CBA planning has commenced and it requires strong grounding for appropriate and effective project support to implement climate resilient agriculture and non-agriculture livelihoods. The ICAM Project, therefore, recruited a team of an international (Team Leader) and national consultant to carry out action research on climate resilient livelihoods. This report is the main deliverable from this consultancy.

The ICAM team aims to use the two key research deliverables – the list of criteria for climate-resilient livelihoods and the final report including the recommended livelihood options - for the following next steps:

- For further analysis to help decide which future livelihood options will be climate resilient and feasible for the ICAM project's main target beneficiaries, i.e. the land-less and land-poor, with a particular emphasis on women and ethnic minorities;
- Use identified livelihood options as a key input for discussion and prioritization of future climate resilient livelihoods during the ICAM project's larger CBA planning process with project partners. This will form the basis for how to best support these ideas for implementation by the ICAM project or for potential implementation by other INGO partners in An Giang and Soc Trang and other Mekong Delta provinces;
- Integrate these livelihood recommendations into advocacy, training material development, DRR, governance, gender equality and women's empowerment, etc.;
- Contribute to the ongoing Vietnam Climate Change Working Group (CCWG) discussions on resilience, and serve as a potential input into a '*resilience framework*' for Vietnam; and finally
- Contribute to CARE's broader discussions and work on resilience.

Research objectives and methodology

2. Research objectives and methodology

2.1. Main objectives of the research

The main objective of this study concerning climate resilient livelihoods was to identify the most appropriate and feasible livelihood options that are **climate resilient, gender responsive** and which **benefit the main target groups.** The purpose of the research was also to build on previous assessments done as part of the project that produced a tentative list of livelihood options that could be supported by the ICAM Project.

The research had four objectives:

1. To develop in consultation with project staff and partners a **list of criteria to define or operationalise 'climate resilient livelihood'** based on international and national best practices, CARE strategies, project experience, lessons learned and tools and in consultation with relevant local stakeholders;
2. To identify the most applicable and effective **gender responsive climate resilient livelihood options** for the context of the project communes, targeting the main project beneficiaries (such as **women, land-less, land-poor, ethnic minorities** and other vulnerable groups);
3. To collect and consolidate **technical, scientific, financial and other information required about the selected livelihood options**; and
4. To make a number of detailed **recommendations for the effective planning, implementation and replication** of each selected climate resilient livelihood option in the project area.

The two main deliverables of the research are:

- **List of criteria** to define and operationalise '*climate resilient livelihoods*'
- **Final report** including detailed information on a number of climate resilient livelihood options for the project target groups and recommendations for implementation.

2.2. Methodology

2.2.1. Scope of work

The consultancy involved 20 working days and was carried out as per the ten-step process set out in the Terms of Reference (TOR) – see Annex 3. The consultant team worked closely with CARE staff and project partners to carry out the work. In consultation and agreement with ICAM staff, the consultant team prepared a detailed work plan and methodology for the action research based on the TOR requirements, the local context and the time constraints.

The overall research approach applied the following principles:

- Application of **an iterative learning** process with strong involvement of Government partners, to ensure ownership, local expertise and buy-in. All tasks were, therefore, undertaken in continuous consultation with CARE staff and the ICAM project partners.
- Whenever feasible, activities **built the capacity** of project partners and ICAM project staff on resilience, livelihood surveying, climate change adaptation, etc. The ICAM staff and many project partners were therefore actively involved in the interviews and focus group discussions to learn and contribute to the outcomes.
- All processes were as **participatory** as possible. For example, both the Criteria Meeting and the Validation Workshop involved participatory Group Exercises to pro-actively engage all participants through a Learning-by-Doing approach.

- Applied a **gender** lens to all aspects of the work.
- **Built on best practices and lessons learned** from CARE in Vietnam and key strategic partners, such as WWF, IUCN, GIZ, AFAP, Oxfam, ADRA – but also **learn from other countries** to introduce new approaches and models.

2.2.2. Information collection

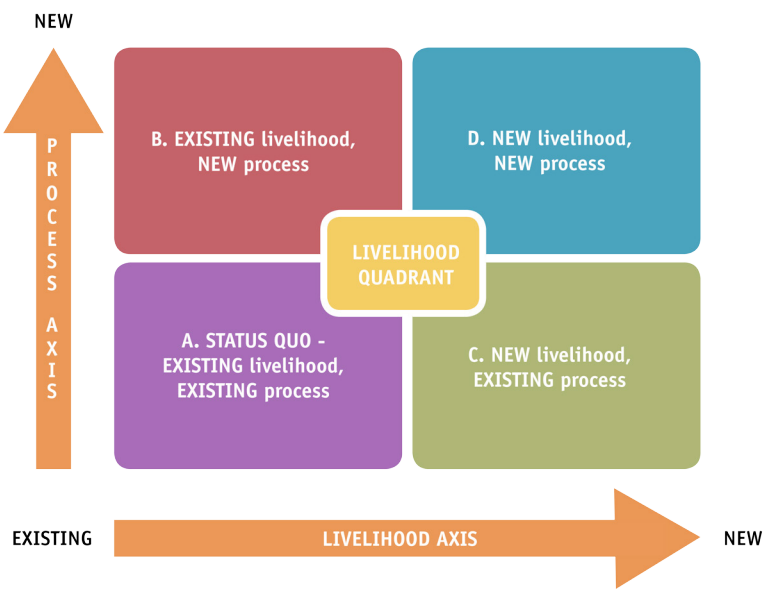
The methodology for information collection involved a mix of desk research, semi-structured interviews with key informants, focus group discussions with select community members from the five different Communes in An Giang and Soc Trang where the ICAM project is working and visits to existing livelihoods. In addition, two stakeholder workshops (a criteria meeting and a validation workshop) were held to discuss and validate consultancy ideas and findings with key project stakeholders.

2.2.3. Introducing the Livelihood Quadrant[1]

To help identify feasible climate resilient livelihoods for the project target groups, the below matrix was put together. The matrix or quadrant has 4 different boxes, which together constitute four different possible livelihood development strategies. The placement of a given livelihood within these four quadrants is based on the responses to the two following main questions:

- Is the livelihood existing or new? - This question is about the **'What'.**
- Can we carry out the livelihood in a better way*?* – This question is about the ***'How'.***

Figure 2-1: Livelihood Quadrant *(Source: Tine Rossing)*



Quadrant A – This livelihood development strategy constitutes status quo, i.e. the existing livelihoods (the 'What') carried out with existing, already established processes (the 'How'). As a *hypothetical* example let's assume this concerns a rice variety and existing cultivation practices that are not climate resilient, i.e. not resilient to drought or salinity and too water-intensive.

Quadrant B – This livelihood development strategy *maintains* the existing livelihood (product, crop or service) but changes the *way* it is carried out (e.g. new technology or process). This strategy is about *optimizing* an

[1] The livelihood quadrant will be further developed by the ICAM Project into a tool that helps to identify and analyse climate resilient livelihood options. The quadrant in this report is therefore considered as a first draft working version.

existing livelihood. Building on above example, if the techniques applied for the existing rice cultivation would be changed, e.g. introducing System of Rice Intensification (SRI) or less water-intensive techniques but still with the same rice variety, we move from quadrant A into B; same livelihood but new process.

Quadrant C – This livelihood development strategy introduces a new livelihood (product, crop or service) – not necessarily an entirely new livelihood sector, but more likely something incremental that draws from *approaches and processes* already learned from other livelihoods. A concrete example would be to move from one economic sector to another, say from agriculture to small-scale handicraft, but drawing from experiences learned from the *processes* applied during the former livelihood. For example, if Women's Union credit and saving or community groups were utilized during the former livelihood to mobilize and train women, these exact processes can likely be applied just as successfully in support of another livelihood. Another example is if we introduce new crops but use the same techniques as with existing crops, e.g. introduction of a new salt resistant vegetable crop that can be grown with same or similar techniques as other already cultivated crops.

Quadrant D – This final development livelihood strategy is the most challenging one, as it changes everything, e.g. both the livelihood and the processes with which it is carried out. From a risk point of view, this strategy is the most risky one, as it changes all known parameters at once. Generally, to take on this kind of risk would necessitate that all parties involved have enough capacity to fail without losing everything. Diversification and risk spreading is essential here.2.2.4. Limitations to methodology
The limitations to the overall research and methodology were identified during the consultancy:

- Due to the multi-sectoral scope of the research, time limitations and the profile of the consultancy team – being an adaptation specialist rather than a sectoral specialist, it was not possible to go into depth with each sector. It was also beyond the scope of this consultancy to provide an *extensive* analysis of possible technologies that could be applied to modify existing livelihoods. Yet, broadly speaking, there is great scope for improving existing livelihoods in this manner, which has been included as one of the main recommendations.
- Given the significant workload and the very iterative, participatory process that was required for this consultancy as per the TOR, there was also not enough time to provide more substantiated recommendations.
- Due to limited availability of detailed information on successful livelihood options and time constraints, it was also challenging to take into account *all* existing climate resilient livelihood options implemented in the Mekong Delta. Best practices research also proved difficult as there were few resilience models that target land-less and land-poor. Most information for these target groups are mainly focused on improving food security.
- Due to time constraints there was some difficulty in locating specific information needed to assess all the proposed livelihood options against the selected criteria.
- The research has been undertaken without much prior CBA planning being conducted in the target communities, given that the ICAM team would be facilitating CBA planning with the communities at a later date. This consultancy, along with its findings and recommendations, were planned as a precursor for this later work. This meant that the consultancy fieldwork did not apply Participatory Rural Appraisal techniques, such as Seasonal Calendar or Climate Hazard/Risk mapping as part of the research, with the rationale to reduce duplicative efforts and risk of over-extending the involved communities.
- While the Focus Group discussions were helpful, the participants were only a partial 'representation' of the targeted non-homogenous groups (e.g. land-less, land-poor, the poorest), which are hard-to-reach, mobile and dynamic.

Research results

3. Research Results

3.1. Development of criteria for selection of climate resilient livelihoods

As a point of departure for developing the overall selection criteria or 'filters' for identifying climate resilient livelihoods, the ICAM team established that livelihoods should be:

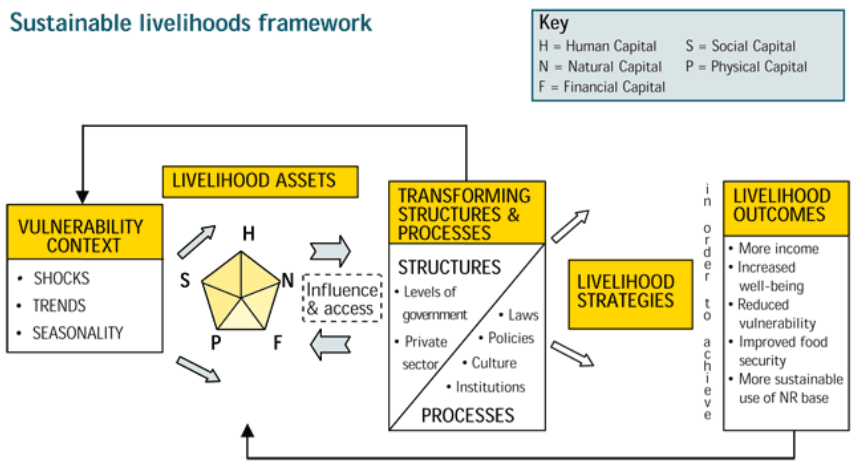
- Sustainable;
- Climate resilient;
- Gender-responsive; and
- Benefiting the main project target groups (land-poor and land-less households, with a particular emphasis on women and ethnic minorities) in An Giang and Soc Trang.

3.1.1. Key definitions

The following definitions of key terms were used as basis for the research. First of all, the words '*livelihood*' and '*sustainable*' can both be used in many ways. According to DFID, the following definition captures the broad notion of a sustainable livelihood:

- 'A **livelihood** comprises the capabilities, assets and activities [that provide goods or services for payment] that are needed to make a living. A livelihood is **sustainable** when it can **cope with** and **recover from** stresses and shocks and **maintain** or **enhance** its capabilities and assets both now and in the future, while not undermining the natural resource base.'[2]

Figure 3 - 1: DFID's Sustainable Livelihoods Framework



Sustainable livelihoods framework (DFID)

DFID's *Sustainable Livelihoods Framework* describes what constitutes the different assets comprising a livelihood and within a given context, structures and processes transforming it into a livelihood strategy with various outcomes.

- Livelihood Assets
  - Household financial capacity (Financial Capital - F)
  - Accessible natural resources (Natural Capital - N)
  - Social cohesion and networks (Social Capital - S)
  - Skills and knowledge (Human Capital - H)
  - Physical infrastructure and equipment (Physical Capital - P)
- Structures & processes
  - Market demand
  - Government policies, regulations and programs
  - Social and cultural norms

[2] DFID (Department for International Development). Sustainable Livelihoods Guidance Sheets.

Building on DFID's definition, for a livelihood to be **climate resilient**, it must not only be able to recover from, but also be able to 'bounce back better' from *current* and *future* shocks and stresses, when challenged by these. To highlight the importance of this ability and context, the following definition was formulated: Climate resilient livelihood**:**

- A livelihood exposed to changing climate change shocks and stresses has the capacity to **resist**, absorb, accommodate to and **recover** from the effects of the shocks and stresses in a **timely and efficient** manner, including through the preservation, restoration and where possible, **improvement** of its essential basic structures and functions.

This definition was derived from the concept of resilience that was defined by UN-ISDR.[3] The word 'improvement' has been added to the original definition to capture the importance of a given livelihood's ability to 'bounce back better' from shocks and stresses in line with the latest thinking of resilience. This definition entails that the livelihood be compatible with not only *current*, but also the *future* context within which it is operating.

Regarding **gender-responsiveness**, while people, policies and processes can be gender-responsive, this term is generally not applied to a livelihood *per se*.[4] Yet, the term can be applied to the ***processes*** with which the livelihood is carried out. The CARE Gender continuum tool categorizes approaches by how we treat gender norms and inequities in the design, implementation and evaluation of a given programmatic initiative. According to CARE's definition, being gender-responsive means to carry out

- …'approaches or activities [that] help men and women examine societal gender expectations, stereotypes, and discrimination, and their impact on male and female relationships.'[5]

Why is this important in relation to climate resilient livelihoods? Men, women, boys and girls have distinct roles in agricultural production, income generation, and household activities. They also face unique constraints. Understanding and taking into account these different roles helps to ensure that projects do not reinforce or exacerbate gender inequality or power imbalances. If constraints are not identified, strategies cannot be developed to overcome them. All too often, women involved in agriculture perform much of the work required to produce crops, but they are excluded from decision-making related to agriculture and livelihoods. Women typically have limited access to markets or control over income from selling crops, despite the fact that increases in women's income is associated with improvements in child nutrition. In many societies, women's access to productive assets such as land, formal credit, capital, inputs, and extension services is constrained even though women produce most of the subsistence crops, manage household seed stocks, and contribute to the maintenance of plant biodiversity.

3.1.2. Process to select criteria for 'climate resilient' livelihoods

With the above information in mind, the DFID's *Sustainable Livelihood Framework* was used as the main foundation to select criteria, while also considering various climate, disaster risk and environmental criteria as well as a number of tentative criteria provided by the ICAM project in the TOR and during consultation sessions in July 2013 to come up with the final set of climate resilient livelihood criteria.

[3] http://www.unisdr.org/we/inform/terminology#letter-r

[4] Exchange with Agnes Otzelberger, Adaptation Advisor Southern and West Africa/Global Gender Advisor, PECCN.

[5] For more information, please see CARE Gender Toolkit.

The climate resilient livelihood decision-making process might be likened to a *water filter system*, wherein livelihood assets and socio-economic-institutional structures and processes, climate conditions and their primary impacts are layers of strata through which livelihood options must be passed – Figure 3-2. Those options, which are compatible with current or future conditions, pass through the filter and those that are not compatible, do not.

The first step was to think about what would constitute the foundation for a set of **Sustainable Livelihoods** Criteria – or a first 'filter' – Figure 3-3.

The key factors that influence the choice and sustainability of a livelihood are the **quantity** and **quality** of assets that people are able to access and use and the economic, institutional and social structures or processes that constrain their application. The broader the range of assets, the higher the quality and security of these assets, the more choices households have for livelihood options and the more flexible is that livelihood to changing contexts. Hence, in choosing livelihoods for a given household, community or country, these factors can act as a useful 'filter' by which to sort out sustainable from unsustainable livelihoods.

Next step was to add the **climate change lens** – i.e. a second 'filter'.

When considering livelihoods in Vietnam, it is now imperative that such development be as resilient as possible to both *ongoing* climate variability as well as *future* climate change and its primary impacts such as flooding or coastal inundation, drought, salinization, new pests, etc. It is important to know which livelihoods will be able to resist, absorb and/or recover from these climatic shocks or stresses in a timely and efficient manner. Hence, a specific second 'climate resilience' filter needs to be added to the above 'sustainability' filter when determining the most viable livelihood options for development in Vietnam. Figure 3-4 highlights some key elements that should be considered as basis for criteria related to climate resilience.

Figure 3 – 2: Climate Resilient Livelihood Decision-Making Process *(Source: Tine Rossing)*

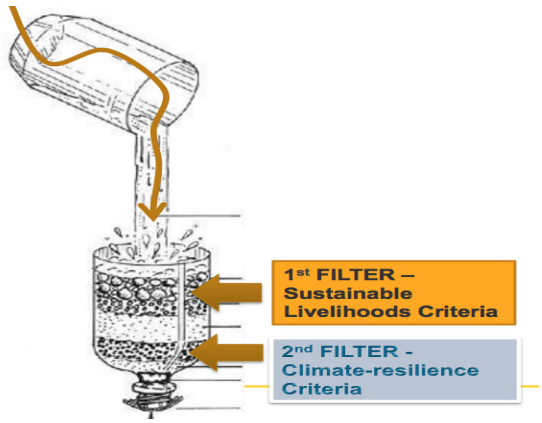


Figure 3 – 3: Inputs for 1st filter – Elements from DFID's Sustainable Livelihood Framework.

Is the livelihood compatible with?

- Market demand/trends,
- Government policies, regulations and programs,
- Social and cultural norms
- Household financial capacity (F)
- Accessible natural resources (N)
- Social cohesion and networks (S)
- Skills and knowledge (H)
- Physical infrastructure and equipment (P)

Figure 3 – 4: Inputs for 2nd filter – Elements of climate resilience.

Is the livelihood compatible with?

Primary and secondary climate stresses

- Higher Temperatures
- Higher Rainfall in Wet Season
- Lower Rainfall in Dry Season
- Sea level rise
- Salinization

Primary and secondary climate shocks

- More intense or frequent storms in wet season
- Flooding
- Drought
- Storm surges
- Heavy rainfall

These two sets of ideas or 'filters' were used as the basis for developing the below set of proposed criteria for identifying and selecting Climate Resilient Livelihood Options.

Lastly, in accordance with the gender-responsive objective and the objective of focusing on specific vulnerable groups like the land-poor and land-less, particularly women and ethnic minorities, it is important that these vulnerable groups be identified in the livelihood selection criteria.

3.1.3. Proposed Criteria for identifying and selecting Climate Resilient Livelihood options

With the research objectives and rationale above in mind, a draft set of climate resilient livelihood criteria was developed. These were discussed, livelihood ideas evaluated with them and fine-tuned at the July 20th validation workshop. Based on feedback received the final criteria were developed and are presented below. These criteria are laid out in more detail in **Annex 2,** together with additional columns of issues to consider, a rating system[5] and a commentary section.

Figure 3 - 5: Overview of climate resilient livelihood criteria *(Source: Tine Rossing)*

Criteria category	Criteria
I. Sustainable Livelihoods Criteria	
1. Economic Compatibility	1.1. Market Demand & Access
	1.2. Financial Investment & Risk
	1.3. Skills and Technology
2. Institutional Compatibility	2.1. Regulations
	2.2. Fiscal Policy
	2.3. Program Assistance
3. Socio-cultural Compatibility	3.1. Local/Indigenous Knowledge
	3.2. Suitability for the poor
	3.3. Suitability for Women
	3.4. Suitability for Ethnic Minorities
	3.5. Suitability for People with Disabilities
	3.6. Location
II. Climate Resilient Livelihood Criteria	
4. Climate Compatibility	4.1. Resilience to *Existing* Climate Change & Impacts
	4.2. Resilience to *Future* Climate Change & Impacts
	4.3. CO^2 Emission Impacts
5. Environmental Compatibility	5.1. Biodiversity Impacts
	5.2. Sustainable Resource Use
	5.3. Suitability for Ecosystem Shifts

One limitation with the selection criteria is that they are numerous and diverse but are not weighted, which means all are weighted fairly equally. This is a limitation, because the criteria do not reflect the differences in importance of the various criteria to the vulnerable groups. For example, the economic criteria are probably the most important criteria to the poor yet these criteria are weighted very similar to the social, institutional and environmental criteria. More research is required to finish the evaluation and ranking process.

[6] Each livelihood can be evaluated and points totaled at the bottom of the matrix to provide a ranking of each option. Many of the criteria are rated on a "Yes or No" scale or a "High, Medium, Low" scale. Where criteria cannot be applied with certainty to a given livelihood, they are marked "NA" (not applicable).

Another limitation of the criteria is that they change at varying speeds. Markets, for example, can change in a season and currencies can change overnight; whereas climate tends to change over decades and millennia (except in the case of climate *variability*). What this ***uncertainty*** points out is that livelihoods are dynamic and need to be regularly evaluated as their conditions change.

3.2 Findings on climate change and livelihood options for land-less and land-poor

The combination of key informant interviews, community focus group discussions, visits to existing livelihoods, two consultative workshops (criteria meeting and validation workshop) and desk review generated a wealth of information. Given the time and report space limitations however, it is not possible to do all this work justice through a thorough situation analysis here. Yet, all this work has been documented and will serve as important inputs for the ICAM project future activities, particularly the CBA planning process. Instead this section will provide a snapshot of the following key information which provided the vital foundation based on which the proposed livelihood options were selected.

3.2.1. Climate change scenarios for the Mekong Delta

Analysis of local climate trends over the past 30 years suggests that climate change is already occurring. Based on community consultations, stakeholders can already verify that they have detected changes in temperature, precipitation and sea level rise (Tuan and Du. 2011). The following provides a summary of expected climatic projections for the MDR, based on work carried out by Can Tho University and SEA START modelling (Tuan, Tri and Trung, 2012, Wyatt ea., 2012) and the MoNRE climate change scenarios.

Table 3- 6: Summary of existing and projected climatic trends in the Mekong Delta in the next three decades

Climate change effect	Trend	Main affected areas
Maximum and minimum daily temperature, average **temperature** in dry season	↗	An Giang, Dong Thap, Long An, Can Tho, Soc Trang, Kien Giang with inland provinces most affected
Number of days that temperature is above 35^{0}C in dry season	↗	Areas that border with Cambodia, West of Hau River
Average annual precipitation or **rainfall**	↘	Decrease by 10-20% for the whole delta
Rainfall at the beginning of the season (May, June, July)	↘	The whole delta - reduced between 0 and 100 mm
Rainfall at the end of the season (August, September, October)	↗	Coastal area of the delta - increase with between 5 and 9 mm
Start wet season	↘	Later for An Giang and Soc Trang
Abnormal **heavy rain** (> 100 mm/day), including unseasonal rainfall during the dry season and more intense rainfall during the wet season	↗	Coastal areas, islands of the delta
Tropical low pressure and coastal storm[7]	↗	Coastal areas of Ca Mau peninsular, areas between Tien and Hau rivers.
Storm– strong winds, often combined with lightening	↗	Coastal area of the delta
Floods (flooded areas and days) - impacts from upstream projects not taken into consideration	↗	Long Xuyen – Ha Tien quadrangular area, Don Thap Muoi, area between Tien and Hau rivers

[7] There are contradictory projections for storm frequency in Southern Vietnam. According to an ADB study (2010) of climate change adaptation for HCMC, "tropical storms and typhoons are expected to land more frequently in the southern region of Viet Nam". Carew-Reid/ICEM also projects higher storm frequencies for the Mekong Delta. However, a recent World Bank study (2013) concludes that storms will be less frequent in the East Sea, but that the intensity of occurring storms and the storm related rainfall will increase significantly. Latest data (by IPCC, CSIRO-MoNRE) confirms the lower frequency of storms and typhoons on average, i.e. overall fewer storms, but a higher intensity, or overall stronger storms.

Climate change effect	Trend	Main affected areas
Sea level rise[8] – salt water intrusion	↗	Coastal provinces. The projected SLR could potentially displace 4.8 million people. 31% of the delta will be inundated with Soc Trang among the worst affected with 43% of the province inundated and 450,000 people affected (Carew-Reid, 2007)
Erosion	↗	Coastal provinces, area between Tien and Hau rivers
Flood-tidal impacts	↗	The whole delta
Salinisation of underground water level	↗	The whole delta

These *direct* climate changes are likely to be exacerbated in An Giang and Soc Trang provinces in a number of ways:

Table 3 – 7: Secondary impacts of climate change in the Mekong Delta.

Saline intrusion:

- World Bank (2011) analysis suggests that higher underground water extraction for agriculture to compensate for increasing salinity levels will create a vicious cycle of over-pumping and salinity increases. While not climate-related, the impacts of over-pumping for agricultural purposes on salinity may be greater than climate change alone.
- Another non-climate-related factor includes the expansion of hydropower developments in the lower Mekong basin that is projected to reduce dry season mainstream flows leading to an increase in salinity levels. The impacts from hydropower development may similarly have a greater effect than climate change alone.
- The higher rainfall runoff in the Mekong Delta during the wet season may have a positive effect and reduce salinity; however the slightly lower dry season runoff leading to slightly higher salinity levels in the dry season may create greater extremes between wet season salinity and dry season salinity.

Soc Trang: from sea water via the My Thanh River and infield irrigation systems, saline intrusion up to 60 km inland will affect about 1.7 million ha in coastal areas. Saline intrusion in agriculture soil, increased salinity levels of water in the My Than River itself and a prolonged high salinity of the river up to 11 months per year. Lower upstream flow leads to more serious salinity intrusion in coastal areas as the upstream flow can no longer push the downstream sea water out.

Erosion:

An Giang – river erosion: more intense and frequent erosion due to both climate and man-made influences, including sudden large quantities of water from upstream, weak geological structure of Mekong Delta and construction of dykes and works along river banks, will change river currents and destabilize the riverbed structure.

Soc Trang - coastal erosion: storm surges associated with strong winds in combination with poorly made ring dykes structures has caused dyke breaks in the past. Strong potential for further increase in significant coastal erosion which will lead to an increase in saline intrusion.

Flooding and drought

- The flooding-dry season cycle is a natural phenomenon in the Mekong Delta and annual floods, especially along the mainstream and distributaries of the Mekong River. However, decreases in rainfall, longer dry seasons, a shorter and more intense wet season and increasing unpredictability of rainfall are likely to result in an increase in flooding and droughts.

[8] SLR modelling by Carew-Reid/ICEM (2007) reveals that if no adaptation measures are taken, about 31% of the Mekong Delta could be inundated by a 1-meter sea level rise by 2100. A 1 meter sea level rise by 2100 has been projected by the IPCC (2007) as a possible A2 scenario. More recent analysis suggests that this might be an underestimation and that higher levels may be possible (World Bank, 2011). In combination with the serious subsidence problem in the Mekong as well as in urban areas like Ho Chi Minh City, combined SLR, groundwater depletion and subsidence could result in an increase to 2.5-3 meters.

Flooding and drought

- Flooding will be compounded by changes in tidal reach and sea-level rise.
- Upstream hydropower developments could also have unpredictable effects on timing and intensity of flooding.
- Changes in the duration, depth and seasonality of flooding and the length of the dry season are likely to affect crop productivity and fresh water aquaculture.
- Negative health impacts associated with flooding may also increase, both due to increasing depth and duration of flood events and changes in disease vectors.
- Approximately 27% of the total population of the Mekong Delta - approximately 18 million people - lie within the potential flood risk areas.

An Giang: Unpredictable and abnormal flooding has become the most common disaster over past 15 years, both in terms of magnitude and timing. Sometimes floods are rising high and rapidly, other times low and slow-onset. Timing is sometimes late, other times early.

Storms and whirlwinds:

- Irregular, more frequent and more severe whirlwinds
- Key impacts of storms are wind damage, inland flooding and large waves affecting coastal areas (Soc Trang).
- Storm surges would be particularly damaging to the Mekong Delta due to its low-lying topography.
- Depletion of coastal protection forests, including mangroves, would compound these effects, leaving areas vulnerable to wave damage (GTZ/AusAID 2010).

Water resources:

- Sea level rise, heavy rain, flooding and temperature increase/drought conditions will have a significant negative impact on groundwater and surface water (river and lagoon/estuaries). For a detailed overview, see Parsons and others (2009).
- Increase in shortage of fresh water for crop/rice production in time of low tide and during dry season.

Sources: CARE in Vietnam/AusAID 2013, World Bank 2011, Wyatt and others 2012, GTZ/AusAID 2010.

3.2.2. Existing livelihoods

Vietnam's Mekong Delta is a highly dynamic socio-economic environment. While agriculture, fisheries and forestry remain the largest sectors in the Delta, accounting for 41% of value-added in 2007, industry, construction and service sectors are growing much faster, accounting for 59% of the Delta GDP by 2007 (GTZ/AusAID 2010). Nevertheless, regional employment and livelihoods remain closely related to agriculture and natural resource use, but differ widely across the overall Mekong Delta. An Giang – which is situated in a plain, flood-prone area upstream - is a highly fertile area with a large percentage of land used for rice production. Soc Trang, which is located in a saline-affected coastal area downstream, generally has poorer quality soils due to saline intrusion and higher acidity levels. This area has seen major increases in brackish water aquaculture, where shrimp are widely promoted as a higher value-added crop (GTZ/AusAID 2009). Over the last decade, the area under rice cultivation in An Giang has *increased* 15%, while in Soc Trang the area has *decreased* by 9% (GTZ/AusAID 2009). Most of this land in Soc Trang has been converted to shrimp production.

As a result of these conditions, rural livelihoods significantly differ in An Phu District (An Giang province) and Vinh Chau District (Soc Trang province). The major livelihood activities in An Phu include freshwater fish farming, rice and vegetable production. In Vinh Chau the key livelihoods are saltwater shrimp farming and vegetable production, such as purple onion and turnip (USAID/ICAM 2013). Freshwater fisheries also constitute an important livelihood in both An Giang and Soc Trang, particularly along the mainstream or main distributaries of the Mekong River. This livelihood is especially important for the Cham in An Giang and land less in Soc Trang. Marine fisheries are important, too, but it has proven difficult to find reliable data on these activities, given that they are part-time endeavors.

The major livelihoods, in which land-poor and land-less households, women and ethnic minorities are involved, include the following:

<table>
<tr><th colspan="4">Table 3 – 8: Overview of existing livelihoods for land-poor and land-less households in An Giang and Soc Trang provinces</th><th>An Giang</th><th>Soc Trang</th></tr>
<tr><td colspan="6">I. Agriculture</td></tr>
<tr><td>Land-poor</td><td>Land-less</td><td>Women</td><td>Ethnic minority</td><td></td><td></td></tr>
<tr><td colspan="4">• Subsistence/small-holder farming of rice alternated with other crops. This option is further inland and predominant in An Giang.</td><td>X</td><td>X</td></tr>
<tr><td>Subsistence rice farming is mixed with maize, okra, chili, peanuts, mushrooms, cucumbers, taro, bitter lemon, etc.[9]</td><td rowspan="2">A number of landless people who can afford it rent land in the local areas for farming rice and crops, often less than 1ha of land.</td><td rowspan="2">Involved in less physically demanding tasks, mainly planting, transplanting, weeding and cutting during harvest.</td><td></td><td>X</td><td></td></tr>
<tr><td>Subsistence vegetable farming is mixed with onions (main crop) and other secondary crops (chili, tomatoes, etc.)</td><td></td><td>X</td></tr>
<tr><td colspan="4">• Local wage labor – in large-scale agriculture. This is usually seasonal on-farm labor with most employment lasting for two to three months a year during planting and harvest time.</td><td>X</td><td>X</td></tr>
<tr><td colspan="2">Involved in large-scale production of purple onion, turnips or other vegetables (plantation)</td><td rowspan="2">Involved as seasonal laborers in less physically demanding tasks, mainly planting, transplanting and weeding. Or sell products from farming.</td><td rowspan="2">As a result of landlessness, over 80% of the incomes of poor Khmer HH surveyed in a 2006 report[10] came from wage labor. Many people work on farms in neighboring provinces, and Khmer HH from the same village often form a group of migrant agricultural labor.</td><td></td><td>X</td></tr>
<tr><td colspan="2">Involved in large-scale production of rice or vegetables (maize, etc.)</td><td>X</td><td></td></tr>
</table>

[9] Generally, rice is mixed with vegetable, 2 crops of rice and 1 crop of vegetables/year. For vegetable gardening, there are 3 crops of vegetables/year, particularly in Vinh Chau, where purple onion is the main crop.

[10] The Mekong Delta, which has a relatively low percentage of minorities, does have a particularly vulnerable group, the Khmer, who have experienced high rates of landlessness and dependency on wage labor as their main source of income in recent years. Surveys have revealed that more than 75 percent of poor Khmer households were landless. This includes inherited landlessness. Khmer loss of land seems to relate primarily to past or recent failures in rice and crop cultivation. Another common reason for land loss is failure to repay debts, medical costs and other expenses (Le Ngoc Thang et al. 2006). Poor Khmer often participate in unskilled manual labor for wage income (both on- and off-farm). Their participation in the labor market, however, is severely limited by a low level of education, language barriers and lack of social connections (GIZ/AusAID 2009).

Table 3 – 8: Overview of existing livelihoods for land-poor and land-less households in An Giang and Soc Trang provinces				An Giang	Soc Trang
II. Animal husbandry					
Land-poor	**Land-less**	**Women**	**Ethnic minority**		
• **Small-scale livestock husbandry,** including pigs, cows and poultry. Most rural households engage in small-scale animal husbandry to varying degrees. In An Giang, due to the vicinity to the border, some small-holders buy up cheap calves or young cows in Cambodia and fatten them up for re-sale. Households particularly in An Giang are also engaged in raising ducks, mostly for eggs.[11]				X	X
Chickens, ducks (both for meat and eggs), cows and pigs. Ducks for egg production are raised much more in An Phu, An Giang than in Vinh Chau, Soc Trang, benefiting from the rice fields as grazing for the ducks. In Vinh Chau ducks are raised too, but pig raising is more popular with an average of 2-4 pigs/per HH	Same as land-poor, but less animals. Ducks are mostly for meat, as it is too expensive to have the large amount of ducks that is necessary for egg production	Home-based small-scale animal husbandry. Women tend to be responsible for livestock keeping except for cows, which are cared for by men due to the need to travel far to obtain grass for fodder.		X	X
III. Aquaculture					
Land-poor	**Land-less**	**Women**	**Ethnic minority**		
• **Local wage labor - Industrial shrimp and fish farming.** This commercial process is highly technical and generally uses high levels of chemical inputs to control the Ph of the water and diseases. It also requires high levels of investments both in terms of land and fry. The land for industrial shrimp farming has mainly been converted from paddy land over the last two decades or so due to promotional policies and programs by the Govt. and potential high profitability.				X	X
Involved in large-scale production of salt-water tiger shrimp farming		Industrial shrimp farming is highly segregated with men dominating much of it.	Khmer often rely to a greater extent on wage employment in unskilled manual labor (both on-farm and off-farm).[12]		X
Involved in large-scale production of fresh-water basa and other fish (*Tra* fish, snake head fish, *Dieu Hong* fish) farming, often via floating farms.				X	

[11] Rice paddies in combination with small ponds are increasingly used for grazing ground where the ducks are herded and moved around constantly to benefit from feeding off left-over rice and small fish found in the rice paddies. This is a positive way of cutting back on the cost of feed. This is one way of raising ducks, optimizing the presence of rice fields. There are other ways of duck raising (from commercial to caged to pond based (as suggested in one of the recommended livelihood options) than only rice field based.

[12] During community focus group discussions it was revealed that some Khmer households with small shrimp farms had initiated these without any technical guidance in how to establish and operate them, simply by copying what a neighbour had done. This has resulted in significant failed harvests. The Khmer shrimp farmers generally have small shrimp farming areas of about 1 ha.

Table 3 – 8: Overview of existing livelihoods for land-poor and land-less households in An Giang and Soc Trang provinces				An Giang	Soc Trang
• **Small-scale aquaculture**					X
Fish (*Tra* fish, snake head fish, *Dieu Hong* fish), eel, snakes, frogs are raised in small ponds.	Involved as day or seasonal laborers	Both men and women involved, as small-scale tends to require less technical knowledge (of chemical use etc.) and machinery. Harvesting farmed shellfish is mainly done by women and female laborers hired for this work.		X	
Shrimp farms, fish raising (Keo), artemia, baby crab.					X
IV. Capture fisheries / collection of natural resources for sale and home consumption					
Land-poor	**Land-less**	**Women**	**Ethnic minority**		
• **Collection of natural resources for sale and home consumption.** This includes capture fisheries, near-shore products, non-timber forest products, fuel-wood, fish and other by-products of rice farming. Collection of natural resources along the coast takes place throughout the years According to findings from focus group discussions, clams are collected during July an August. In the other months, the coastline is too muddy to collect clams. Fishing is also seasonal with the peak season being during annual floods.				X	X
As with on-farm wage labor, this work is usually undertaken by HH with little or no land. River fishing is mainly done by men		Women may assist with support activities such as repairing and preparing nets.	Land-less Khmer or Cham HH rely predominantly on river fishing for their incomes.		
	Young clam, crab and fish collection	Many land-less women and children are clam, crab or fish collectors, although men are also involved.			X
V. Off-farm small-scale business					
Land-poor	**Land-less**	**Women**	**Ethnic minority**		
• **Handicraft and petty trade (like home-based shops, mobile food shops or 'kitchen/street food' carts):** No particular experience with handicraft in the visited communities in Vinh Chau, Soc Trang, while in the visited communities in An Phu, An Giang it is a much more common practice, especially for Cham ethnic minorities.				X	X
Petty trade	Petty trade. Embroidery, handicrafts, Cham traditional silk weaving, leaf hat making	Women dominate home-based small-scale industries	The Cham women have a tradition for embroidery used on textiles, such as scarves	X	
Small petty trade business is a primary income source of both land-poor and land-less HH. Sleeping mat and handicraft weaving (from sedge) existing but limited, small business – like mobile food carts or pickled turnip making (the latter in Vinh Chau, Soc Trang)					X

Table 3 – 8: Overview of existing livelihoods for land-poor and land-less households in An Giang and Soc Trang provinces				An Giang	Soc Trang
VI. Off-farm large-scale industry					
Land-poor	**Land-less**	**Women**	**Ethnic minority**		
• **Wage labor - Labor migration. Temporary and permanent** out-migration is a common trend in both provinces. Main destinations for people are the Mekong Delta cities like Can Tho, Ho Chi Minh City and Binh Duong. A smaller number of young people aim for labor export, mostly to Malaysia.				X	X
As with on-farm wage labor, this work is usually undertaken by households with little or no land. Seasonal work in the construction, timber/furniture, transport and garment industries in the big cities.		Seasonal work in garment and timber/furniture sector, or working as kitchen aids and cleaners. Married women are less likely to migrate than married men because of their duties at home.	Khmer often rely to a greater extent on wage employment in unskilled manual labor (both on-farm and off-farm). Traditionally, Khmer have been migrating to HCMC and have networks there to rely on.	X	X
Some people are also involved in salt production, mainly as workers					X

Sources: Elaborated based on Key Informant interviews, community focus group discussions, supplemented with CARE in Vietnam/AusAID (2013) and GIZ/AusAID (2010).

These different livelihoods are pursued to varying degrees, mainly determined by a household's *access* to resources and knowledge. The poorest and most marginalized groups tend to be the land-less, who are primarily Khmer or Cham[13]. Their livelihoods are highly dependent on wage labor and collection of natural resources. Not surprisingly, better-off households tend to have more diversified livelihood strategies.

Men tend to be engaged in wage labor more than women. Yet, both poor men and women are under constant pressure to earn income for their daily survival. Still, men tend to be more associated with tasks that require technical skills and physical strength, whereas women generally take on lighter tasks (GIZ/AusAID 2009).

[13] Soc Trang has more ethnic Khmer than any other province, while the Cham mainly reside in An Giang province. 4.2% of the population in An Giang and 28.9% of the population in Soc Trang is Khmer. 0.7% of the population in An Giang is Cham and 5.9% of the population in Soc Trang is from the Hoa ethnic minority. Based on data from GIZ/AusAID 2012

3.2.3. How climate change is and will impact existing livelihoods

Given that this research consultancy was a precursor to ICAM's planned larger CBA planning process, it was not possible to carry out a full Climate Vulnerability & Capacity Assessment. However, the following table 3-9 provides an overview of how the above projected climate change trends may impact the existing livelihoods of the land-poor and land-less households in the project area based on a desk review of existing sources and key informant interviews.

Table 3-9: Overview of climate change impacts on existing livelihoods of land-poor and land-less

Livelihood	Climate change impacts
ON-FARM	
I. AGRICULTURE	In general: • Agricultural land and water resources salinized. • Increase in pests and diseases due to increased temperatures. • Reduced crop yield and increased crop failures.
Rice farming[14]	• Both rain fed and irrigated rice are highly vulnerable to: 1) increased temperature in wet season, 2) decreased water availability in dry season, and 3) saline intrusion (in the Delta) • Increased household insecurity, particularly for families who rent land for farming.
Vegetable farming	• Unseasonal rainfall may have a serious negative impact on watermelon crops. • Increased duration and intensity of rainfall events may cause poisonous levels of alum concentration. • Delay in the start of the wet season will change the shrimp crop calendar. • Increased household insecurity, particularly for families who rent land for farming.
II. ANIMAL HUSBANDRY	In general: • Climate change will likely affect the availability and price of local feed sources and ingredients, which will have significant impact on smallholders. • Negative impacts on feed availability caused by drought and flooding will reduce stock condition and resilience to disease challenges. • Increase in temperature will increase pests and diseases and negatively impact reproduction and growth of livestock (incl. poultry) • Wetter weather will increase the likelihood of disease transmission through mud and aggravate internal and external parasites. • Increased number and intensity of extreme events will have a negative impact on livestock raising.

Table 3-10: General vulnerability of key livestock to climate change

	Impact	Capacity to adapt	Vulnerability
Smallholder cattle/buffalo	Low	Low	Medium
Dairy/large commercial	Very high	High	High
Small commercial pig	High	Medium	High
Smallholder low input pig	Low	Low	Medium
Small commercial chicken	Very high	Low	Very high
Scavenging chicken	Low	Low	Medium
Field running layer duck	Very low	Low	Low

Source: ICEM 2013.

[14] A recent study (ICEM 2013) provides a detailed overview of key climate change threats for rain fed rice in Kien Giang. Although not entirely the same, this province has similar climatic and livelihood factors in common with An Giang.

III. AQUACULTURE	In general: • Aquaculture appears to be more vulnerable to climate change than capture fisheries • Intensive aquaculture appears to be more vulnerable to climate change than semi-intensive or extensive systems - even though the more intensive systems would have greater adaptive capacity in the form of technology and management (ICEM 2013). • Freshening and salinisation of water resources used for aquaculture will change. • Decline in aquatic products due to floods (shifting pollutants), sedimentation obstructing fish movement, salinity changes, and water freshening. • Increased stress and workload for men. • Indebtedness for the household. • Abandoned farms means reduced wage labor opportunities for male wage labors
Extensive/intensive shrimp farming	• SLR increasing salt concentration. • Increased temperatures causing increase in diseases and sudden change in salt concentration. • Increased erosion and mangrove destruction leading to a loss of natural habitat and food.
IV. CAPTURE FISHERIES	In general: • Decrease in structure and volume of marine life, especially clams and scallops as cannot survive change in salinity concentration.
Clam farming/ collection	• Increased annual maximum temperature could cause increase in mass, simultaneous death of clams. • Increased recurrence of tidal waves and saline intrusion will likely cause death of clams.
Capture/off-shore fisheries	• SLR causing increase in salt concentration. • Increased temperature causing disease and sudden changes in salt concentration. • Increased erosion and mangrove destruction leading to a loss of natural habitat and food.
OFF-FARM	
Off-farm small-scale business	• Possible decline in natural resources used for small-scale handicrafts, such as timber and silk worms cultivated for silk weaving, with the exception of water hyacinth, which appears very resilient to climate changes. • Likely decline in existing small-scale veggie production, which is the basis for mobile food carts, unless adaptive measures are taken to existing agricultural practices.
Off-farm large-scale industry	• The heavy negative impact on large-scale rice and shrimp farming could negatively impact seasonal labor opportunities in these sectors. • The extensive timber/lumber industry will likely also be negatively impacted by climate changes due to the impact on trees. • Salt farming is also negatively impacted due to increased heat waves and unseasonally of rainfall. • This could lead to an increase in migration to pursue different employment in sectors not as *directly* impacted by climate change, especially non-resource-based ones like construction or garment.

Sources: Tuan and others 2012, USAID/ICEM 2013, Wyatt and others 2012

Recommendations

4. Recommendations

The analysis carried out in Section 3 established that the majority of the existing livelihood options for the land-poor and land-less would not be climate resilient in the longer run without any major changes to techniques and practices or to the *way* they are carried out. All the existing *natural resource-based* livelihood sectors are already negatively impacted by climate change and will get hit increasingly hard in the future. More particularly, the agriculture, animal husbandry and aquaculture sectors already are and will likely continue to suffer, depending on the local context, such as location, crop/animal mix variety, etc. Upstream in An Giang, increases in temperature, flooding and river erosion, coupled with a decrease in freshwater (both in terms of surface and groundwater) will constitute the biggest challenges to the vital rice and vegetable production and freshwater fish farming. Downstream by the coast in Soc Trang, saline intrusion, coastal erosion and drought will impact on both soil and water resources, jeopardizing the important saltwater shrimp farms and onion production, regardless of whether production is carried out at commercial/ large-scale or subsistence/small-scale. In addition, some of the key industrial sectors, such as the timber/wood processing and garment industries, are also depending on natural resources, so they will suffer from climate change impacts as well. As a result, the negative impacts from climate change will reach beyond the 'traditional' natural resource-based livelihoods.

These changes will likely hit the livelihoods of the poorest – of which many are land-less and/or ethnic minorities - the hardest in two ways. First of all, many land-poor and most of the land-less households are dependent in varying degrees on wage labor and income. As a result of the above developments, employment opportunities within some of the industrial sectors are likely to shrink. Second, the poor households, which are fortunate enough to have their own supplementary small-scale agriculture, aquaculture and/or animal husbandry livelihoods, will likely suffer significant losses on this front as well. Overall, the key target groups of the ICAM project – i.e. the land-poor and land-less - will become more vulnerable.

The Mekong Delta has already seen a significant shift in wage labor from the natural resource-based livelihood sectors to the services and industrial sectors such as construction, garment and the timber/wood processing. Yet, while these industrial sectors are providing an increasing amount of opportunities for many land-poor and land-less people in the Delta, it is widely felt among these people that such employment comes at a high price. For most people involved in this kind of labor, it involves either seasonal or permanent migration from rural areas to the big urban cities, particularly Ho Chi Minh City. Such migration often leads to households being split up, where some family members stay behind, while others leave. It was beyond the scope of this consultancy to examine the consequences of such migration, but the effects are already documented extensively elsewhere.

So what is the solution to these challenges? During the community focus group discussions with key project beneficiaries, the majority of the participants expressed a strong preference for remaining in their villages if a sustainable livelihood option could be provided as an alternative to having to migrate. One of the key findings from these community consultations was a clearly expressed desire by the community members to be involved in livelihoods that would allow then to increase their self-reliance and control over their own lives, instead of being dependent on others. The following sections provide tentative recommendations for how to provide such livelihood options that are also climate resilient.

4.1. Recommendations - proposed climate-resilient livelihood options

This section provides a summary of the results generated from applying the criteria to a *tentative* selection of potential climate resilient livelihood options. The results are not meant to be an exhaustive, final list of climate resilient livelihood options for An Giang and Soc Trang. Yet, this tentative assessment will provide a point of

departure for the ICAM project and its partners to identify and assess possible livelihood options for the two provinces. Further research and analysis is needed to fill in information gaps and to identify the most feasible or viable livelihood options for the most vulnerable groups, especially regarding how to modify existing livelihood practices through application of innovative technologies etc.

4.1.1. *Which* climate-resilient livelihood options, *where* and *with whom?*

The following overview shows which tentative climate resilient livelihood options this consultancy identified and where (i.e. in which province) they may be suitable. Some tentative efforts have also been made to identify which target groups these livelihood options would be suitable for. The rationale for these choices along with more detailed recommendations on how to implement the options is provided in **Annexes 1.1 – 1.11**.

Table 4-1: Proposed climate resilient livelihood options, possible location and suitable target groups

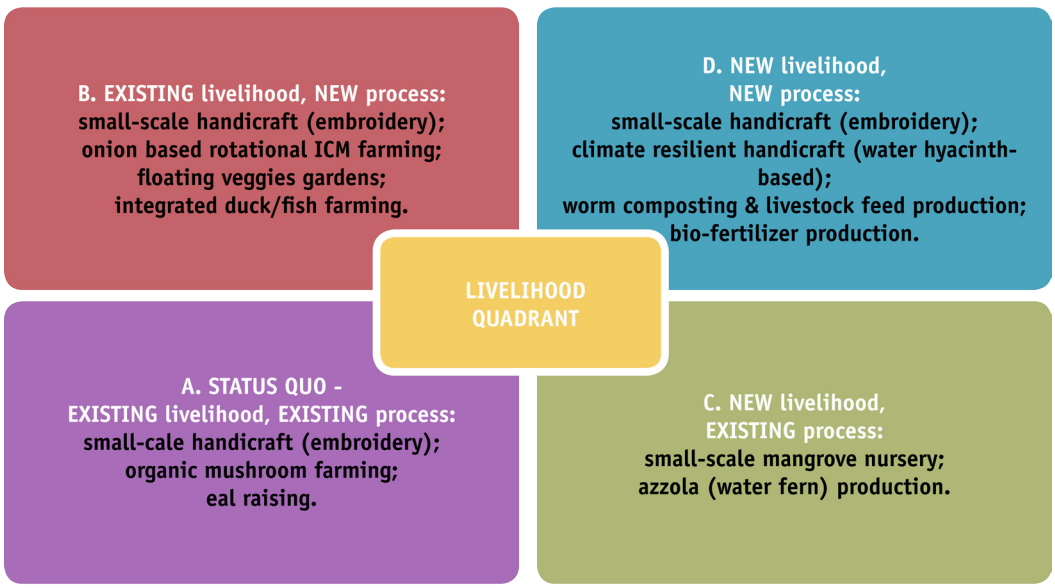
Name of proposed climate resilient livelihood option	Brief description	An Giang	Soc Trang	Suitable target groups			
				Land-poor	Land-less	Women	
I. AGRICULTURE							
1. Azolla (water fern) production	This product provides an opportunity to reduce farming costs and provide a supplemental livelihood, which is climate resilient and ecologically beneficial. The product can be easily grown in small ponds or rice fields to provide a high quality livestock feeds and/or a high quality nitrogen fixing green manure.	X		X		X	X
2. Organic mushroom farming	Mushrooms are grown in cylindrical plastic bags hanging from beams inside a communal mushroom growing centre. They cultivate mostly Oyster, Wood-ear and Linghzi, a kind of mushroom popular in traditional medicine. They can either be grown in individual households or in a communal growing house.	X		X	X	X	X
3. Organic Onion-based Rotational Integrated Crops Management (ICM) farming	This livelihood option provides an effective model for climate-resilient purple onion (shallots) production. In combination with purple onions, the model uses plant species and alternative rotational and integrated farming methods that suits/can adapt to soil affected by droughts and salinisation in Vinh Chau. The model thereby addresses the current overexploitation of underground water in conventional red onion cultivation, while also providing an approach to growing onion that is resilient to the climate change impacts of droughts and salinisation in Soc Trang.		X	X	X	X	X
4. Organic Bio-Fertilizer production	This product provides an opportunity to reduce farming costs and act as a supplemental livelihood, which is climate resilient and ecologically beneficial. The model composts local organic farm waste to produce an ecologically sustainable soil additive that enhances soil nutrients and soil structure, while at the same time reducing chemical contamination of soil and water.	X	X	X	X	X	
5. Earth worm composting & livestock feed production	Vermiculture uses worms to compost farm and household and even aquaculture waste into high quality bio-fertilizer. A portion of the worm colony can also be used as high protein livestock (such as duck) and fish feed.	X	X	X	X	X	X

Name of proposed climate resilient livelihood option	Brief description	An Giang	Soc Trang	Suitable target groups			
				Land-poor	Land-less	Women	
6. Organic floating garden production (onions and squash)	Floating agriculture is a way of utilizing waterlogged areas for the production of food. It is a technology that is well adapted to regular or prolonged flooding. The approach employs beds of rotting vegetation, which act as compost for crop growth. These beds are made in such a way that they are able to float on the surface of the water, thus creating growing areas. The floating gardens can be created in ponds, canals and other open water sources, but not in open, unprotected water by the coast. In this case, onions and squash were suggested as potential crops for this technology.	X	X	X	X	X	X
II. LIVESTOCK HUSBANDRY							
7. Integrated Duck and Fish Farming	This livelihood option provides an effective model for integrating livestock and aquaculture. Ducks are raised above or in the fish ponds (carp) and their feces provide a source of nitrogen and food for the fish. The integration model is dependent on access to freshwater and land for a holding pond but it is resource efficient and symbiotic. A stocking density of 20,000 fish/ha. will normally generate 450-500kg/ha of fish, 3000 to 3300 duck eggs/year and 30-35 kg of duck meat/year.	X	X	X		X	X
III. AQUACULTURE							
8. Eel raising	Eel raising in man-made basins.	X		X		X	X
IV. BIODIVERSITY/ ECOSYSTEM HEALTH							
9. Small-scale mangroves nursery	Nursery producing mangrove seedlings needed for mangrove restoration.		X	X	X	X	X
V. OFF-FARM/TRADE							
10. Small-scale handicraft (Embroidery)	Production of hand-made handicrafts – building on a traditional knowledge from Cham.	X		X	X	X	X
11. Climate-resilient handicraft (Water Hyacinth-based)	Production of hand-made handicrafts – or even furniture - made from Water Hyacinth, which is a plant that grows for free in many locations. This craft is very popular in Indonesia and Cambodia.	X	X	X	X	X	X

4.1.2. *Why* are these livelihood options proposed?

The following Figure 4-2 shows how the proposed livelihood options are located in the Livelihood Quadrant from *section 2.2.4*. To some extent, the placement of the livelihood options very much depends if the quadrant is seen from the perspective of the target groups, the commune, the individual, etc. With this in mind, the following placement was made based on location or the assumption that for a livelihood or a process to qualify as 'existing', it would have to have a history of past implementation within the ICAM project sites, i.e. either in An Phu, An Giang or Vinh Chau, Soc Trang. Note that the categorization as in Figure 4-2 below is valid for both provinces resulting in some livelihoods appearing twice or more but in different quadrants.

Figure 4-2: Categorization of proposed climate resilient livelihood options *(Source: Tine Rossing)*



In addition, table 4-3 shows how the proposed livelihood options rated and ranked as per the developed criteria for climate resilient livelihoods from *section 3.2.3*. For the detailed rating and assessment, please see Annex 2.

Based on a first rough assessment, the proposed livelihood options appeared to be compatible with the developed selection criteria, while others did not. Among the latter group of livelihoods that were ruled out were: 1) chicken raising, 2) rice farming under existing practices, 3) sedge cultivation, 4) sea weed cultivation and chip production, 5) water melon growing, 6) ginger in vertical gardens, 7) Artemia, 8) shrimp raising under existing practices, 9) clam cooperatives and 10) bamboo growing for handicraft because they scored too low when the selection criteria were applied, they needed further research and/or they were evaluated as not appropriate during the validation workshop.

Table 4-3: Summarized rating and ranking of proposed climate resilient livelihood options

Livelihood	Livelihood Quadrant	Rationale for this placement	Rating	Ranking
1. Azolla (Water Fern) production	D	New livelihood based on traditional processes	87	1
2. Small-scale handicraft (Embroidery)	A, B or D	Please see below.	86	2
3. Climate-resilient handicraft (Water Hyacinth-based)	D	New handicraft and new technology/ skills	86	2
4. Organic mushroom farming	D or A	D for most community members in An Giang and Soc Trang. A if mushrooms have been cultivated in the province before.	84	3
5. Onion-based Rotational ICM farming	B	Existing livelihood, but new processes, introducing the organic processes and different veggie rotations.	81	4
6. Organic floating vegetable garden production (of onions and squash)	B	Existing livelihood (veggie farming), but done differently in terms of process.	80	5
7. Eel raising	A	Existing livelihood, existing processes, BUT emphasis on more organic fertilizers	79	6
8. Worm composting & livestock feed production	D	Both new livelihood and new technology	79	6
9. Organic Bio-Fertilizer production	D	Both new livelihood and new technology	78	7
10. Integrated Duck and Fish Farming	B	Existing livelihoods (duck and fish farming, respectively), but new process by combining them.	78	7
11. Small-scale mangroves nursery	C	Existing process (cultivating plants in a nursery), but different livelihood applying it to mangroves	77	8

4.1.3. Quick-win options

The highest ranking livelihood options above scored highest because they rated highest on the criteria. Some of these livelihoods may be fairly easy and quick to implement while others may take time depending on the capacity and resources of the particular household. At first glance, the quickest and easiest livelihood options on the list appear to be:

- Azolla production;
- Floating vegetable gardens (onion & squash);
- Organic mushroom production;
- Water hyacinth handicraft business; and
- Embroidery handicraft business among the Cham people.

Azolla production has a long production history in Viet Nam before chemical fertilizers were adopted. It was used to fertilize rice and can be grown in paddies during wet season. The plant grows quickly and is highly nutritious animal feed or plant fertilizer. This option would likely fall into **Quadrant C**: it is a known product, but it is now recommended in this report as a new option based on combining azolla production for both

animal feed and rice fertilizer. It would only be accessible to households with land and water.

Floating vegetable gardens (onion and squash) are easy and inexpensive to develop and are very suitable for the landless poor, provided they have secure access to public freshwater bodies. This option would likely fall into the **Quadrant B** strategy, since it produces known products (onion and squash) but is produced in a new way. While there is an existing process of cultivating some plants in water, building the kind of rafts that are part of this proposed floating garden livelihood is new and as such would necessitate technical training up front, both initially for DARD and the selected pilot communities (for more information, please see Annex 5.6). This livelihood would be accessible to land-poor and land-less.

Organic mushroom production is also easy and inexpensive to develop and provides a great use for livestock waste and field crop waste. Even though there are experiences in Vietnam with mushroom growing, this option would likely fall into the **Quadrant D**, since it would be a new product for most farmers in An Giang and Soc Trang as would be the growing process. Again, it is most appropriate for households with land, since an enclosed space away from home is required. It can also be grown under stilt houses but in limited quantity. The reason why this option is very attractive is that a mushroom factory in Long Xuyen has expressed interest in promoting collaboration with farmers (see Annex 5.2).

Both handicraft livelihood options – using water hyacinth for weaving products or embroidery - are suitable to land-less and land-poor and even PWD but they require technical assistance for design, craft and/or marketing skills and financial support for setup, which may take time to develop. The skills for the embroidery handicraft are already developed to some extent among the Cham, so this livelihood may develop quickly with the right kind of technical and financial support. Among the Cham this option would likely fall into the **Quadrant A strategy,** since both the kind of handicraft and crafting process may be similar. It would qualify for **Quadrant B** if the product line was diversified to include new products, for example diversifying from only embroidering scarves to also use the technique on bags, clothing, linen etc. Among other groups not familiar with this handicraft, this would fall into **Quadrant D**.

4.1.4. Other potential options

The remaining livelihood options are either agriculture, livestock or aquaculture based. These options require more land, water, money and time to develop and so may not provide a "quick win", especially for land-less and land-poor. However, again this conclusion is situational, since some farmers may already be undertaking some aspect of these livelihoods (e.g. fish farming) and hence may be able to adopt the incremental activities (e.g. integrated duck-fish farming) fairly easily.

Perhaps the most difficult or risky venture would be the mangrove nursery, which will depend on government or NGO funding to develop demand for mangrove seedlings, since it will be these organizations who are likely funding the restoration of mangrove areas in Viet Nam. However, if a medium-term or long-term contract can be obtained by a household or group of households, this venture might be feasible. It is important to link up with existing mangrove restoration programs, such as the ones implemented by GIZ, World Bank and IUCN in partnerships with DARD and see where CARE within the project resources can complement ongoing activities in terms of livelihood options targeted at the land-less and land-poor who depend on mangroves, e.g. through trainings, community mobilization, awareness raising, etc.[15]

[15] The GIZ co-management model was carefully reviewed as part of this work. Yet, while commendable efforts, due to the scope of this research, the focus was on *livelihoods instead of broader mangrove restoration*. For more information, see Lloyd 2010.

4.2. Recommendations - for planning and implementation of proposed climate resilient livelihood options

4.2.1. Planning and implementation

A number of specific recommendations for future planning and implementation of each proposed resilient livelihood option by the ICAM project and its partners in An Giang and/or Soc Trang provinces has been provided in Annexes 1.1-1.11. Each annex contains detailed information on various aspects and a rationale for promoting this particular livelihood option applying the criteria for climate resilient livelihoods.

Fill information gaps regarding the proposed climate resilient livelihood options during the ICAM CBA planning process and planned Value Chain and other technical analyses

The annexes prepared for each proposed livelihood should be considered tentative as they highlight information gaps for each of the proposed livelihood options. In particular, the gaps concern financing opportunities for the land-less and land-poor, government assistance and civil society support. The findings of this research were meant to serve as a *precursor* for the larger ICAM CBA planning processes. A Value Chain analysis and other technical analyses are also planned to follow up on this consultancy, after the proposed livelihood options have been narrowed down to a few selected ones in consultation with both the target groups and strategic partners of the ICAM project.

Continue to explore how to make existing climate-vulnerable livelihoods more resilient to climate change

It is recommended that the ICAM project should continue explore technologies that would help make existing climate-vulnerable livelihoods more resilient towards identified climate changes. In particular, technologies should focus on making these livelihoods: less water-intensive; more drought-tolerant; more salinity-tolerant; more heat tolerant; and more environmentally friendly.[16]

Continue to explore how to make the proposed climate resilient livelihood options more gender-responsive

Although the proposed climate-resilient livelihood options are for the most part considering gender aspects and there are details regarding their gender suitability provided in each livelihood annex, it was not possible during this consultancy to provide enough attention to a thorough analysis of these crucial aspects of livelihoods.

4.2.2. Support for building Climate Resilient Livelihoods

In general, the poorest households and communities tend to be risk averse and face significant barriers to adopting livelihood strategies that would allow them to enhance their food security and broader well-being in the face of increased risks. It is not enough to provide them with these new ideas of climate-resilient livelihoods, since the poor have very few resources to risk on them. . Three types of additional support are required to facilitate the development of these and other livelihoods among the poor: a) financial support, b) training and

[16] There are multiple sources that could assist in this kind of process, such as FAO's Climate-Smart Agriculture Sourcebook (2013) and the ClimateTechWiki - http://climatetechwiki.org, which offers a platform for a wide range of stakeholders in developed and developing countries who are involved in technology transfer and the wider context of low emission and low vulnerability development. ClimateTechWiki offers detailed information on a broad set of mitigation and adaptation technologies.

information on how to adopt these livelihood options and c) increased level of community organization.

a) Financial support

During interviews with key informants, including representatives from the Women's Union, the strengths and weaknesses of existing micro-loan schemes were discussed. The loan schemes provided by the Social Policy Bank and the Women's Union appear to have reached a significant amount of people. Yet, while some land-poor HH participating in the community focus group discussions mentioned they had received such loans, it appeared that the land-less HH were falling through the cracks. Globally, the poorest often do not have enough financial and other resources, proper business or investment plans and access to micro-credit programs, as they, for example, do not have any land they can provide as potential collateral. Yet, this lack of funding access limits their ability to engage in most livelihood improvement measures that have higher initial start up costs.

Advocate for more flexibility and customization of loan programs for various target groups through the Social Policy Bank and local mass organizations, like the Women's Union and Farmers' Union

One idea could be to increase loan ceilings to match unit prices of, for example, high value livestock, and adopting flexibility in repayment schemes, while also teach loan recipients the importance of regular saving to ensure repayment later. In particular, credit services need to pay specific attention to the needs of the poorest and most vulnerable. One idea could be to provide subsidized livelihood support by loans-in-kind from, for example, a cow 'bank'. Repayment could eventually come from livestock products.

b) Training and information on how to adopt the livelihood options

Establish connection between livelihood implementers, climate scientists and relevant departments in DARD/DONRE

The objective would be to transfer knowledge from the former to the latter, based on which DARD and DONRE – possibly in collaboration with the Farmers' and Women's Unions – would prepare subsequent training materials for training of community members.

Enhance knowledge and practice of DARD's agricultural extension services on climate change and climate resilient livelihoods

This could include increasing the number and skills of extension staff and increase training of women and ethnic minorities, via training materials targeted at people who cannot read and write or in ethnic languages. The training should include aspects such as climate change and climate resilient livelihoods, including discussion on risk protection measures and insurance to reduce risks from climate change, disease and market fluctuations.

Increase information on climate change, its impacts and how these impacts affect livelihoods.

The ICAM baseline survey highlighted and the community focus groups confirmed that there is a lack of awareness among the poor of what climate change is and how it will affect them. In addition, it is crucial to increase access to and use of climate information so as to gain improved capacity for risk management and anticipatory decision making.

Increase information on market supply and demand and prices

Local officials, business organizations, universities and traders are potential sources for a market information network, which could be linked with livelihood coaching and training or to a web based source that is accessible to extension officers or local farmers.

c) Community organization

Organization of the poorest community groups can provide them with a peer-to-peer social support system. This is important as the poor generally have so few livelihood resources to draw upon or risk to undertake livelihood development. The solution in many of these cases is to first organize stakeholders so that they can share information and lobby for resources or support to assist in their development. Credit, training, technology transfer and/or access to land and water are key supports in this case. Organizing can also help the poor pool their limited resources to achieve economies of scale in purchasing, production and sales, not to mention in bargaining for more livable wages.

Support both registered and informal farmers' and handicraft community groups.

One way could be to allow for provision of credit to groups, not only individuals, from the Social Policy Bank and the Women's and Farmers' Unions. Another way would be to provide targeted training to members of community groups. Training could be more efficiently provided to poor community members if they were organized in groups, where follow up peer-to-peer training could be encouraged.

4.2.3. Resilient Livelihood Assessment

Just like with climate change, economic, institutional, socio-cultural and environmental contexts change at varying rates and often interact with each other in unpredictable ways. What may be considered a climate resilient livelihood today may no longer be climate-resilient in one to five years from now because the market may no longer support it (due to, for example, shifting supply-demand dynamics), or the regulatory environment may no longer be favourable or perhaps a climate disaster has wiped out a key resource vital for this livelihood. This uncertainty points to the fact that the resilience of a livelihood will need to be regularly monitored and evaluated as the context changes.

Monitor and evaluate the resilience of a given livelihood regularly

Organizations such as CARE can facilitate this evaluation process, but because resources and time are limited, it would be advisable to build the necessary capacity among local community groups to undertake this evaluation process themselves as part of building the capacity. It would also be advisable to partner with organizations that provide information on key criteria (e.g. market information) in the region to make this readily accessible to stakeholder groups.

4.2.4. Climate-resilient Livelihood Selection Criteria

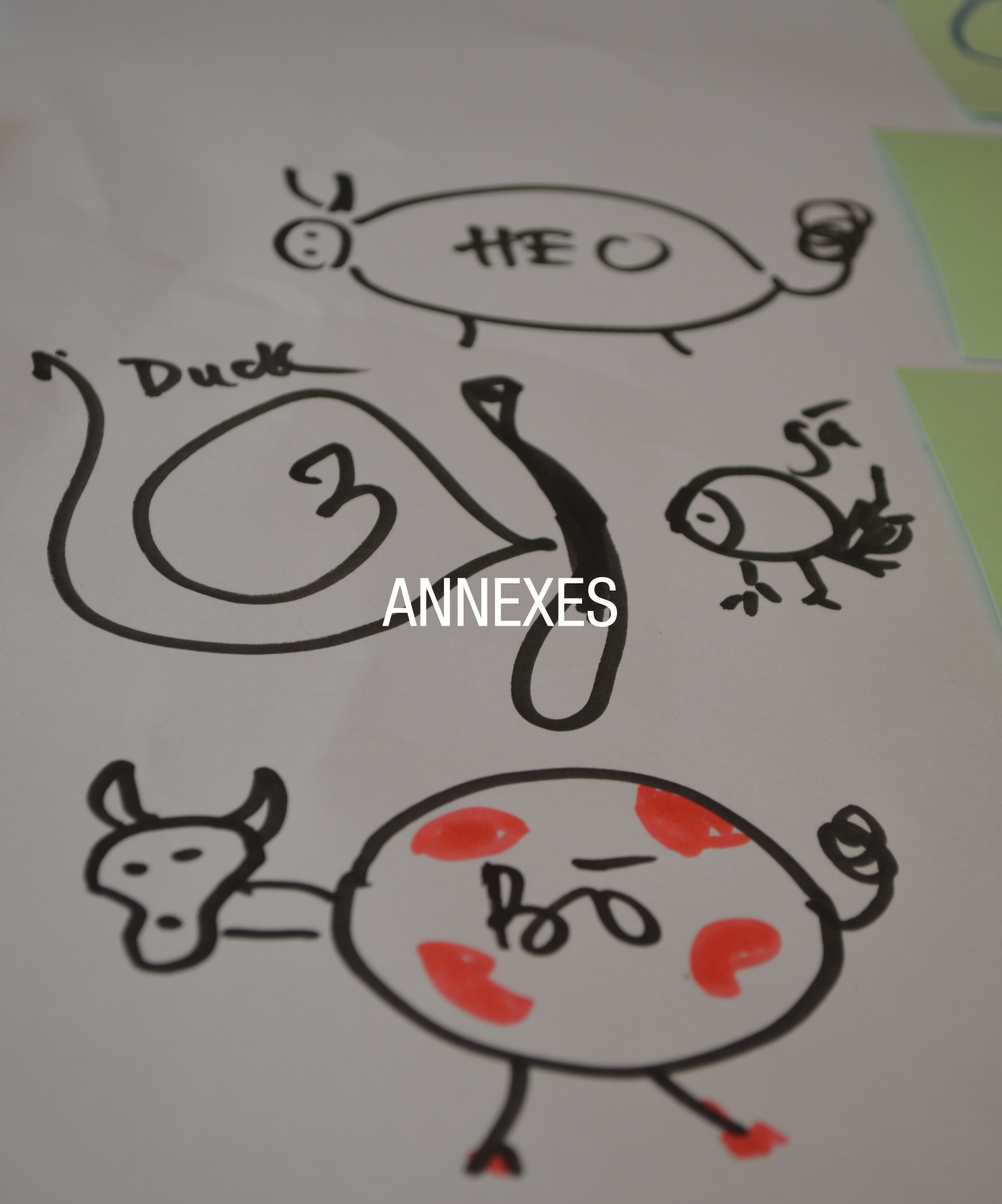
Further fine-tune the climate resilient livelihood criteria

The livelihood criteria in this research should be viewed as a first attempt at developing a resilient livelihood selection and evaluation process. They are still tentative or questionable in some cases and need to be reviewed by the research team and relevant stakeholder groups to confirm their relevance and effectiveness. This review would be best undertaken after more information about each livelihood option has been generated through the CBA planning processes and the further technical analyses.

A final concluding comment: It is also recommended to apply the criteria across a wider spectrum of sectors to determine if they work well. As the ICAM team reviews the criteria and the ratings and rankings of livelihoods, a number of things should be kept in mind, including:

- Are definitions of key criteria and target groups clear or appropriate? For example, are the current definitions of "land-less and land-poor" or "people with disabilities" suitable to the evaluation objectives? What does a metric like high, medium or low mean in specific terms?
- Are some criteria more important than others and therefore should they be weighted heavier than others?
- Are the criteria meant to be applied across one, several or many sectors?
- Are the criteria meant to be applied at the household, community or regional scale?
- Is there a timeline over which the livelihoods are expected to be developed?
- Is sufficient information available on a given livelihood to evaluate it adequately?

These were questions that were asked by the consultant and addressed as best as possible under the given circumstances during the research, but they may change as project objectives change or as new information becomes available.



ANNEXES

OVERVIEW OF ANNEXES

ANNEX 1.1 - AZOLLA (WATER FERN) PRODUCTION

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION

1. WHAT is the climate resilient livelihood option we are proposing?

Name:	**AZOLLA (WATER FERN) PRODUCTION**
Livelihood sector(s):	Climate-resilient, small-holder agriculture
Short description or summary:	This product provides an opportunity to reduce farming costs and provide a supplemental livelihood which is climate resilient and ecologically beneficial. The product can be easily grown in small ponds or rice fields to provide high quality livestock feeds and/or a high quality nitrogen fixing green manure.
Rationale for promoting this livelihood option:	This plant was once grown throughout much of northern Viet Nam prior to the 1980's, mainly as a bio-fertilizer for rice but was replaced by chemical fertilizers. It is now used in various countries around the world as a green manure/ bio-fertilizer and/or a livestock feed with great success. The product is very simple to produce and only requires very basic technologies. It addresses current concerns over livestock feed costs and/or the high cost and negative effects of chemical fertilizers.

2. WHY are we proposing this option?

Livelihood Strategy:	Livelihood Quadrant C
Key climate resilient elements:	• **Moderate water usage:** The product requires moderate water input. • **Financially/Technologically Accessible:** product can be produced with basic HH tools and very rudimentary learning costing HH very little. • **Diversification:** The production can contribute to farmer self-reliance and livelihood diversification, since it reduces or eliminates the need for the purchase of livestock feed and/or fertilizers and it generates a marketable product (feed). • **Environmentally friendly:** The product can be grown in small ponds. It uses waste products from livestock (fecal matter) and can be used as an bio-fertilizer additive or as a bio-fertilizer in its own right

II. ASSESSMENT OF CLIMATE-RESILIENT LIVELIHOOD OPTION – Based on Best Practices/Lessons Learned elsewhere

3. WHERE and WHEN – has this livelihood option been/is being implemented?

Current/previous location(s):	Thai Binh Province, Azolla Multiplication Centre in Nam Dinh Province Currently being piloted in suitable areas in India.

4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?

Main community group(s) implementing the livelihoods:	• Poor farmers (rice or livestock)
Gender dimensions:	To be further researched
Type and/or name of implementing organisation:	To be further researched
Main strategic partners:	To be further researched

5. HOW?

Model / process:

Azolla is a free floating water fern that floats in water and fixes nitrogen in association with the nitrogen fixing blue green algae, *Anabaena azollae*. Azolla is considered to be a bio-fertilizer in terms of nitrogen contribution for rice. Long before its cultivation as a green manure, Azolla was used as a fodder for domesticated animals such as pigs and ducks. In recent days, Azolla is very much used as a sustainable feed substitute for livestock especially dairy cattle, poultry, piggery and fish. Azolla contains 25 – 35 per cent protein on dry weight basis and rich in essential amino acids, minerals, vitamins and carotenoids including the antioxidant b carotene. Cholorophyll a, chlorophyll b and carotenoids are also present in Azolla, while the cyanobiont *Anabaena azollae* contains cholorophyll a, phycobiliproteins and carotenoids. The rare combination of high nutritive value and rapid biomass production make Azolla a potential and effective feed substitute for live stocks.

Methodology - The area selected for Azolla nursery should be partially shaded. The convenient size for Azolla is 10 feet length, 2 feet breadth and 1 feet depth. The nursery plot is spread with a polythene sheet at the bottom to prevent water loss. Soil is applied to a depth of 2 cm and a gram of super phosphate is applied along with 2 kg of vermicompost or cow dung in the nursery for quick growth. Azolla mother inoculum is introduced at 5 kg/plot. The contents in the plot are stirred daily so that the nutrients in the soil dissolve in water for easy uptake by Azolla. Azolla is harvested fifteen days after inoculation at the rate of 50-80 kg / plot. One third of Azolla should be left in the plot for further multiplication. Five kg cow dung slurry should be sprinkled in the Azolla nursery at ten days intervals. Neem oil can be sprayed over the Azolla at 0.5 5 level to avoid pest incidence.

Application - In many countries, agriculture is very much coupled with poultry farming. Azolla is an important low cost input, which plays a vital role in improving soil quantity in sustainable rice farming. The twin potentials as bio-fertilizer and animal feed make the water fern Azolla as an effective input to both the vital components of integrated farming, agricultural and animal husbandry.

Limitation - Azolla is a water fern and requires a growth temperature of 35-38° C. The multiplication of Azolla is affected under elevated temperature. Hence adopting this technology in dry zones where the temperature exceeds 40°c is difficult.

Inputs, costs and financial investment required:

For **cultivation**: Azolla ponds, Polythene sheet, Super phosphate and Cow dung.

As an **animal feed:**

Animal	Dosage / day
adult cow, buffalo, bullock	1.5 - 2 kg
layer, boiler birds	20 - 30 g
goat	300 -500 g
pig	1.5 - 2 kg
rabbit	100 g

Market linkage (suppliers, etc.):	To be further researched
Institutional and organizational requirements:	To be further researched
Output/benefits/results:	**Value of the technology -** Application for Chicken **Feed**: The egg yield is increased in layer birds due to Azolla feeding. The Azolla fed birds register an overall egg productivity of 89.0 per cent as against 83.7 per cent recorded by the birds fed with only concentrated feed. Azolla feeding shows considerable amount of savings in the consumption of concentrated feed (13.0 %) leading to reduced operational cost. By considering the average cost of the concentrated feed as Rs. 17/ Kg, a 13.0 % saving in the consumption ultimately leads to a feed cost savings of 10.0 paise /day/ bird and hence a layer unit maintaining 10,000 birds could cut down its expense towards feed to a tune of rs.1000/ day. **Benefits -** The Azolla feeding to layer birds increase egg weight, albumin, globulin and carotene contents. The total protein content of the eggs laid by the Azolla fed birds is high and the total carotene content of Azolla eggs (440 g 100 g-1 of edible portion) is also higher than the control. The rapid biomass production due to the high relative growth rate, increased protein and carotene contents and good digestibility of the Azolla hybrid *Rong ping* favour its use as an effective feed supplement to poultry birds. **Effect of Azolla hybrid *Rong Ping* on the nutritional value of egg**
Strengths and challenges:	**Strengths:** • High quality livestock feed • Bio-fertilizer (particularly for rice) • Reduces farm costs (for chemical fertilizer or livestock feed) • Uses farm waste productively (fecal waste) **Challenges:** • It was phased out in the 1980s in Viet Nam and replaced by chemical fertilizers and may be seen as antiquated technology. • Space or land is required for production, which may limit access to the landless poor

Parameters	*Azolla egg*	*Control*	*Percentage increase over control*
Egg weight (g)	61.20	57.40	6.62
Albumin (g /100 g of edible portion)	3.9	3.4	14.70
Globulin (g /100 g of edible portion)	10.1	9.5	6.31
Total protein (g/ 100 g of edible portion)	14.0	12.9	8.52
Carotenes (µg / 100 g of edible portion)	440	405	8.64

Expert contacts and/or (scientific) documentation/sources/ pictures:	*Contact Persons*: Dr. Do Can Cat *Sources*: Scenery of using Azolla as rice green manure in Northern Vietnam in 1979 http://www.asahi-net.or.jp/~it6i-wtnb/viet79E.html Tamil Nadu Agricultural University, Coimbatore - Organic farming - http://www.agritech.tnau.ac.in/org_farm/orgfarm_biofertilizertechnology.html

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT	
3. WHERE?	
Target location(s):	An Giang, due to the larger presence of cows to obtain cow manure.
4. BY/WITH WHOM?	
Target community group(s):	• Land-poor HH (both men and women), as only little land is needed.
CBOs:	• Farmers Groups
Strategic partners:	• Academy of Agriculture Sciences, Hanoi
5. HOW?	
How to step-wise implement in Soc Trang or An Giang:	To be further researched
Inputs needed:	• See above example for details
Rough cost estimation:	• See above example for details
Role and involvement of strategic partners:	To be further researched
Opportunities:	To be further researched
Barriers to implementation:	To be further researched

Azolla on surface and fish grown in pond

La Van vollage in Thai Bin province

ANNEX 1.2 – ORGANIC MUSHROOM FARMING

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION	
1. WHAT is the climate resilient livelihood option we are proposing?	
Name:	**ORGANIC *PLEUROTUS / OYSTER* MUSHROOM FARMING**
Livelihood sector(s):	Climate-resilient, small-holder agriculture
Short description or summary:	Mushrooms, e.g. *Oyster/Pleurotus, Wood-ear and Linghzi,* are grown in cylindrical plastic bags hanging from beams inside a communal mushroom growing house or in individual households.
Rationale for promoting this livelihood options:	It has been implemented by various organizations before and in the target provinces. It is particularly suitable for land-less and land-poor
2. WHY are we proposing this option?	
Livelihood Strategy:	Livelihood Quadrant A or D, depending on circumstances (see report)
Key climate resilient elements:	• **Low water usage:** only require limited water meaning that farmers are protected from the risk of off-season drought or water shortages • **Heat and humidity tolerant:** The humid climatic conditions in Vietnam are well suited for mushroom growing. Mushrooms are also not affected by higher temperatures (only moderately by extreme temperatures) • **Diversification:** Contributes to livelihood diversification • **Little land needed:** Limited land required for the activity • **Environmentally friendly:** production is environmentally friendly as it does not require fertilizers/ pesticides and can even produce compost • **High nutritional value** and strengthens immune system

3. WHERE and WHEN – has this livelihood option been/is being implemented?	
Current/previous Location(s):	1) Dong Thap province, Mekong Delta (under CARE CRND Project) 2) Pilot model in Thach Dau Village in Cam Hieu Commune, Quang Tri Province (North Central Vietnam).
4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?	
Main community group(s) implementing the livelihoods	RE: 1) 12 communes in 6 districts in An Giang, Dong Thap and Long An provinces, involved both land-poor and land-less people. • At the beginning of pleurotus mushroom growing model, CRND/CARE supported 6,000 mushroom seeds to 3 groups only at Tan Kieu, Hung Thanh and Tan Cong Sinh commune. Presently, Tan Kieu has developed 5 more groups; Hung Thanh is still operating well up to now. Besides that 5 more groups were developed in others commune outsider project target area. RE: 2) Poor HH – particularly women who are heads of households and people with disabilities.
Gender dimensions:	No gender discrimination or create gender sensitiveness

Type and/or name of implementing organisation:	RE: 1) Implemented through *Community Resilience to Natural Disaster in the Mekong Delta Region* (CRND) project from July 2005-June 2011 under the AusAID funded VANGOCA Program. RE: 2) Project RENEW / Humpty Dumpty Institute "*Mushrooms with a Mission*" (MwM) program
Main strategic partners:	RE: 1) Provincial and district DARD, CARE, Vietnam Red Cross, Farmers' Union and Women's Union. RE: 2) RENEW and involved HH
5. HOW?	
Model / process:	**RE: 1) Pleurotus /oyster mushroom growing model 1** Participatory Village Planning: • Jointly identify mushroom growing as new income generating activity • Agreement on 20% community contribution to germ purchasing • Identification of support package: e.g. post-harvest packaging Model implementation: • Mushroom growing clubs per 10-20 HH: monthly meetings to share knowledge and experience, meet technical experts and join efforts • Training on mushroom germination and growing, including demonstration exercises • Growing period (3 months): continuous technical guidance and inter-farmer exchange visits **RE: 2) Pleurotus / oyster mushrooms model 2:** • Currently, 14 families are working together in a communal grow house which holds 8,000 ready-to-fruit oyster mushroom "blocks" (as the cylindrical bags are called). Mushrooms are grown in cylindrical plastic bags hanging from beams inside a house/facility. • At a small laboratory, staff place rice grains/cassava bark infused with mushroom spawn into sterilized bags of rubber-tree sawdust. • Each bag weighs 1kg and can produce 500g of mushrooms. After 30 days the bag should turn white as the spawn grows. Farmers cut 10 holes in the bags and wait another 15 days for the mushrooms to grow through the holes. • All the farmers need to do is cut the holes and water regularly.
Inputs, costs and financial investment required:	RE: 1) • Support package provided: watering tools, preliminary treatment foam, rubber vessels and post-harvest packaging • Start up mushroom seeds: at the start of *pleurotus* growing, 3 groups in 3 communes were supported with 6,000 mushroom seeds. RE: 2) • RENEW provides training and builds a standard grow house for farmers to hang the blocks. This creates a social working facility for more than 10 farming families to earn sustainable income for poverty reduction. Instead of

Inputs, costs and financial investment required:	investing in a separate grow house for each family, this communal grow house can engage many families at one facility, making it easier for the Project to provide training and to control mushroom quality. • Before joining the program, participating families had hands-on training by staff and they practiced proven mushroom farming techniques and management at the Mushroom Centre. Technical assistance available at the Centre allows farmers to operate on their own, from taking care of their crops to harvesting and selling their products at the local market. At the end of each crop season, they pay back their initial investment from the mushroom blocks they were provided. • The grow house costs $600, of which farmers must provide $100. This means the farmers have ownership of the house, so they take care of the house (RE: Ngo Xuan Hien, head of communications, RENEW) • RENEW provides no-interest loans to farmers under the scheme, who usually buy around 1,500 blocks for 15 US cents each. • RENEW then buys the crop back at slightly higher than market price and sells it at local markets. Profits go towards mine clearance.
Market linkage (suppliers, etc.):	RE: 1) Market linkage and support: creation of employment opportunities for agents to supply germs and to purchase products for wholesale
Institutional and organizational requirements:	• Seed funds to pay for startup inputs • Provision of vocational training in the process of growing mushrooms
Output/benefits/results:	RE: 1) • With 4,000 VND/mushroom seed including labor and initial cost investment, farmers can get interest with 2,000 VND/ mushroom seed. • The price can fluctuate from 15,000-25,000 VND/kg. RE: 2) • A farmer involved in mushroom growing at the commune mushroom house can earn $7.50 USD/day. As of 25 March 2013, according to MwM Manager Ngo Thien Loi, the 14 fourteen families had harvested 700 kg of oyster mushrooms from the communal grow house and sold them all to local markets for about 14 million VND, or $700 US dollars. • Do Thien Dang is a disabled veteran mushroom farmer. The 53-year-old lost both his legs in 1980 when he stepped on a landmine when harvesting bamboo. He took part in the pilot mushroom project in 2003 and now produces 250-300kg of mushrooms per year, earning up to $300.
Strengths and challenges:	**Strengths:** RE: 1) • The activity has lead to a diversification of livelihoods and increased adaptive capacity of the households • The model proved to be popular in the project areas, especially with land-less and land-poor • The whole community (incl. women, the young and the elderly) can manage production and harvest as production takes place indoors.

Strengths and challenges:	• The process is simple and not labour intensive. It was verified by participants as being easy to implement with high production yields. • Production only requires a small space. The germ baskets can be hung indoors or under the floor of elevated houses. • *Pleurotus mushrooms* are considered as clean vegetables with high nutritional content. They can be prepared in many ways. • Furthermore, mushrooms can be grown in 3-month cycles all year round to limit dependence on seasonal work. RE:2) • Project RENEW and HDI consider this model a good initiative to help disadvantaged communities in Quang Tri to reduce poverty. • Does not involved hard labour – so very suitable for both women and people with disabilities. • The involved HH love growing mushrooms because it generate better incomes for them than growing rice, which is often labor-intensive for women. With knowledge and experience from their work at the communal grow house, they hope they will be able later to cultivate mushrooms successfully at their own houses. • The pilot initiative has proven to be cost-effective and will be replicated elsewhere. HHs involved in the pilot are now actively encouraging other community members/neighbours to sign up for the next communal grow house, based on their own positive experience. **Challenges:** RE: 1) • Initial challenge with establishing linkages with existing market • Small profit at the start increases risk and entrance of households into mushroom market • Type of mushroom not part of local people's consumption patterns ('*I don't know how to cook them*'), but changed through targeted marketing skills and training, e.g. recipes on package, gradual increase of price depending on consumption, etc. RE: 2: • The pilot project in 2003 largely failed because farmers didn't have the expertise to cultivate spawn themselves and in 2011 all the mushroom blocks were wiped out by disease from their source in South Vietnam. But despite these hurdles, the project is optimistic and in 2012 they set up a brand name, NAMUS, with the intention of selling the product outside the province and even abroad what when they harvest is big enough. By 2015 they want to expand to 1,000 families.

Expert contacts and/or(scientific) documentation/sources/ pictures:	RE: 1) CARE in Vietnam: Nguyen Thi Yen - NguyenThi.Yen@careint.org and Miguel Coulier - Miguel.Coulier@careint.org RE: 2) RENEW • Brown, M. March 17 2013. Mushrooms help Vietnam farmers maimed by war-time munitions. Gulf Times http://www.gulf-times.com/culture/238/details/345783/mushrooms-help-vietnam-farmers-maimed-by-war-time-munitions • PROJECT RENEW, March 22, 2013. Communal Grow Houses Protect, Nurture Mushroom Cultivation – Helping Poor UXO-affected Communities Reduce Poverty.

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT	
3. WHERE?	
Target location(s):	An Giang, Soc Trang
4. BY/WITH WHOM?	
Target community group(s):	• Land-poor HH (both men and women), as only little land is needed. The above projects also involved land-less people. Perhaps it can be implemented at smaller scale by land-less people, if they live in a house on stilts, as the space under their house may be suitable for hanging mushrooms. Alternatively, if the HH group together they could buy or lease land and create a communal growing centre • Also suitable for people with disabilities.
CBOs:	To be further researched
Strategic partners:	To be further researched
5. HOW?	
How to step-wise implement in Soc Trang or An Giang?	• First pilot with a few HH in select commune locations in An Giang • Then document lessons learned and use these for scaling up this livelihood approach • Entire process needs to be participatory, including multiple mechanisms for learning and sharing of experiences • Need for a comprehensive market analysis before selection of HOW to best support this livelihood • Support package should include marketing skills and business development training but also needs to make link with the market and identify other market support if needed • The creation of clubs increases the negotiation skills and market strengths of individual farmers but also learning
Inputs needed:	• With 4,000 VND/mushroom seed including labor and initial cost investment, farmers/ beneficiaries can get interest with 2,000 VND/ mushroom seed.
Rough cost estimation	To be further researched
Role and involvement of strategic partners:	DARD – to help establish connection between the community HH and the factory.

Opportunities:	• In 2011 a mushroom seeds factory project was set up with MARD funding (about $225,000US (4,5billion VND). MARD provided this funding based on the commitment of An Giang PPC to support the 2ha land for building the factory and also multiplication of mushroom seeds to provide to farmers who would be interested in joining the supply chain for this mushroom production. • The factory would also provide the technical training to the farmers. • Farmers would benefit from the whole process (both input and output), as the factory would guarantee a high price for the produced mushrooms through based on a signed contract. • Company name: Tien Dung Lmt. Address: Binh Khanh commune, Long Xuyen City, An Giang province. • Contact person: Hoang Phi Hung, Deputy Director cell: 0939 181 177
Barriers to implementation:	To be further researched

ANNEX 1.3 - ORGANIC ONION-BASED ROTATIONAL ICM FARMING

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION	
1. WHAT is the climate resilient livelihood option we are proposing?	
Name of the livelihood option:	ORGANIC ONION-BASED ROTATIONAL INTEGRATED CROP MANAGEMENT (ICM) FARMING
Livelihood sector(s):	Climate-resilient, small-holder agriculture
Short description or summary:	This livelihood option provides an effective model for climate resilient purple onion (or shallots) production. In combination with purple onions, it uses plant species and alternative rotational/ integrated farming methods that can adapt to soil affected by droughts and salinisation in Vinh Chau. The option thereby addresses the current overexploitation of underground water in conventional red onion cultivation, while also providing an approach to growing onion that is resilient to the climate change impacts of droughts and salinisation in Soc Trang.
Rationale for promoting this livelihood options:	Red onion farming is already one of the main income sources for people in Soc Trang. Yet, most of the ongoing production is carried out in an unsustainable manner that has negative impacts on both soil and water resources. This option, which has proven to be effective, would provide an opportunity to continue onion production but in a more sustainable and climate resilient manner.
2. WHY are we proposing this option?	
Livelihood Strategy:	Livelihood Quadrant B
Key climate resilient elements:	• **Low water usage:** The model uses rotation crops with low water demand and short growing time, such as green beans. • Using rotational crops that are **heat and salt tolerant**, such as green beans. • **Diversification:** Contributes to livelihood diversification, as the move away from using only one type of crop, which helps ensure a lower risk of losing all crops to bad weather, pests/diseases or price fluctuations. • **Environmentally friendly:** Since this model uses organic fertilizers and less chemical fertilizers, it doesn't pollute the environment (soil and water) the same way conventional onion production does.

II. ASSESSMENT OF CLIMATE RESILIENT LIVELIHOOD OPTION – Based on Best Practices/Lessons Learned elsewhere	
3. WHERE and WHEN – has this livelihood option been/is being implemented?	
Current/previous Location(s):	Vinh Chau Commune, Vinh Chau District, Soc Trang. The project was implemented in three villages of Ca Sang, Ca Lang A and Vinh Binh with 93 participating households in a total cultivated area of 165.5 hectares in 5 crops, from 2010 to 2011.
4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?	
Main community group(s) implementing the livelihoods	• Poor farmers, mainly Khmer. • Included Khmer women
Gender dimensions:	Has created job opportunities for Khmer women in the project area

Type and/or name of implementing organization:	UNDP Community-based Adaptation Project, *Developing cultivation crops adapting to saline water intrusion and droughts in Vinh Chau, Soc Trang,* funded through the Global Environment Facility (GEF) Small Grants Program.
Main strategic partners:	The funder was GEF, the Grantee for this project was the Women's Union of Vinh Chau Town, and a group of expert consultants from the Cuu Long Rice Research Institute provided technical assistance.
5. HOW?	
Model / process:	**Adaptive management practices and Integrated Crop Management,** using/combining the following climate resilient cultivation processes: • The key lesson was to select a plant type of upland crops for the Spring-Summer season with low water requirement and short growth time, such as mung beans instead of radishes, which used to be the main crop in Spring-Summer season in previous years. • The following **3-season rotational cropping pattern** was used: 1) Main crop Winter-Spring: purple onion, 2) Spring-Summer crops: Mung bean, Onion for seeds, and Radish, and 3) Summer/Autumn/Mua crop: salt and drought-tolerant rice. • Increased use of rice straw mulching to save input water in onion-based cropping systems (mung bean, radish, onion for seeds, chili, etc.) • More water-conserving irrigation techniques using underground water for upland crops in drought and high salinity conditions of Vinh Chau • Improvement of soil condition and nutrition level by mixing of loamy soil with sandy soil: After 2-3 years of cultivation of onion and other upland crops (radish, mung bean, chili, manioc, etc.), farmers of Vinh Chau bought loamy soil from other places to mix with sandy soil (about 10 m3 /1000m2. The added layer is 20-30cm) in order to supply nutrients for the soil, which had been degraded due to continuous use of the same upland crops, especially onion and radish, without applying organic fertilizers. • Water use was reduced for red onion cultivation with traditional methods by using a significant amount of straw to cover crops. Together with using crops with low water demand, such as green bean, water savings was from 8.2% to 18.4%, depending on the crop cultivation. This reduced the use and, therefore, the cost for water (1.2 to 1.8 million VND/ha). • Supplementary use of organic fertilizer and lime, reduced use of chemical fertilizers, especially nitrogen fertilizer, helping crops to withstand unusual heat in early and mid growth and increase capacity to resist pests and diseases. As a result, negative environmental impact from the chemical fertilizers is reduced, soil quality is improved with organic fertilizers and cost of fertilizer reduced from 889,000 to 433,000 VND/ha. • Applying Integrated Pest Management in pest management (using biological pesticides; reducing pest density in onion (12.73% Beet armyworm and 14.87% stem borer); pesticide cost reduced 1.08 million /ha. • Application of strict measures in disease prevention before sowing, namely, cleaning the field, drying the soil, lime treatment, applying chemicals to prevent fungus disease and other harmful diseases developing quickly in high humidity and heavy rain, such as *Spodoptera litura, Spodoptera exigua, purple blotch/spot-Alternaria porri, Sclerotium cepivorum*

Model / process:

- Adoption of rice varieties that can stand droughts, salinity and have short growth duration such as OM5451, OM6377, etc.

Inputs, costs and financial investment required:

Items	Model farming (1)	Local conventional farming (2)	Difference (1 vs. 2)
Yield (tonne/ha)	**20.83**	**19.53**	**1.30**
Total income (1,000 VND/ha) *	**374,873**	**351,552**	**23,321**
Seeds (1,000 VND/ha)	12,303	12,303	0
Soil preparation (1,000 VND/ha)	4,881	4,881	0
Making beds (1,000 VND/ha)	6,550	6,550	0
Sowing (1,000 VND/ha)	5,393	5,393	0
Mulching by rice straw (1,000 VND/ha)	**2,677**	**1,041**	**1,636**
Watering (1,000 VND/ha)	22,610	24,971	-2,361
Weeding (1,000 VND/ha)	4,101	4,465	-364
Fertilizer (1,000 VND/ha)	13,290	13,920	0
Pesticides (1,000 VND/ha)	4,518	5,181	-663
Harvesting (1,000 VND/ha)	8,882	8,882	0
Drying and transport (1,000 VND/ha)	4,991	4,991	0
Total costs (1,000 VND/ha)	**90,195**	**92,579**	**-2,384**
PROFIT (1,000 VND/ha)	**284,677**	**258,973**	**25,704**

Source: UNDP-GEF SGP project Powerpoint

- The above table shows how the model farming practices are cheaper than local conventional farming.
- It also shows how the different practices are producing a higher yield and higher profit.
- Onions were sold from 17,000 VND/kg to 20,000 VND/kg depending on selling time, average price is 18,000 VND/kg

Market linkage (suppliers, etc.):

To be further researched

Institutional and organizational requirements:

To be further researched

Output/benefits/results:

Table: The efficiency of the farming model applying ICM in onion-based cropping system (mean of 2 years)

- In an area of 165.5ha of 5 demonstration plots, which applied ICM to prevent soil degradation due to drought and salinity, crop rotation approach of purple onions met and exceeded adaptation indicators for the project - 6 solutions were adapted successfully.
- Economic efficiency was improved: by using ICM in 5 crops the profit increased with 1,755 billion VND on 165.5 hectares. **Average is 10,604 VND / ha (14.4%).**

Output/benefits/results:

No	Items	Model Farming	Difference vs. Local Conventional Farming (%)
1	**Yield (tons/ha)**		
i	Onion in main crop (Winter-Spring)	19.20	+5.4
Ii	Mung bean (in Spring-Summer crop	1.93	+12.9
Iii	Onion for seeds (in Spring-Summer crop)	12.35	+6.8
Iv	Radish (in Spring-Summer crop)	37.73	+4.3
V	Rice (in Summer/Autumn crop/mua crop	5.75	+4.0
2	**Increased profit (million VND/ha)**	**10.604**	**14.4**
3	Water input saving (m3 water/ha/crop)		
i	Onion in main crop (Winter-Spring)	481	-7.9
Ii	Mung bean (in Spring-Summer crop)	336	-10.2
Iii	Onion for seeds (in Spring-Summer crop)	393	-9.1
iv	Radish (in Spring-Summer crop)	236	-12.5

Source: UNDP-GEF SGP project Powerpoint

The adaptive Integrated Crop Management (ICM) practices:

- Helped minimize the adverse effects of climate change on the agricultural production of the community despite the evolution of climate change and erratic weather trend worsening.
- Contributed to addressing the need to save water for irrigation for onions and other crops in drought conditions. This model achieved water savings from 6.2% to 18.4% depending on the crop and crop cultivation.
- Contributed to the protection and improvement of climate resilient farming by preventing new land degradation, while providing viable results despite drought and salinity.
- Overall, the project contributed to the adaptive capacity of the local community

Strengths and challenges:

Strengths:

- Provides a viable combination of balance between indigenous knowledge of Vinh Chau farmers with new technologies and between economic efficiency and environmental benefits.
- Improved fields: to limit impact of rainy season, ground was elevated by 10-20 cm, resulting in lower quantity of rotten onions and radishes.
- Onion preservation: frequency/time of watering and fertilizing affect the shelf life.
  - Best to reduce watering in the afternoon, when the onions are 50-55 days of age
  - Limit excess chemical fertilizers
  - Use a nylon tarpaulin to shield onion plants during the Northeast monsoon
- Diversifying crop rotations/ intercropping of crops such as radish, green beans, chili, etc. in spring–summer crop increases profits and contribute to addressing sustainable livelihoods.

Strengths and challenges:	**Challenges:** the weather was very unpredictable during the project implementation process (2010-11)
Expert contacts and/or (scientific) documentation/sources/ pictures:	Contact Persons: Nguyen Thi Kim Anh, UNDP Viet Nam, nguyen.thi.kim.anh@undp.org and Mrs. Huong Thi Pham Sources: • Ms. Tran Thi Ngoc Huan - Efficiency and lessons learned from CBA project in Vin Chau – Soc Trang. Developing a community-based model of onion-based cultivation crops to adapt to droughts and saline intrusion in Vinh Chai, Soc Trang Province. Powerpoint presentation • Developing cultivation crops adapting to saline water intrusion and droughts in Vinh Chau, Soc Trang, The GEF Small Grants Programme, Vietnam http://sgp.undp.org/index.php?option=com_sgpprojects&view=projectdetail&id=16768&Itemid=205

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT	
3. WHERE?	
Target location(s):	Vinh Chau district, Soc Trang province – especially since this model has already been successfully tested and implemented in Vinh Chau Commune.
4. BY/WITH WHOM?	
Target community group(s):	• Land-poor HH (both men and women), as only little land is needed. • Perhaps it can be implemented at smaller scale by land-less people, if they can apply the farming practices on communal or public access land. • Alternatively, if the land-less HH group together they could buy or lease land, if provided micro-loan assistance. • Suitable for Khmer, as the above project involved Khmer.
CBOs:	• Farmers' Groups
Strategic partners:	• Women's and Farmers' Unions • DARD
5. HOW?	
How to step-wise implement in Soc Trang or An Giang:	• Use the lessons learned from the above model to replicate/scale out in additional communes in Soc Trang. • Entire process needs to be participatory, including multiple mechanisms for learning and sharing of experiences. • Support package should include provision of micro-loans and vocational training to teach marketing skills and business development training • Support to better link with market and identify other market support to promote benefits of organic farming practices and products. • Creation of farmers' groups or cooperatives would increase negotiation skills and market strengths of individual farmers but also learning
Inputs needed:	• See above example for details
Rough cost estimation	• See above example for details

Role and involvement of strategic partners:	• DARD – to provide training in organic ICM farming practices and help establish connection between the community HH and the market • Farmers' Union and/or Women's Union – provide micro loans
Opportunities:	• The above ICM farming model has already been applied very successfully in Soc Trang providing strong incentive to replicate elsewhere • It would be easy to establish learning visits for new farmers to visit farmers who have already applied these practices.
Barriers to implementation:	To be further researched

ANNEX 1.4 - ORGANIC BIO-FERTILIZER PRODUCTION

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION	
1. WHAT is the climate resilient livelihood option we are proposing?	
Name of the livelihood option:	**ORGANIC BIO-FERTILIZER PRODUCTION**
Livelihood sector(s):	Climate resilient, small-holder agriculture
Short description or summary:	This product provides an opportunity to reduce farming costs and act as a supplemental livelihood, which is climate resilient and ecologically beneficial. The model composts local organic farm waste to produce an ecologically sustainable soil additive that enhances soil nutrients and soil structure, while reducing chemical contamination of soil and water.
Rationale for promoting this livelihood option:	The product is very simple to produce and requires very basic technologies and it addresses current concerns over soil erosion, soil nutrient depletion, water and soil contamination, farm waste management and the high costs of chemical fertilizers. It can be used by farmers as a production input and/or sold to create an additional source of income.
2. WHY are we proposing this option?	
Livelihood Strategy:	Livelihood Quadrant D
Key climate resilient elements:	• **Low water usage:** The product requires very little water input. • **Environmentally friendly:** The product improves soil nutrients and structure, reduces soil and water pollution from chemical fertilizers. It uses waste products that would have been burnt or buried. Reduces pests and disease. • **Diversification:** Contributes to farmer self-reliance and livelihood diversification, since it reduces or eliminates the need for chemical fertilizers and generates a marketable product. • **Financially/Technologically Accessible:** product can be produced with basic HH tools and very rudimentary learning, costing the HHs very little.

II. ASSESSMENT OF CLIMATE RESILIENT LIVELIHOOD OPTION – Based on Best Practices/Lessons Learned elsewhere	
3. WHERE and WHEN – has this livelihood option been/is being implemented?	
Current/previous Location(s):	Daloc and Nga Thuy Communes, Hau Loc and Nga Son Districts, Thanh Hoa province: from 14 HH in December 2011 gradually increased to 695 HH in May/June 2013. Additionally in Xuan Lam and Phu Son Communes, Tinh Gia District, Thanh Hoa province: from 703 HH in November 2012 to 742 HH in May/June 2013: 742
4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?	
Main community group(s) implementing the livelihoods	• Poor farmers • Individual and poor households
Gender dimensions:	No gender discrimination or creation of gender sensitiveness

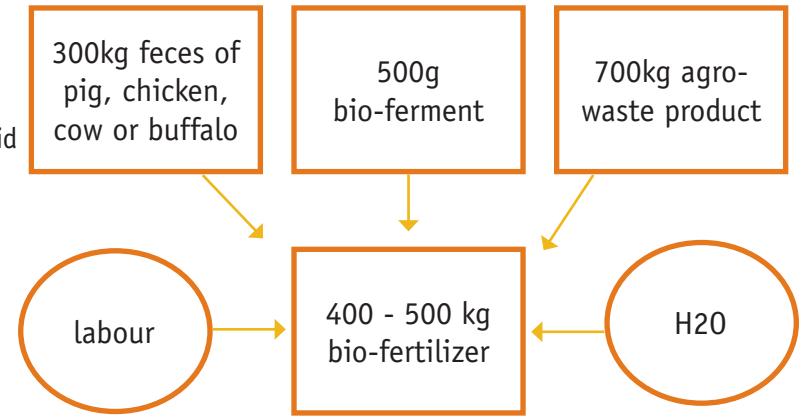
Type and/or name of implementing organization:	CARE International
Main strategic partners:	To be further researched

5. HOW?

Model / process:

Essential Materials:

- Muck (buffalo, cow, pig, chicken…)
- Bio-ferment microbes (500g = 50,000VND)
- Agro-waste product derived from starch, lipid such as straw, peanut body, been, corn, banana: are all used as materials to make bio-fertilizer



Bio-fertilizer production process:

- Prepare available essential materials
- Moisten agro-waste products
- Dissolve bio-ferment microbes in clean water and add to agro-waste layer
- Alternate straw and muck each layer and spread ferment on each layer.
- Repeat process until finished with materials. When done cover the materials with a dark canvas sheet.

(Note: Ensure no lime substance gets in the materials. Moisten each layer with water. The amount of bio-ferment applied depends on amount of materials being composted)

Inputs, costs and financial investment required:

- See matrix below for inputs. Main purchase costs are the bio-ferment microbes. Remaining inputs can be assembled from most working farms (water, fecal waste, straw, corn leaves, peelings, etc)

Market linkage (suppliers, etc.):

- Bio-ferment availability needs to be further researched
- Uncertain of sales channels for bio-fertilizer. While households produced and used the fertilizers, they did not think about selling them yet.

Institutional and organizational requirements:

To be further researched

Output/benefits/results:

	With Bio-fertilizer	With Chemical Fertilizer	Difference
Peanut Output Kg/Sao (500 m^2)	240	222	18
Fertilizer Cost/Sao (500 m^2)	168,000	336,000	168,000
Total Income (VND)	5,520,000	5,106,000	414,000
Net Income (VND)	5,352,000	4,770,000	582,000

Output/benefits/results:	• Saving 500.000 VND/*sao* (500 m2) from reduce chemical fertilizer, and gain 500.000 VND/*sao* more from yield increase • In total increased 10,000,000 VND/hectare
Strengths and challenges:	**Strengths:** • Bio-fertilizer is as or more cost effective than most conventional fertilizers (for most crops). • Improves the soil quality of the fields (unlike chemical fertilizers) • Reduces soil and water pollution • Reduces farm costs (for fertilizer purchases) • Uses farm waste productively **Challenges:** • Some bio-fertilizer may not have adequate nutrients for all crops • Space or land is required for production, which may limit access to the land-less and land-poor
Expert contacts and/or (scientific) documentation/ sources/ pictures:	Contact Persons: Mr. Nghi, Project Manager, CARE's project in Thanh Hoa and Mrs. Mai Thi, Soc Trang DONRE Sources: Manure management http://climatetechwiki.org/technology/manure-management

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT	
3. WHERE?	
Target location(s):	Could be applied in both An Giang and Soc Trang. Already been introduced by Soc Trang provincial DONRE for HH in Au Tho B village, Vinh Hai Commune, Vinh Chau Town
4. BY/WITH WHOM?	
Target community group(s):	• Land-poor HH (both men and women), as only little land is needed. • Perhaps it can be implemented on small scale by land-less people, collecting waste from farms generating labour and income.
CBOs:	• Farmers' Groups
Strategic partners:	• DARD
5. HOW?	
How to step-wise implement in Soc Trang or An Giang:	• Use the lessons learned from CARE pilot projects and Green Club. • Entire process needs to be participatory, including multiple mechanisms for learning and sharing of experiences. • Support package should include training to teach production skills and fine tuning bio-fertilizers for various crops • Credit assistance (if necessary) for bio-ferment input. • The creation of farmers' group or cooperative to act as a marketing group for bio-fertilizers

Inputs needed:	• See above example for details • Training courses
Rough cost estimation	• See above example for details
Role and involvement of strategic partners:	• Choose households for pilots
Opportunities:	To be further researched
Barriers to implementation:	To be further researched

ANNEX 1.5 - VERMICULTURE (Earth worm composting & livestock feed production)

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION	
1. WHAT is the climate resilient livelihood option we are proposing?	
Name of the livelihood option:	**VERMICULTURE (Earth worm composting & livestock feed production)**
Livelihood sector(s):	Climate resilient, small-holder agriculture
Short description or summary:	Vermicomposting is in use in many countries. Vermiculture uses worms to compost farm, household and even aquaculture waste into high quality bio-fertilizer. A portion of the worm colony can also be used as high protein livestock (such as duck) and fish feed.
Rationale for promoting this livelihood options:	This option is very simple to manage, can be undertaken in small spaces (containers or piles) and is adaptable to varying climates. It addresses current concerns over high cost and negative effects of chemical fertilizers and high costs of livestock feed. In addition, this livelihood presents several income options for HHs, as demand for both high quality bio-fertilizer and protein feed for livestock and fish will increase in the future.
2. WHY are we proposing this option?	
Livelihood Strategy:	Livelihood Quadrant D
Key climate resilient elements:	• **Low water usage:** The product requires very little water input if it kept out of the sun. • **Financially/Technologically Accessible:** Worms cost very little and can be managed with basic household tools and very rudimentary learning, costing the household very little. And as long as there is waste to eat and it is not too hot or too cold, the worms will continue to multiply and produce more bio-fertilizer. • **Diversification:** The production can contribute to farmer self-reliance and livelihood diversification, since it reduces the need to the purchase of livestock feed and fertilizers and surpluses can be sold as a marketable product (feed or bio-fertilizer). • **Environmentally friendly:** Vermiculture converts waste (that would be burnt or buried) into usable products.

II. ASSESSMENT OF CLIMATE RESILIENT LIVELIHOOD OPTION – Based on Best Practices/Lessons Learned elsewhere	
3. WHERE and WHEN – has this livelihood option been/is being implemented?	
Current/previous Location(s):	Philippines (Ma. Elena Chiong-Javier and others, published in *Holding their own: Smallholder Marketing, Production and Women Issues in Philippine Agroforestry*, by the De La Salle University, the Philippines, in 2012)
4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?	
Main community group(s) implementing the livelihoods	• Poor farmers • Land-less workers
Gender dimensions:	To be further researched

Type and/or name of implementing organization:	World Agroforestry Centre - http://www.worldagroforestrycentre.org/
Main strategic partners:	To be further researched
5. HOW?	
Model / process:	Earthworms can consume practically all kinds of organic matter and they can eat their own body weight per day, e.g. 1 kg of worms can consume 1 kg of residues every day. The excreta (castings) of the worms are rich in nitrate, available forms of P, K, Ca and Mg. The passage of soil through earthworms promotes the growth of bacteria and actinomycetes. Actinomycetes thrive in the presence of worms and their content in worm casts is more than six times that in the original soil. A moist compost heap of 2.4 m by 1.2 m and 0.6 m high can support a population of more than 50 000 worms. The introduction of worms into a compost heap has been found to mix the materials, aerate the heap and hasten decomposition. Turning the heaps is not necessary where earthworms are present to do the mixing and aeration. The ideal environment for the worms is a shallow pit and the right sort of worm is necessary. *Lumbricus rubellus* (red worm) and *Eisenia foetida* are thermo-tolerant and so particularly useful. Field worms (*Allolobophora caliginosa*) and night crawlers (*Lumbricus terrestris*) attack organic matter from below but the latter do not thrive during active composting, being killed more easily than the others at high temperature. European night crawlers (*Dendrabaena veneta* or *Eisenia hortensis*) are produced commercially and have been used successfully in most climates. These night crawlers grow to about 10-20 cm. The African night crawler (Eudrilus eugeniae), is a large, tropical worm species. It tolerates higher temperatures than *Eisenia foetida* does, provided there is ample humidity. However, it has a narrow temperature tolerance range, and it cannot survive at temperatures below 7 °C. **Vermicomposting model from the Philippines:** • The worms used were *Lumbricus rubellus* and/or *Perionyx excavator*. The worms were reared and multiplied from a commercially-obtained breeder stock in shallow wooden boxes stored in a shed. • The boxes were approximately 45 cm × 60 cm × 20 cm and had drainage holes; they were stored on shelves in rows and tiers. • The bedding material comprised miscellaneous organic residues such as sawdust, cereal straw, rice husks, bagasse and cardboard, and was well moistened with water. The wet mixture was stored for about one month, being covered with a damp sack to minimize evaporation, and was mixed thoroughly several times. • When fermentation was complete, chicken manure and green matter, such as *ipil ipil* leaves or water hyacinth, were added. The material was placed in the boxes. It was sufficiently loose for the worms to burrow and it was able to retain moisture. • The proportions of the different materials varied according to the nature of the material, but the aim was to achieve a final protein content of about 15 percent. A pH value as near neutral as possible was necessary and the boxes were kept at temperatures between 20 and 27 °C (at higher temperatures, the worms aestivate; at lower temperatures, they hibernate).

Model / process:	• Although the worms were able to eat the bedding material, the worms were fed regularly at this stage: every kilogram of worms received 1 kg of feed every 24 hours. For each 0.1 m2 of surface area, 100 g of breeder worms were added to the boxes. The feedstuffs included chicken manure, *ipil ipil,* and vegetable wastes. At one farm, water hyacinth was grown specifically and used fresh (chopped up) as the sole source of feed. Some form of protection was required against predators (birds, ants, leeches, rats, frogs and centipedes). • **Composting procedure: a** series of pits (the number depending on the space available) were dug approximately 3 m × 4 m × 1 m deep, with sloping sides. Bamboo poles were laid in a parallel row on the pit floor and covered with a lattice of wood strips. This provided the necessary drainage as the worms could not have survived in a waterlogged environment. The pits were lined with old feedstuff sacks to prevent the worms from escaping into the surrounding soil and yet permit drainage of excess water. The pits were then filled with rural organic residues such as straw and other crop residues, animal manure, green weeds, and leaves. The filled pits were covered loosely with soil and kept moist for a week or so. One or two spots on the heap were then well watered and worms from the breeding boxes were place on top. The worms burrowed down immediately into the damp soil. • In order to harvest the worms from the boxes, two-thirds of the box was emptied into a new box lined with banana leaf or old newspaper. The original box was then provided with fresh bedding material and those worms remaining multiplied again. The worms emptied from the box were picked out by hand for adding to the heap. • The compost pits were left for a period of two months; ideally such pits should be shaded from hot sunshine and kept moist. • Within two months, about 10 kg of castings had been produced per kilogram of worms. The pits were then excavated to an extent of about two-thirds to three-quarters and the bulk of the worms removed by hand or by sieving. This left sufficient worms in the pit for further composting, and the pit was refilled with fresh organic residues. The excess worms harvested from the pits were then either used in other pits, sold to other farmers for the same purpose, used or sold as animal feed supplement, used or sold as fish food, or used in certain human food preparations. • The compost was sun-dried and sieved to produce good quality material. A typical analysis was: organic matter, 9.3 percent; N, 8.3 percent; P, 4.5 percent; K, 1.0 percent (water soluble); Ca, 0.4 percent; and Mg, 0.1 percent.
Inputs, costs and financial investment required:	Input costs are very low, including: 1) worm seed stock, 2) a shaded container or site, 3) food or animal fecal waste and 4) waste fiber or starchy materials (straw, rice husks, peanut shells, etc.)
Market linkage (suppliers, etc.):	One large supplier of worms in Vietnam is An Phu Worm Farm (50 km outside Ho Chi Minh City)
Institutional and organizational requirements:	To be further researched
Output/benefits/results:	See above

Strengths and challenges:	**Strengths:** • High quality bio-fertilizer • Reduces farm costs (for chemical fertilizer or livestock feed) • Uses farm, household and even aquaculture waste productively **Challenges:** • The drawback of the vermicomposting process is that the temperature is not high enough for a full pathogen kill (like thermo composting)
Expert contacts and/or (scientific) documentation/sources/ pictures:	In **Vietnam**: Dept. of Soil Sciences, Cuu Long Rice Research Institute, Can Tho, Vietnam In **Philippines**: • Ma. Elena Chiong-Javier and others (2012), published in *Holding their own: Smallholder Marketing, Production and Women Issues in Philippine Agroforestry*, by the De La Salle University, the Philippines. • FAO (Natural Resource Management and Environment Department (Year unknown). 4. Vermicomposting - http://www.fao.org/docrep/007/y5104e/y5104e08.htm

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT	
3. WHERE?	
Target location(s):	An Giang and Soc Trang – both provinces would have a potential market for both bio-fertilizer and protein animal feed for either livestock or fish.
4. BY/WITH WHOM?	
Target community group(s):	• Land-poor HH (both men and women), as only little land is needed. • Possible for land-less people as well, if little space available by their house. • Very suitable for women, as carried out close to home
Community-based organizations:	• Farmers' Groups
Strategic partners:	• Dept. of Soil Sciences, Cuu Long Rice Research Institute, Can Tho or Academy of Agriculture Sciences, Hanoi
5. HOW?	
How to step-wise implement in Soc Trang or An Giang:	To be further researched
Inputs needed:	• See above example for details
Rough cost estimation	• See above example for details
Role and involvement of strategic partners:	To be further researched
Opportunities:	To be further researched
Barriers to implementation:	• Need space for composting • Need heat tolerant worm species



ANNEX 1.6 - ORGANIC FLOATING GARDEN PRODUCTION

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION	
1. WHAT is the climate resilient livelihood option we are proposing?	
Name of the livelihood option:	**ORGANIC FLOATING GARDEN PRODUCTION**
Livelihood sector(s):	Small-holder, climate resilient agriculture
Short description or summary:	Floating agriculture is a way of utilizing areas which are waterlogged for long periods of time in the production of food. It is a **technology** that is mainly aimed at adapting to more regular or prolonged flooding. The approach employs beds of rotting vegetation, which act as compost for crop growth. These beds are made in such a way that they are able to float on the surface of the water, thus creating areas of land suitable for agriculture within waterlogged regions. Scientifically, floating agriculture may be referred to as *hydroponics*. The floating gardens can be created in ponds, canals and other open water sources, but not in open, unprotected water by the coast.
Rationale for promoting this livelihood options:	Floating gardens allow farmers to grow crops during the heavy rains when their fields are flooded. In Bangladesh and Myanmar the floating gardens provide vital food for poor people even during the annual *monga* (period of food shortages) and they can also provide an alternative source of income through sale of any surplus on the market. Since the approach is fully organic, the produce receives special attention from local buyers and consumers. Finally, the Water Hyacinth – which would be the main component for creating these floating garden beds - is the most abundant water plant in the Mekong Delta, which grows in the wild and can be found in larger water areas. It is considered a very problematic invasive species, and if not controlled it can cover lakes and ponds entirely. This dramatically impacts water flow, blocks sunlight from reaching native aquatic plants and starves the water of oxygen often killing fish. So by using this plant for floating gardens, a problem is turned into a solution by helping to improve the natural environment and creating a new livelihood for land-poor and land-less people. Because the system is fairly labour intensive, it also has the capacity to provide employment opportunities within communities.
2. WHY are we proposing this option?	
Livelihood Strategy:	Quadrant B
Key climate resilient elements:	• **Low water usage:** Due to their small size and compact format, water use is very efficient. The gardens only require limited water meaning that farmers are protected from the risk of off-season drought or water shortages. • **Diversification:** contributes to farmer or even subsistence fishermen's self-reliance and livelihood diversification: 1) It contributes to food security; 2) eliminates the need for chemical fertilizers and 3) generates a marketable product. • **Financially/Technologically Accessible:** can be produced with cheap inputs, basic HH tools and very basic learning, costing HHs very little. • **Heat and humidity tolerant:** the humid climatic conditions in Vietnam are well suited for floating gardens. • **Little land needed:** limited or no land required for the activity, as the gardens can be established on inland water bodies.

Key climate resilient elements:	• **Environmentally friendly:** floating gardens are environmentally friendly as they do not require fertilizers or pesticides and can even be turned into compost for a new garden after one year. The approach uses water hyacinth, a highly invasive weed with prolific growth rates, in a highly beneficial way. Aquatic invasive species used in floating agriculture are considered to be the second largest reason for biodiversity loss worldwide. Clearing waterways to collect these plants is therefore beneficial to the health of wetland ecosystems and may contribute toward maintaining high biodiversity and associated benefits. By harvesting water hyacinth, areas covered by the weed are cleared, with the beneficial side-effect of reducing breeding grounds for mosquitoes and improving conditions for open-water fishing. • **High nutritional value**: The gardens can help diversify the diet of poor, land-less households.

II. ASSESSMENT OF CLIMATE RESILIENT LIVELIHOOD OPTION – Based on Best Practices/Lessons Learned elsewhere

3. WHERE and WHEN – has this livelihood option been/is being implemented?

Current/previous Location(s):	• Floating gardens are successfully applied particularly in Bangladesh and Myanmar in areas and ecosystems with similar climatic conditions as the ones found in both An Giang and Soc Trang. In Bangladesh, the communities are growing red onion, sweet pumpkin and okra.

4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?

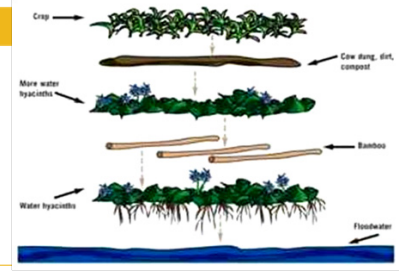
Main community group(s) implementing the livelihoods	• This livelihood technology is particularly suitable for land-less people, given that it can be applied to common property areas. • It is suitable for both men and women. • Would be particularly useful for supplementary income generation or food security enhancement for Cham subsistence fishermen living on boats, as the gardens can be kept on the water.
Gender dimensions:	• While men may be needed for the initial creation of the floating gardens, the daily maintenance is particularly useful for women. • Can engage different generations, from youth through to elderly women. • As both men and women can carry out the floating agriculture practices, it can also lead to improvements in gender equity.
Type and/or name of implementing organization:	• Floating gardens are used extensively in Bangladesh and Myanmar. • Farmers living in the district of Faridpur, central Bangladesh have adapted the age-old practice by growing vegetables on floating gardens.
Main strategic partners:	Both CARE and Practical Action have applied this livelihood technique in Bangladesh.

5. HOW?

Model / Process:

See illustration (from Practical Action).

- The rafts, 8 meters long and 1 meter wide, are made from hyacinth, which is available for free locally.
- Soil is put on the surface of the raft and then the seeds planted in the soil. In Bangladesh and Myanmar, summer and winter vegetables such as gourd, okra and leafy vegetables are grown.



Model / Process:

- The structure of the floating raft is strengthened with bamboo, while bamboo poles are used to fix it in position to avoid damage caused by wave action or drifting.
- The rafts can be moved from place to place so are also suitable for those that have temporarily or permanently lost their homes and land.
- In Bangladesh, Practical Action trains families in pit cultivation – making 30cm x 30cm holes for planting vegetable seed. Every household has ten pits to grow vegetables and is given ten different high yielding varieties of fast growing vegetable and groundnut seeds. Training is provided in new techniques to cope with the conditions in order to grow more and better crops throughout the year. People are shown how to protect against plant disease and insect attack using organic control methods (e.g. homemade botanical insecticide). Advice is also given in making seed-beds, preparing compost and enriching the sandy soil with compost and manure.

Inputs, costs and financial investment required:

- Floating agriculture practices have minimal infrastructure and very little capital requirement.
- The key input – the Water Hyacinth – can be harvested for free.
- Costs can also be kept low because raw materials for the construction of floating beds are readily available from local waterways. For example, the main component – the Water Hyacinth – is very common in most water ways in the Mekong Delta. Haq et al. (2004) conducted an analysis of the costs of implementing floating agriculture in Bangladesh. Their findings are shown in the table below:

Table 1: Costs of implementing a floating agricultural system in Bangladesh

Activity	Duration	Total Cost (Tk)	Total cost converted to USD (in 2009 USD)
Construction of floating beds	60 man days	3,000	63
Collection of raw materials (weeds)	20 man days	1,000	21
Seed and/or seedling purchase		600	13
Bamboo, rope, crop harvesting and maintenance		1,000	21
Total		**Tk 5,600**	**USD 118**

Market linkage (suppliers, etc.):

To be further researched

Institutional and organizational requirements:

- Due to a lack of sufficient knowledge and skills of floating agriculture and its methods, it will be necessary to raise awareness and educate local communities. A recent scheme in Bangladesh was promoted by the Wetland Resource Development Society (an international research and development organization), which provides training and technical support to local communities.
- Provided communities are furnished with the appropriate knowledge, implementation of floating agricultural systems should be achievable at community scale. This is because raw materials are widely available and costs are low and offset by the production and sale of food stuffs.

Institutional and organizational requirements:	• In order to implement these schemes at the local level, communities are required to work together. It has been observed that in doing so, the local community and communal harmony can be strengthened. • Through a programme to encourage floating agriculture in Bangladesh, it was found that one of the most important aspects of implementation is to organize small-scale and poor farmers at grass-roots level and build up their entrepreneurial capacity for running small businesses. This builds the benefits to less well-off farmers and can be accomplished on a local level.
Output/*benefits*/results:	• Depends on the scale of the floating gardens and the produce selected.
Strengths and challenges:	**Strengths:** see also above. • The practice helps mitigate land loss through flooding by allowing cultivation of these areas to continue. This way, the total cultivatable area can be increased and communities can become more self-sufficient. In addition, the area under floating cultivation is up to 10 times more productive than traditionally farmed land with no additional chemical fertilizers or manure required. When crops have been harvested and floating rafts are no longer required, they can be used as organic fertilizers in the fields or incorporated into the next years' beds as fertilizer. • By cultivating crops in water, it is also possible to simultaneously harvest fish populations, which reside in the beds. • The practice of floating agriculture also helps supplement the income of local communities and contributes to alleviation of poverty. It also provides greater food security by increasing the land output and supporting capacity for poor and land-less people. • People practicing floating-bed cultivation are enjoying a better life economically than those in other flood-affected areas who have not yet adopted this practice. **Challenges:** • While this technology works well in some areas today, it is unclear how it may be affected by sea level rise and increases in salinity. Additionally, while the technique is applicable in several mega-deltas such as the Ganges-Brahmaputra, a more general wide-scale application of this approach may be unrealistic. • The technology can cause conflict within the community if common property areas are dedicated to the practice. • Although this technology provides the advantage of maintaining food production, it may be difficult to transport produce to market because the area remains waterlogged most of the time • Floating agriculture has the drawback of encouraging insect or rodent infestation, which may cause health problems and damage to crops.
Expert contacts and/or (scientific) documentation/sources/ pictures:	Most of the information for this annex was obtained from the *ClimateTechWiki* here: http://climatetechwiki.org/content/floating-agricultural-systems Other sources: • APEIS and RIPSO (2004) Floating Agriculture in the flood-prone or submerged areas in Bangladesh. Bangladesh: APEIS and RIPSO. (*picture*)

Expert contacts and/or (scientific) documentation/sources/ pictures:	• Haq, A.H.M.R., ea. (2004) Cultivating wetlands in Bangladesh. India: LEISA. • Haq, A.H.M.R., Ghosh, P. and Islam, M.A. (2005) Wise use of wetland for sustainable livelihood through participatory approach: A case study of adapting to climate change. Bhubaneswar: Asian Wetland Symposium. • Islam, T. and Atkins, P. (2007) Indigenous Floating Cultivation: A Sustainable Agricultural Practice in Wetlands of Bangladesh. Development in Practice, 4(1), 130–136. (LEISA, 2009) • Linham, M., Nicholls, R.J. (2010) Technologies for Climate Change Adaptation: Coastal erosion and flooding. Guidebook Series. UNEP/GEF. • Saha, S.K. (2010) Soilless Cultivation for Landless People: An Alternative Livelihood Practice through Indigenous Hydroponic Agriculture in Flood-prone Bangladesh. Beppu: Ritsumeikan Asia Pacific University. • Practical Action: Floating Gardens. http://practicalaction.org/floating-gardens-1

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT	
3. WHERE?	
Target location(s):	• Both An Giang and Soc Trang, given availability of inland lake and river water bodies and abundance of Water Hyacinth in both provinces. • Given the physical structure of the platforms, floating cultivation is not suitable in all open waters and cannot withstand devastating floods or strong waves. Nonetheless, this production system can be very useful in many wetlands during normal floods
4. BY/WITH WHOM?	
Target community group(s):	• This livelihood **technology** is particularly suitable for land-less people, given that it can be applied to common property areas. • It is suitable for both men and women. • Would be particularly useful for supplementary income generation or food security enhancement for Cham subsistence fishermen living on boats, as the gardens can be kept on the water.
CBOs:	• Local Farmers' and Women's Union
Strategic partners:	• DARD • Farmers' Union and Women's Union
5. HOW?	
How to step-wise implement in Soc Trang or An Giang:	• In Bangladesh, since floating gardening and associated winter gardening were completely new techniques for the project participants, four types of capacity building were used: • Class-room training in groups, • On-site training for individuals, • Cross-visit for selected participants visiting traditional floating gardeners in southern Bangladesh, and • Exposure visits for selected participants from one village visiting other village.
Inputs needed:	• See above example for details

Rough cost estimation	• See above
Role and involvement of strategic partners:	• DARD to first be trained in how to set up floating gardens (making seed-beds, preparing compost and enriching sandy soil with compost and manure) and growing techniques, protection against plant disease and insects using organic methods, e.g. homemade botanical insecticide • Then provide training in the practice through its extension services to communities
Role and involvement of strategic partners:	• Help establish connection between the community HH and the market • Farmers' Union and/or Women's Union – provide micro loans
Opportunities:	• Floating agriculture is an environmentally-friendly option for increasing the land available for agriculture. As such, the practice could be sustainable and profitable in both An Giang and Soc Trang, helping to supplement incomes and to increase food security. • Regular, land-based agriculture requires farmland to be protected behind embankments or reclaimed from estuarine systems. Both of these activities can have detrimental side effects upon the local environment and economy. In contrast, floating agriculture can be conducted without land claim and hard defenses. The procedure can even contribute toward maintaining healthy wetlands which have coastal defense functions and also support a wide range of biodiversity. • The practice is already widely applied in some developing countries such as Bangladesh, and the uptake of the technology is already increasing due to its sustainable, positive features
Barriers to implementation:	• It is essential that knowledge of this technology be passed on to local communities in areas where floating agriculture is not carried out. To an extent, this has naturally occurred in Bangladesh where the practice has spread throughout the country, but on a global scale, the approach will require local awareness raising. • Poorer farmers can be prevented from participating in floating agriculture schemes if their rights to common property and ownership of technology are not protected. While many wetland areas with plentiful water hyacinth may exist, they are likely to be grabbed by the upper levels of the rural and urban society if extensive and persistent advocacy is not considered by the implementing bodies • The reviewed literature mentioned that the availability of high volumes of fast growing organic material may be limited in some areas and may be problematic if the uptake of this technology becomes widespread. As this is an essential material for floating agriculture, a limited supply will limit the uptake of this technology. *Yet, this does not appear to be a problem in neither An Giang nor in Soc Trang*.

ANNEX 1.7 - INTEGRATED DUCK & FISH (CARP) FARMING

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION	
1. WHAT is the climate resilient livelihood option we are proposing?	
Name of the livelihood option:	**INTEGRATED DUCK & FISH (CARP) FARMING**
Livelihood sector(s):	Small-holder, climate resilient agriculture/aquaculture
Short description or summary:	Integrated duck and fish (carp) farming combines animal husbandry with aquaculture to optimize production and diversify farm outputs.
Rationale for promoting this livelihood options:	An integrated agriculture-aquaculture approach has been used by farmers in Vietnam for centuries to reduce risk, spread labor inputs and re-utilize resources. There are a number of integration configurations that can be used in this approach. The choice of animals depends on a number of factors important to the farmer. In this case, fish and ducks were chosen because they are marketable, they require little land, they can be grown quickly, ducks are more climate-resilient than other poultry and able to forage for most of their food, and their waste feeds fish.
2. WHY are we proposing this option?	
Livelihood Strategy:	Livelihood quadrant B
Key climate resilient elements:	• **Diversification:** Contributes to food security and livelihood diversification. Fish and ducks can be eaten or sold, ducks can produce eggs for consumption or sale. • **Marketability**: Both fish and duck are highly desirable meats in Vietnam and Southeast Asia. • **Technologically/Financially Accessible:** Raising ducks and fish are relatively simple and inexpensive to buy and raise. • **Heat and water tolerant:** Ducks and fish are relatively tolerant to heat, given the appropriate species. • **Little land needed:** Limited land is required for raising ducks and fish. • **Environmentally friendly:** Ducks are able to forage for most of their food and their waste feeds the fish. Ducks aerate the water for the fish while swimming and keep water plants in check. • **Pest resistance**: Ducks and fish are fairly resistant to pests and disease (relative to some other poultry/animals).

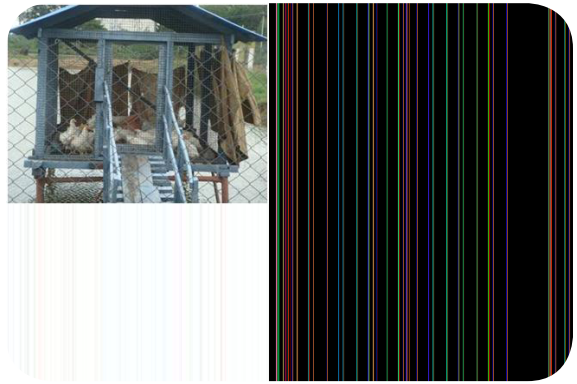
II. ASSESSMENT OF CLIMATE-RESILIENT LIVELIHOOD OPTION – Based on Best Practices/Lessons Learned elsewhere	
3. WHERE and WHEN – has this livelihood option been/is being implemented?	
Current/previous Location(s):	Dai Xuyen Duck Breeding Centre, Ha Tay - Ha Noi province; Cam Binh duck enterprise, Hai Hung, Vinh Long province and Tu Binh duck farms in the south. This integration is also being done by private producers, in household units in the villages and by members of VACVINA Association (This association encourages integrated production system, VAC i.e. Gardening - Fish rearing - Livestock Production).
4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?	

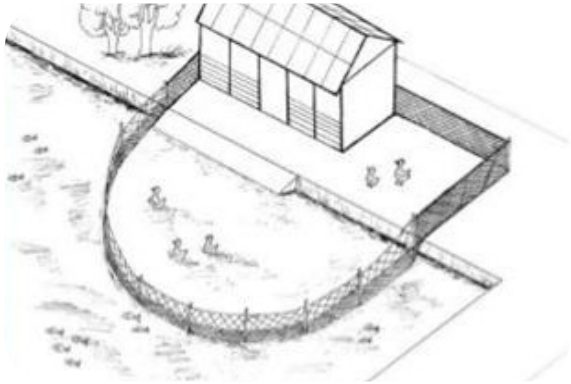
Main community group(s) implementing the livelihoods	• This mix of poultry and fish is particularly suitable for land poor, given that these two species can be raised in fairly confined spaces. • It is suitable for both men and women but women tend to manage these livestock, given this generally being close to home. • These livestock meat, eggs or offspring can provide *supplementary* income or household food. Duck waste can also be used for aquaculture.
Gender dimensions:	• Typically women manage duck and pig production because it can be undertaken close to home.
Type and/or name of implementing organization:	Private sector VACVINA Association (semi-Govt)
Main strategic partners:	To be further researched
5. HOW?	
Model / Process:	**Raising ducks with fish can occur in 3 ways:** 1) on open water, 2) on shore, and 3) above pond surface in duck houses. o The *open water approach* is generally used for large bodies of water and ducks are housed in pens at night. This approach is very in-expensive in terms of feed but does not utilize the duck manure effectively. o The o*n-shore* approach is more expensive because a concrete spillway and fenced perimeter needs to be constructed but it does allow for some centralized feeding and collection of manure. o The *above pond* approach is the most uncommon, and involves constructing a duck house over a fish pond and bridge from the shore to the house as well as a fenced perimeter. This approach is more constrictive for ducks but maximizes use of duck manure for fertilizing and feeding fish. • **Fish and duck stocking density**: Ducks are stocked at 200-300 ducklings/ha of fish pond. From duck excreta annual manure production is 45-55 kg/duck/yr. Duck droppings contain 81% moisture and 0.91% Nitrogen and 0.38% $P_2 0_5$. It is advisable to seed the pond with fingerlings of no less than 10 cm in size, since the ducks may feed on smaller fingerlings. Stocking density depends on the size of the pond and number of ducks. Nitrogen rich duck manure enhances both phytoplankton-feeding silver carp and zooplankton-feeding catla and common carp. • In the *Cam Binh duck farm*, duck houses are built near the pond/lake border and in that pond they keep various kinds of fish like carps, salmon (a kind of carp), roach, and tilapia etc. In the night, ducks are kept in the houses till about 8am (laying ducks will lay eggs in the houses before leaving for feed). During daylight, ducks scavenge food in the pond; they feed on snails, crab, algae, plankton, fishlings and other food available in the water. They are also provided with certain ration of mixed feed from automatic feeders scattered on the border of the ponds. Duck manure excreted together with the waste feed, which is cleaned and drained into the pond, help the aquaculture, plankton, micro bacteria and microbial grow quickly. These, in turn, become feed for either duck or fish. This system helps to save a part of supplementary feed (30–40%) and at the same time improves the environmental conditions of the fish. The most desirable area in lakes/pond for integration

Model / Process:	system is 30/50 ha. The density of ducks raised depends on the water streaming and the water cleanliness. Generally, we can keep about 200–300 ducks/ha. After 2–3 years, the ponds may be full of mud and the duck/ fish yield will start to reduce. Then ponds should be emptied to clear out the mud/sludge, repair the border and improve the sanitary conditions. The sludge can be used as organic fertilizer for gardens or rice paddy. This has increased rice yields by 50–80%. After, the duck-fish integration can start again.
Inputs, costs and financial investment required (per hectare or depending on no. of population):	• Fish Pond • Duck House – bamboo, cane or thatch • Concrete spillway (for on-shore approach) • Fencing (for on-shore or above pond approaches) • Ducklings & Fish fingerlings • Duck feed (poultry feed and rice bran – 200 gm/duck/day) & pond forage • Duck nests – bamboo or wood with tin boxes to hold straw
Market linkage (suppliers, etc.):	To be further researched
Institutional and organizational requirements:	To be further researched
Output/*benefits*/results:	• The fish rearing period is generally one year. • A stocking density of 20,000 fish/ha. will normally generate 450-500kg/ha of fish, 3000 to 3300 duck eggs/ yr and 30-35 kg of duck meat/yr.
Lessons learned:	• Integrating duck and fish farming reduces costs of protein for duck feed and the need for pond fertilization and fish feed. Moreover, the continuous flow of manure into the pond increases fish growth and fish yields and avoids pollutions problems associated with duck excreta. • Integration also causes recycling of pond nutrients since ducks turn up the bottom in shallow water and aerate the water when swimming • Vaccinating ducks and keeping the duck habitat clean and separate from human living areas prevents the development and spread of disease to ducks, other bird life and humans.
Expert contacts and/or (scientific) documentation/sources/ pictures:	• FAO. Duck-Fish Integration in Vietnam. http://www.fao.org/docrep/004/ac155e/AC155E15.htm • Powerpoint Presentation. The Integration of Fish and Ducks Farming. Meela Upendo, J. Aldo Mwapinga, G., Mlay Francis, G. http://www.slideshare.net/mlay1982/the-integration-of-fish-and-ducks-farming • The Azolla Foundation. Rice-Duck-Azolla-Fish cultivation. http://theazollafoundation.org/features/rice-duck-azolla-loach-cultivation/ • Heifer International. Coming Full Circle: Integrated Farming in Vietnam. • Duck-cum-Fish Farming. http://assamagribusiness.nic.in/2ndoct/fishduck.pdf

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT

3. WHERE?	
Target location(s):	Both suitable for An Giang and Soc Trang provinces.
4. BY/WITH WHOM?	
Target community group(s):	• This livelihood **technology** is particularly suitable for land-poor, given that it uses space effectively for two species
Target community group(s):	• It is suitable for both men and women. • Would be particularly useful for *supplementary* income generation or food security enhancement for small landholders with access to water
Community-based organizations:	• Local Fish Farmers' and Women's Union members
Strategic partners:	• DARD • Farmers' Union and Women's Union
5. HOW?	
How to step-wise implement in Soc Trang or An Giang:	1. Pre-stocking management. i. Construction of a fish farm: site selection; pond construction; and pond preparation for stocking with fish. ii. Renovation of an existing fish farm. 2. On stocking management. i. Selection of species. ii. Size, quality, number and composition of fish species to be stocked. iii. Stocking of fish pond with fish seed. iv. Cares to be taken during stocking. 3. Post stocking management: Liming; Fertilization; Feeding; Water quality management; and Fish health management. 4. Harvesting management.
Inputs needed:	• See above example for details
Rough cost estimation	To be further researched
Role and involvement of strategic partners:	• DARD – extension service providers should be trained in this livelihood approach. • Then provide training in the practice through extension services to pilot land-poor HHs. • The training to communities should also include help to establish connection between the community HH and the market. • Farmers' Union and/or Women's Union – provide micro loans
Opportunities:	To be further researched
Barriers to implementation:	• Land • Availability of water • Cost of ducks, duck feed and antibiotic.





ANNEX 1.8 - SMALL-SCALE, CLIMATE RESILIENT EEL FARMING

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION	
1. WHAT is the climate resilient livelihood option we are proposing?	
Name:	**SMALL-SCALE, CLIMATE RESILIENT EEL FARMING**
Livelihood sector(s):	Aquaculture
Short description or summary:	Eel raising in man-made basins.
Rationale for promoting this livelihood option:	• There is a good market for eels. • There is a strong interest by the Government – including DARD and the Women's Union - to promote additional eel farming. • There is already a lot of successful eel farming cases in An Giang to learn from.
2. WHY are we proposing this option?	
Livelihood Strategy:	Livelihood Quadrant A
Key climate resilient elements:	• Eel raising is a water-intensive livelihood, as the eel basin needs to be flushed with clean water on a daily basis. • Eel raising involves a high risk of diseases - particularly if the farming is not done correctly. • It is considered normal to lose 40-50% of the baby eels, even without diseases. With increasing temperatures this risk could further increase. • In addition, given the high disease risk, conventional eel raising generally uses a lot of pesticides and chemicals, which has a very negative impact on water resources.

II. ASSESSMENT OF CLIMATE RESILIENT LIVELIHOOD OPTION – Based on Best Practices/Lessons Learned elsewhere	
3. WHERE and WHEN – has this livelihood option been/is being implemented?	
Current/previous Location(s):	An Giang
4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?	
Main community group(s) implementing the livelihoods	• Near poor, poor, land-poor – but some land is needed, unless the land is leased. • The funding opportunities from the Government tend to target the near-poor. • Land-less can work as day/seasonal labourers. Yet, eel farming is mostly a family business, so generally not much seasonal labor is needed.
Gender dimensions:	• While it tends to be men that are leading the eel raising, women are also involved in the food processing • It tends to be a family-driven business.
Type and/or name of implementing organization:	DARD An Giang

Main strategic partners:	DARD and Women's Union
5. HOW?	
Model / Process:	• Eel raising takes 6-8 months. It is possible to have 2 harvests of eels per year. • Each adult eel weigh about 200g (5 eels per kg). The fat eels are sold, but the medium and small size eels are kept and further fattened. • Baby eels are produced locally and 1 kg (approx. 50 eels/kg) costs 65,000 VND • It takes 6 hours per day to take care of eel, mainly for preparing food. • Food for eels include yellow snail mixed with pellet feed. 3000 eels need 7 kg of yellow snail per day and 2 packs of pellet feed during 6 months • After 5-6 months, households can harvest 300-400 kg of eels (after losing about 40% of them).
Inputs, costs and financial investment required (per hectare or depending on no. of population):	• Medium-size investment is needed up front. The below calculation is for a relatively large size operation. • Yet, after the initial start up cost - including the cost of the basin, water pump, etc - the maintenance cost is relatively low. • It is possible to start eel raising with about 10 mills VND per basin, but you can make VND20 mill from 1 harvest, which means a 50% profit. • Yet, also uses cheap/free agricultural waste – cornstalk - as part of the setup. • One way to save costs on food is to hunt for and use snails from rivers instead.

Inputs, costs and financial investment required (per hectare or depending on no. of population):

Description	Amount (VND)	Note
Total budget	**26,100,000**	
Baby eels (60 kg)	3,900,000	65,000VND x 60 kg 50 eels/kg x 60 kg = 3,000 eels
Family labour (including feeding, food preparation, take care of and clean eel cages etc.)	10,800,000	6 hours/day x 10,000VND x 6 months x 30 days
Food for eels	6,820,000	6 months 2 packages x 260,000VNd x snail 7 kg/day x 5,000VND/kg x 6
Medicine (incl. vaccines and treatment)	180,000	60,000VND/kg x 3 kg
Electricity for water pumping (2m3 of water/day)	1,800,000	10,000VND x 6 months x 30 days
Money for plastic cages	1,700,000	Water roof 1 million, bamboo 500,000VND, 2days labour (200,000VND)
Revenue	**43,200,000**	**Losing approx. 40%** **5 eels/kg x 360 kg x 120,000VND/kg**
Net profit (if using hired labour)	15,300,000	Without including loan interest
Net profit (if using family labour)	**28,800,000**	**Without including loan interest**

Source: WWF Vietnam

Market linkage (suppliers, etc.):

- Baby eels are bought from a middle-man and most people also sell through middle-men. Most HH have no direct contact with the market.

Institutional and organizational requirements:

- Policy no. 1956 by the Government (MARD) provides both for 1) funding opportunities and 2) vocational training: the Govt can provide a micro-finance loan with up to 60% financial support for the startup cost via a loan from the Social Policy Bank. The HH has to come up with the remaining 40%.
- The Government has capacity to support 50-60 HH per year to start up eel farming.
- The HH submit funding applications to the commune, which inform the district about who to fund. This program started in 2011 and will run until 2020.
- The Government, through MARD, also provides vocational training in how to set up and raise eels. This training is free and the Govt also provides an allowance for people who are attending.

Output/*benefits*/results:

- *See above matrix.*
- Eel production can be highly profitable; VND15-20 Mill/per harvest.
- Grown eel sells for VND 110,000/kg.
- The price of eel is quite stable (average 120,000VND/kg)
- It is considered normal to lose about 40-50% of the initial baby eels. If more are lost, the crop will produce at a loss.

Strengths and challenges:	**Challenges:** • Conventional eel farming tends to use a high amount of pesticides and chemicals, which pollutes the water resources used in the eel production. It further pollutes the water bodies into which the polluted water is released after use. Therefore, there is an urgent need to develop and promote an environmental friendly model.
Expert contacts and/or(scientific) documentation/sources/ pictures:	• DARD • WWF Vietnam. – Livelihood study of WWF • ICAM Project livelihood study field visit

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT	
3. WHERE?	
Target location(s):	Mostly suitable for An Giang province, particularly as there is already a lot of eel farming taking place.
4. BY/WITH WHOM?	
Target community group(s):	• Land-poor HH (both men and women), as only little land is needed • There will not be many employment opportunities for land-less in the small-scale productions, as these tend to be family run without much need for additional labor.
Community-based organizations:	• Members of local Farmers' or Women's Union, as that would help make them eligible for a micro loan from the Social Policy Bank or the Women's Union.
Strategic partners:	• Farmers' Union • Women's Union • DARD
5. HOW?	
How to step-wise implement in Soc Trang or An Giang:	To be further researched, especially on the development of an environmental friendly model
Inputs needed:	• See above for details
Rough cost estimation	• See above for details
Role and involvement of strategic partners:	• The Government would provide micro-finance loan opportunities through 1) the Social Policy Bank or 2) the Women's Union. • DARD would provide training in how to set up and maintain the eel production
Opportunities:	• There is a strong interest from the Government to support additional expansion of eel farming in An Giang.
Barriers to implementation:	• There are limits to how many HHs can obtain a micro loan every year. • Also, they need to meet the eligibility criteria, which include providing approx. 40% of the necessary funding themselves.

Pump, that pumps water in and out of the basin

Dry corn husk, used to cover the eels

Eel basin, made of plastic

Eels

ANNEX 1.9 - SMALL-SCALE MANGROVES NURSERY

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION	
1. WHAT is the climate resilient livelihood option we are proposing?	
Name:	**SMALL-SCALE MANGROVES NURSERY**
Livelihood sector(s):	Climate resilient, small-scale community based forestry, biodiversity or natural resource management
Short description or summary:	Nursery producing mangrove seedlings needed for mangrove restoration
Rationale for promoting this livelihood options:	Increasing sea level rise, coastal erosion and salt water intrusion is a growing problem in Soc Trang. As a result, the need to rehabilitate and enhance existing mangroves is also increasing. There will be an increasing market and demand for mangrove seedling production.
2. WHY are we proposing this option?	
Livelihood Strategy:	Livelihood Quadrant C
Key climate resilient elements:	• Mangrove ecosystems serve to prevent and reduce the impacts of climate-induced impacts, such as typhoons, high waves and rising tides. • They also help stabilize the coast, facilitate sedimentation and reduce coastal erosion. • Mangroves serve as a carbon sink to help mitigate climate change.

II. ASSESSMENT OF CLIMATE-RESILIENT LIVELIHOOD OPTION – Based on Best Practices/Lessons Learned elsewhere	
3. WHERE and WHEN – has this livelihood option been/is being implemented?	
Current/previous Location(s):	Coastal communities: Da Loc Commune, Hau Loc District, and Nga Thuy Commune, Nga Son District, Thanh Hoa Province
4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?	
Main community group(s) implementing the livelihoods	• 1,070 HH with a total of 6,200 people in Da Loc Commune • 1,598 HH and 6,417 people in Nga Thuy Commune
Gender dimensions:	• Women can do this livelihood after their household chores. It is also a livelihood that can engage different generations, from youth through to elderly women. • It is a good way to provide sustainable livelihood for ethnic minorities.
Type and/or name of implementing organization:	ARE International
Main strategic partners:	Part of Project: *Community-based Disaster Risk Reduction, Risk Management, Climate Change and Mangrove Reforestation Management* and ANCP Projects, funded by Precision Foundation, ANCP – CARE Australia, Metro Company – CARE Denmark, AXA – CARE France.

5. HOW?

Main community group(s) implementing the livelihoods

- 1,070 HH with a total of 6,200 people in Da Loc Commune
- 1,598 HH and 6,417 people in Nga Thuy Commune

Model / process:

- Established mangroves plantations on 257 ha (2007 to 2009) and
- Replicated an additional 37 ha (2010), 82 ha (2011 to May 2013) and will be planting 80 ha more in second crop 2013
- Set up mangrove nursery gardens with over 200,000 seedlings: the established mangrove nurseries provide on-site seedlings and juvenile trees for planting as well as creating an additional source of income for the local people involved.

Inputs, costs and financial investment required:

Estimated budget for setting up a mangroves nursery garden with 4,000 m2 land area and 40,000 seedlings *(source: CARE in Vietnam):*

Item	Unit	Amount	Cost (VND)	Total
Land rent	Year	3	18,000,000	54,000,000
Materials				
Nylon bag	kg	850	120,000	102,000,000
Hoe, basin, pot				3,000,000
Tunnel to make gate	Metre	16	120,000	1,920,000
Bamboo to make fence	Tree	32	35,000	1,120,000
Technical training courses on set up nursery garden	Course	4	5,500,000	22,000,000
Seed	Seed	40,000	70	2,800,000
Labour Cost				
Labour cost for soil making	Công	300	70,000	21,000,000
Fertilisers, chemicals	ha	0.4	15,000,000	6,000,000
Put land to nylon bag	Day	670	70,000	46,900,000
Put seeds into nylon bag	Day	50	70,000	3,500,000
Take care of seedlings (3 person/month x 2.000.000VND/ person)	Month	36	2,000,000	72,000,000
Moving seedlings before get out nursery garden as technical requirement	Day	140	70,000	9,800,000
Protection cost	Month	36	1,500,000	54,000,000
Total				**400,040,000**
Cost per one seedling				**10,001**

Market linkage (suppliers, etc.):

To be further researched

Institutional and organizational requirements:	To be further researched
Output/*benefits*/results:	1,000 to 1,600 seedlings per ha
	Strengths: • Mangrove afforestation when integrated with livelihood options and diversification supports community livelihoods and creates diversification options (raising pigs, oysters, bio-fertilizer, excavates and bee keeping)
Strengths and challenges:	that served to reduce poverty and people's vulnerability against disaster risks and climate change and dependence on natural resources. **Challenges:** • Planting mangroves in the coastline at sea means at times facing big waves • Barnacles attacking young trees
Expert contacts and/or (scientific) documentation/sources/ pictures:	Contact Person: Mr. Nghi, Project Manager, CARE in Vietnam's project in Thanh Hoa Sources: • SRD/CARE VN, Experience NGOs in Vietnam Responding to CC. Community-based Mangrove plantation, protection & management, p21-22 • CARE VN (2013). Powerpoint: Community-based Disaster Reduction, Risk Management, Climate Change and Mangrove Reforestation Management / Budget notes for setting up a mangroves nursery garden

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT	
3. WHERE?	
Target location(s):	Soc Trang in districts by the coast with mangroves: making mangroves nursery beside the river where there are enough brackish water to supply water to the mangrove seedlings every day. (*Lesson learned from CARE in Thanh Hoa - see above*)
4. BY/WITH WHOM?	
Target community group(s):	• Land-poor and land-less HH (as labor for others or if they can establish a nursery on communal or public land) • Suitable for ethnic minorities and for women
Community-based organizations:	• Local Farmers' and Women's Union members
Strategic partners:	• DARD – as it is responsible for restoration, protection and management of mangrove forests • GIZ and IUCN due to existing successful efforts in Soc Trang related to mangroves restoration • Farmers' Union and Women's Union

5. HOW?	
How to step-wise implement in Soc Trang or An Giang:	• Use the lessons learned from CARE pilot activities for how to establish mangroves nurseries. Also draw from lessons learned by GIZ and IUCN • Entire process needs to be participatory, including multiple mechanisms for learning and sharing of experiences. • Support package should include training to teach production skills and fine tuning mangrove seedling production and maintenance. • Credit assistance (if necessary) for nursery set up and maintenance. • Creation of farmers' group/ cooperative for selling mangroves seedlings to Govt and others involved in mangrove restoration activities.
Inputs needed:	• See above example for details
Rough cost estimation	• Please see table in above example
Role and involvement of strategic partners:	• Local government: provide regulations in support of Community Based Mangrove Management and Protection made by local people
Opportunities:	Increasing sea level rise, coastal erosion and salt water intrusion is a growing problem in Soc Trang. As a result, the need to rehabilitate and enhance existing mangroves is also increasing. There will be an increasing market and demand for mangrove seedling production
Barriers to implementation:	To be further researched

ANNEX 1.10 - SMALL-SCALE HANDICRAFT: IRON EMBROIDERY

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION	
1. WHAT is the climate resilient livelihood option we are proposing?	
Name of the livelihood option:	**SMALL-SCALE HANDICRAFT: IRON EMBROIDERY – using indigenous knowledge**
Livelihood sector(s):	Climate resilient, off-farm/trade (handicraft)
Short description or summary:	Production of hand-made handicrafts – building on a traditional knowledge from Cham
Rationale for promoting this livelihood options:	Recent years have seen a near-collapse in the Cham home-based weaving industry, especially the silk one. The key reasons was that silk is more expensive than other fibers due to the high cost of raising silk worms and the laborious investment required to process the thread. A second reason was the competition from cheaper, factory-made fabric. Yet, there is still a positive demand for the traditional Cham embroidery skills.
2. WHY are we proposing this option?	
Livelihood Strategy:	Livelihood Quadrant A or D, depending on circumstances
Key climate-resilient elements:	This option is climate resilient, as it does not depend on declining natural resources nor is it specifically impacted by climate shocks or stresses.

II. ASSESSMENT OF CLIMATE RESILIENT LIVELIHOOD OPTION – Based on Best Practices/Lessons Learned elsewhere	
3. WHERE and WHEN – has this livelihood option been/is being implemented?	
Current/previous Location(s):	An Giang province, due to the existing Cham population
4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?	
Main community group(s) implementing the livelihoods	• Poor Women – both land-poor and land-less, as the work can be carried out at home (home-based) and no land is needed. • Ethnic minorities (Cham) – as will be capitalizing on and/or further enhancing the existing traditional Cham handicraft skills. • Women with disabilities, as long as they can use their hands.
Gender dimensions:	• This livelihood is particularly suitable for women, as it is home-based. • Women can do this livelihood after their household chores. • It is also a trade that can engage different generations, from youth through to elderly women.
Type and/or name of implementing organization:	**1. Craft Link** – http://www.craftlink.com.vn: • Craft Link's vision - *One day all the artisans in Vietnam will earn a fair wage and have happy life.* • Craft Link's mission - Craft Link is a Vietnamese not-for-profit, Fair trade organization which helps traditional craft producers to revive their culture and improve their livelihoods through handicraft production and marketing

Type and/or name of implementing organization:	• Craft Link' objective: 1) Help craft producers, especially the poor, to improve their livelihoods through craft production and marketing; 2) Help to revive and promote traditional culture and skills; and 3) Educate the public about handicraft producers and their products **2. Vietcraft** – Vietnam Handicraft Exporters Association http://vietcraft.org.vn: • Mission: To improve our members' competitive capability and business effectiveness by enhancing global opportunities for exporters and importers interaction; offering services that contribute to bottom-line success; and fostering networking within the handicraft industry. **Main activities:** *(for more see website)* • Provide commercially useful information and assistance to members to develop and increase exports with effective workshops and seminars, an online information system and an in-house library. • Organize training courses on production techniques, appropriate material processing technologies, management skills, etc. • Offer professional advice and services to members in technological upgrades, quality and design improvement, establishment and maintenance of standards and specifications, and product development and innovation through Skills development • Offer professional and profitable advice and services to importers in all aspects of handicraft business in relation to the full value chain. • Participate in specialized International Trade Fairs of handicrafts & gifts, and organize International Handicraft and Gift Fair in Vietnam. • Organize annually internationally recognized VIETCRAFT Awards (Export Awards, Technology and Innovation Awards, Design Awards…) • Interact between the exporting community and government at the Central and Provincial levels. **3. Mekong Creations** – http://www.mekong-creations.org • All Mekong Creations products are handmade by village women from rural areas in Vietnam and Cambodia. This work allows the women to care for their families as they work together in groups close to home. The products make use of natural and recycled materials wherever possible and are checked to ensure high quality standards, before being introduced to Mekong Creations outlets. • Product designs are generated from a number of sources –professional trainers, brand supporters, professional designers, customers and of course the women themselves. Mekong Creations seeks to blend traditional and locally inspired design features with modern and global design to create unique products, combining affordability with quality, technical proficiency and consideration for the local environment.
Main strategic partners:	Women's Union: to provide micro loans for start up
5. HOW?	
Model / process:	To be further researched

Inputs, costs and financial investment required:

- On average, a woman can embroider about 2-3 pieces of cloth/day
- Silk costs 33,000 VND and materials cost 10,000 VND per cloth. Cost for making 1 scarf is 58,000 VND.
- Each women can make approx. 60 scarves per month and she can earn around 2,5 mill VND/month

Inputs, costs and financial investment required:

Description *(source: WWF Vietnam)*	**Amount (VND)**	**Note**
Total budget	**3,780,000**	**60 scarf/month**
Materials (silk and beads)	2,580,000	Silk: 33,000 VND/scarf - Beads: 10,000 VND/scarf
Electricity	300,000	2KW/scarf x 2,500 VND/KW
Family labour	900,000	4-6 hours/day
Revenue	**5,400,000**	
Net profit (if using hired labour)	1,620,000	Without incl. loan interest
Net profit (if using family labour)	**2,520,000**	**Without incl. loan interest**

Market linkage (suppliers, etc.):

- Demand for embroidered items remains strong, including new demands from Malaysia as well as national markets.
- The above organizations are all providing assistance with defining market and customers and securing market access.
- Some use middle men, but others are dealing directly with the community members, cutting out the middle man link, thereby increasing the income/profit to the community members.

Institutional and organizational requirements:

- The above organizations are using locally-sourced materials as much as possible and are making a serious effort to draw from/build on existing traditional knowledge and local resources. Yet, training and ideas for both design and marketing can be provided if needed.

Output/*benefits*/results

- Depends on the specific product (*see pictures below and websites*), but see above for concrete example related to scarf production.

Strengths and challenges:

Strengths:

- Small-scale handicrafts can be a powerful way to empower poor, land-less people, ethnic minorities, women and people with disabilities.

Challenges:

- Market linkage and sustainable income generating aspects

Expert contacts and/or (scientific) documentation/sources/ pictures:

- Mekong Creations - http://www.mekong-creations.org
- Craft Link - http://www.craftlink.com.vn
- Vietcraft – Vietnam Handicraft Exporters Association http://vietcraft.org.vn
- Philip Taylor. 2007. Cham Muslims of the Mekong Delta: Place and Mobility in the Cosmopolitan Periphery.

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT

3. WHERE?

Target location(s):	Mostly suitable for communities in An Giang province, due to the existing Cham population.
4. BY/WITH WHOM?	
Target community group(s):	• Land-poor or land-less women, as no land is needed. • Suitable for ethnic minorities, especially Cham, as this livelihood would draw from traditional handicraft skills of Cham
Community-based organizations:	• Local Women's Union members
Strategic partners:	• Women's Union • Handicraft organization (see proposed ideas above)
5. HOW?	
How to step-wise implement in Soc Trang or An Giang:	• Connect with a Handicraft Organization that has experience in how to produce, market and sell this type of handicraft • Select communes/HH to be involved • Together with the Handicraft Organization, establish a production unit to produce the handicrafts and select which handicrafts to focus on • Carry out training in the production of embroidery products • Develop commercially viable products that utilizes the embroidery technique • Establish access to local and international markets for the new products.
Inputs needed:	• See above example for details
Rough cost estimation	To be further researched
Role and involvement of strategic partners:	• The Handicraft Organization will prepare training materials in how to produce handicrafts and help establish connection between the community HH and the market • Women's Union will provide access to micro loans and will also get trained in how to replicate the above training in additional communities.
Opportunities:	To be further researched
Barriers to implementation:	To be further researched

ANNEX 1.11 - SMALL-SCALE HANDICRAFT (Water Hyacinth-based)

I. INTRODUCTION TO CLIMATE RESILIENT LIVELIHOOD OPTION	
1. WHAT is the climate resilient livelihood option we are proposing?	
Name:	**SMALL-SCALE HANDICRAFT (Water Hyacinth-based)**
Livelihood sector(s):	Climate resilient, off-farm/trade (handicraft)
Short description or summary:	Production of hand-made handicrafts – or even furniture - made from Water Hyacinth, which is a plant that grows for free in many locations. This craft is very popular in Indonesia and Cambodia.
Rationale for promoting this livelihood options:	Water Hyacinth is the most abundant water plant in the Mekong Delta. It is a free-floating perennial aquatic plant which grows in the wild and can be found in larger water areas. It is considered a very problematic invasive species and if not controlled it can cover lakes and ponds entirely. This dramatically impacts water flow, blocks sunlight from reaching native aquatic plants and starves the water of oxygen often killing fish. So by using this plant for handicraft or furniture production, a problem is turned into a solution by helping to improve the natural environment and creating a new livelihood for land-poor and land-less.
2. WHY are we proposing this option?	
Livelihood Strategy:	Livelihood Quadrant D
Key climate resilient elements:	Small-scale handicraft made out of Water Hyacinth provides a climate-resilient livelihood option, especially to land-poor and land-less women, given that the material – the Water Hyacinth – grows wild and in abundance in many locations.

II. ASSESSMENT OF CLIMATE RESILIENT LIVELIHOOD OPTION – Based on Best Practices/Lessons Learned elsewhere	
3. WHERE and WHEN – has this livelihood option been/is being implemented?	
Current/previous Location(s):	There are ample examples of successful examples to draw from in Thailand, Cambodia, Indonesia and also in Vietnam.
4. BY/WITH WHOM? - Who implemented/is implementing the livelihood?	
Main community group(s) implementing the livelihoods	• Poor Women, both land-poor and land-less, as work can be carried out at home and no land is needed • Ethnic minorities – often capitalizing on and/or further enhancing their existing traditional handicraft skills • Poor men in marginalized positions (e.g. as disabled or elderly workers, or members of social minorities) as home-based work may be their best-or only employment option. • People with disabilities.
Gender dimensions:	• This livelihood is particularly suitable for (ethnic minority) women. • It is also a trade that can engage different generations, from youth through to elderly women.
Type and/or name of implementing organization:	**1. Mekong Creations** – http://www.mekong-creations.org • All Mekong Creations products are handmade by village women from rural areas in Vietnam and Cambodia. This work allows the women to care for their families as they work together in groups close to home. The products make use of natural and recycled materials wherever possible and are checked to ensure high quality standards, before being introduced to Mekong Creations outlets.

Type and/or name of implementing organization:	• Product designs are generated from a number of sources –professional trainers, brand supporters, professional designers, customers and of course the women themselves. Mekong Creations seeks to blend traditional and locally inspired design features with modern and global design to create unique products, combining affordability with quality, technical proficiency and consideration for the local environment. **2. Craft Link** – http://www.craftlink.com.vn: Craft Link's vision; *One day all the artisans in Vietnam will earn a fair wage and have happy life.* • Craft Link's mission - Craft Link is a Vietnamese not-for-profit, Fair trade organization which helps traditional craft producers to revive their culture and improve their livelihoods through handicraft production and marketing • Craft Link' objective: 1) Help craft producers, especially the poor, to improve their livelihoods through craft production and marketing; 2) Help to revive and promote traditional culture and skills; and 3) Educate the public about handicraft producers and their products
Main strategic partners:	To be further researched
5. HOW?	
Model / process:	• In the Philippines, Thailand and Vietnam the water hyacinth's stems are used as a braiding material and a source of fibers. Strings of dried fibers are woven or interlinked together to form a braid or cord used for making bags, footwear, hats, vases, and more decorative materials. • Dried stems are used for baskets and furniture. • Water hyacinth fibers are used as a raw material for paper.
Inputs, costs and financial investment required:	• The key input – the water hyacinth – can be harvested for free.
Market linkage (suppliers, etc.):	• There is a strong international market and demand for handicrafts and furniture made of water hyacinth. • The above organizations are all providing assistance with defining market and customers and securing market access. • Some use middle men, but others are dealing directly with the communities, thereby increasing the income/ profit to the community.
Institutional and organizational requirements:	• Above organizations are using locally-sourced materials as much as possible and build on existing traditional knowledge and local resources. • Yet, training and ideas for both design and marketing can be provided if needed.
Output/*benefits*/results:	• Depends on the specific product (*see pictures below*)
Strengths and challenges:	**Strengths:** small-scale handicrafts can be a powerful way to empower poor, land-less, ethnic minorities, women and people with disabilities.
Expert contacts and/or (scientific) documentation/sources/ pictures:	Mekong Creations - http://www.mekong-creations.org/products.html - and Craft Link - http://www.craftlink.com.vn • Water Hyacinth http://en.wikipedia.org/wiki/Water_hyacinth • Turning pest into profit: Utilization of Water Hyacinth. http://www.youtube.com/watch?v=IXwW6EM-2c8

Expert contacts and/or (scientific) documentation/sources/ pictures:	• Phnom Penh Post, 24 June 2011 Weeds weave new hope for village jobs. http://www.cam111.com/photonews/2011/06/23/104747.html • WWF Vietnam (year unknown). Livelihood study of WWF. Summary of key information.

III. RECOMMENDATIONS FOR IMPLEMENTATION IN THE ICAM PROJECT	
3. WHERE?	
Target location(s):	Both suitable for An Giang and Soc Trang provinces, given the abundance of Water Hyacinth in both provinces.
4. BY/WITH WHOM?	
Target community group(s):	• Land-poor HH (men and women), as only little land is needed. It might be implemented at smaller scale by land-less, if they can apply the techniques on communal/public access land. Alternatively, if land-less group together they could buy or lease land, if provided micro-loans. • Suitable for Khmer, as the above project involved Khmer.
CBOs:	• Local Women's Union members
Strategic partners:	• Women's Union • Handicraft organization (see proposed ideas above) • DARD
5. HOW?	
How to step-wise implement in Soc Trang or An Giang:	• Connect with a Handicraft Organization that has experience in how to make handicraft and furniture out of Water Hyacinth. • Select communes/HH to be involved • Together with the Handicraft Organization, establish a production unit to produce the handicrafts and select which handicrafts to focus on • Carry out training in the production of hyacinth products • Develop commercially viable products from the water hyacinth • Establish access local and international markets for the new products.
Inputs needed:	• See above example for details
Rough cost estimation	To be further researched
Role and involvement of strategic partners:	• Women's Union – first to get trained • Handicraft Organization will prepare training materials in how to produce handicrafts and/or furniture made from Water Hyacinth and help establish connection between the community HH and the market • Women's Union will provide access to micro loans and will also get trained in how to replicate the above training in additional communities.
Opportunities:	To be further researched

Barriers to implementation:	To be further researched

2. Ranking of proposed Climate-resilient Livelihoods Options as per Selection Criteria

These ratings and rankings are only estimates, because some information regarding the livelihoods was incomplete. This means some ratings and rankings may change slightly as information is added based on further research (e.g. financing for land-less, government assistance and civil society support for given livelihoods, market linkage, barriers). *(Matrix source: Tine Rossing)*

CATEGORIES	CRITERIA	ISSUES TO CONSIDER	RATING OF EACH CLIMATE RESILIENT LIVELIHOOD OPTION										
			1. Azolla	2. Mushroom	3. Onion ICM	4. Bio-Fertilizer	5. Worm composting	6. Floating garden	7. Duck & Fish	8. Eel raising	9. Mangroves nursery	10. Embroidery	11. Water Hyacinth
1st FILTER – SUSTAINABLE LIVELIHOODS-RELATED CRITERIA													
1. ECONOMIC COMPATIBILITY	**1. MARKET DEMAND & ACCESS**	What is the size of the market for the product or service? 0) None, 1) district, 2) province or 3) country, 4) global, 5) All = 2-5	4	5	5	3	3	2	3	5	3	5	5
		What is the growth rate of demand? 0) None, 1) low, 2) medium or 3) high.	3	3	2	3	3	2	2	3	3	2	3
		What level of market knowledge do HH/people have to serve the market (what, where, when, how, who)? 0) None, 1) low, 2) medium or 3) high.	0	1	3	1	1	2	2	2	0	1	0
		Rate other market access barriers preventing profitability (physical access, transport and other costs, middlemen, cartels)? 0) High, 1) Medium, 2) Low, 3) None.	1	2	2	2	2	2	2	2	2	2	2
		Would this livelihood option add to the overall livelihood **diversification** of the HHs? 1) No, 2) Yes	2	2	2	2	2	2	2	1	2	2	2
		total	10	13	14	11	11	10	11	13	10	12	12
	2. FINANCIAL INVESTMENT AND RISK	Are the necessary **public infrastructure/ resources** available for the poor HH to undertake this livelihood (water, power, water, roads, etc.)? 1) No, 2) Yes.	2	2	2	2	2	2	2	2	2	2	2

CATEGORIES	CRITERIA	ISSUES TO CONSIDER	RATING OF EACH CLIMATE RESILIENT LIVELIHOOD OPTION										
1. ECONOMIC COMPATIBILITY	**2. FINANCIAL INVESTMENT AND RISK**	Would the **land-less** be able to invest in this option with their own resources? 1) No, 2) Yes	1	1	1	1	1	2	1	1	1	2	2
		Would the **land-poor** be able to invest in this option with their own resources? 1) No, 2) Yes	2	2	2	2	2	2	2	1	1	2	2
		Could the average **land-less** HH access credit (loans) for this option? 1) No, 2) Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Could the average **land-poor** HH access credit (loans) for this option? 1) No, 2) Yes	2	2	2	2	2	2	2	2	2	2	2
		Is this livelihood vulnerable to major economic fluctuation (e.g. wild price fluctuations in inputs or outputs, currency fluctuations, etc.)? 1) Yes, 2) No	2	2	1	2	2	2	2	2	2	2	2
		Can inputs be obtained from **multiple** locations (local, regional etc.) (= reducing supplier risk)? 1) No, 2) Yes.	2	2	2	2	2	2	2	2	2	2	2
		Is the average HH **scale (size)** of production sufficient to produce the good or service with a profit? 1) No, 2) Yes	2	2	2	2	2	2	2	2	1	2	2
		total	13	13	12	13	12	14	13	12	11	14	14
	3. SKILLS AND TECHNOLOGY	Does the average poor HH have the necessary **technical skills** to carry out the livelihood competitively? 1) No, 2) Yes	1	1	1	1	2	2	2	1	1	1	1
		If no, are there affordable **training/ extension** opportunities available to provide necessary skills/ know-how? 1) No, 2) Yes	2	2	2	2	2	2	2	2	1	2	2
		total	3	3	3	3	4	4	4	3	2	3	3

CATEGORIES	CRITERIA	ISSUES TO CONSIDER	RATING OF EACH CLIMATE RESILIENT LIVELIHOOD OPTION										
2. INSTITUTIONAL COMPATIBILITY	**1. POLICIES & REGULATIONS**	Rate any **policy or regulatory barriers** to entering this livelihood (health & environmental regulations, business certification etc.)? 0) High, 1) Medium, 2) Low, 3) None	2	3	3	3	3	3	3	3	3	3	3
	2. FISCAL POLICY	Please rate any **fiscal barriers** to competing in this sector (taxes, duties, licenses). 0) High, 1) Medium, 2) Low, 3) None	3	3	3	3	3	3	3	3	3	3	3
	3. GOVERNMENT PROGRAM ASSISTANCE	Are there any **Govt/NGO programs** accessible to assist this livelihood? 1) No, 2) Yes.	2	NA	NA	NA	NA	2	NA	NA	1	NA	NA
	4. CIVIL SOCIETY & SOCIAL NETWORKS	Are there existing civil/social networks to support this livelihood option? 1) No 2) Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. SOCIO-CULTURAL COMPATIBILITY	**1. LOCAL/ INDIGENOUS KNOWLEDGE**	To what extent does the livelihood use existing **traditional/ local knowledge?** 0) None, 1) Low, 2) medium, or 3) high	3	1	2	0	1	2	2	0	0	3	1
	2. SUITABILITY FOR POOR PEOPLE	Are there any cultural/social barriers to **the average land-less HH** being involved in this livelihood? 1) Yes, 2) No.	2	2	2	2	2	2	2	2	2	2	2
	3. SUITABILITY FOR WOMEN	Is it culturally/ socially acceptable for **women** to be involved in this livelihood? 1) No, 2) Yes.	2	2	2	2	2	2	2	2	2	2	2
	4. SUITABILITY FOR ETHNIC WOMEN	Are there any social/cultural barriers to **ethnic minorities** involving in this livelihood? 1) Yes, 2) No.	2	2	2	2	2	2	2	2	2	2	2

CATEGORIES	CRITERIA	ISSUES TO CONSIDER	RATING OF EACH CLIMATE RESILIENT LIVELIHOOD OPTION										
	5. SUITABILITY FOR DISABLED	What level of physical ability is required to be involved in this livelihood (strength, mobility, endurance)? 1) High, 2) Medium, 3) Low	2	2	2	2	3	2	2	2	2	3	3
3. SOCIO-CULTURAL COMPATIBILITY	**6. LOCATION**	Can the livelihood be done **at home/ close to home?** 1) No, 2) Yes.	2	2	2	2	2	1	2	2	1	2	2
	7. OTHER	Are there any OTHER cultural/ social barriers to HH entering this livelihood? 1) Yes, 2) No.	2	2	2	2	2	1	2	2	2	2	2
2nd FILTER – CLIMATE CHANGE-RELATED CRITERIA													
4. CLIMATE COMPATIBILITY	**1. RESILIENCE TO *EXISTING* CLIMATE CHANGE AND IMPACTS**	Is the livelihood suitable to existing climate **conditions**? Please respond 1) No, 2) Yes											
		a. Temperature	2	2	2	2	2	2	2	2	2	2	2
		b. Precipitation (rain and snow)	2	2	2	2	2	2	2	2	2	2	2
		c. Winds/Storms	2	1	1	2	2	2	2	2	2	2	2
		Is the livelihood suitable to existing climate **impacts?** Please respond 1) No, 2) Yes.											
		a. Flooding	2	2	2	1	1	2	2	2	2	1	2
		b. Drought	1	1	1	2	2	1	1	1	1	2	2
		c. Sea water inundation	2	2	1	1	1	1	1	2	2	2	NA
		d. Saline Intrusion	2	2	2	1	1	1	1	2	2	2	NA
		total	13	12	11	11	11	11	11	13	13	13	10
	2. RESILIENCE TO *FUTURE* CLIMATE CHANGE AND IMPACTS	Is the livelihood suitable for **future** climate conditions? 1) No, 2) Yes											
		a. Temperature (hotter in dry season, more variable temp)	2	2	2	2	1	2	2	1	1	2	2
		b. Precipitation (more rain in wet season, less rain in dry season)	2	2	2	2	2	2	2	2	2	2	2
		c. Winds/Storms (More frequent/ intense storms)	2	1	2	2	2	2	2	2	2	2	2
		Is the livelihood suitable to future climate **impacts?** 1) No, 2) Yes.											
		a. Flooding	2	2	1	1	1	2	2	2	2	1	2

CATEGORIES	CRITERIA	ISSUES TO CONSIDER	RATING OF EACH CLIMATE RESILIENT LIVELIHOOD OPTION										
4. CLIMATE COMPATIBILITY	**2. RESILIENCE TO *FUTURE* CLIMATE CHANGE AND IMPACTS**	b. Drought	1	1	2	2	2	1	1	1	1	2	2
		c. Sea water inundation	2	2	1	1	1	1	1	2	2	1	2
		d. Saline Intrusion	2	2	2	1	1	1	1	2	2	1	2
		total	13	12	12	11	10	11	11	12	12	11	14
	3. CO2 EMISSION IMPACTS	What impact does the livelihood have on CO2 emissions? 1) Negative, 2) Neutral, 3) positive	3	2	3	3	3	2	2	2	3	2	3
5. ENVIRONM. COMPATIBILITY	**1. IMPACT ON WILD BIODIVERSITY/ ECOSYSTEMS**	What impact does the livelihood have on existing wild **biodiversity?** 1) Negative, 2) Neutral, 3) Positive.	3	2	2	2	2	3	2	2	3	2	3
	2. SUSTAINABLE RESOURCE USE	To what extent is the livelihood **compatible with sustainable local resource use?** 1) low, 2) medium or 3) high.	3	3	2	3	3	3	2	2	3	3	3
	3. SUSTAINABLE FOR ECOSYSTEMS SHIFTS	Is the livelihood **flexible enough** to affordably accommodate **future** ecosystem shifts (change in species, new pests, etc.) 1) No, 2) Yes	2	3	2	3	3	2	2	2	2	2	2
Total Score			87	84	81	78	79	80	78	79	77	86	86
Ranking (compared to other livelihood options)			**1**	**3**	**4**	**7**	**6**	**5**	**7**	**6**	**8**	**2**	**2**

3. Consultancy scope of work and work plan

The consultancy involved 20 days and was carried out as per the following 10-step process (see TOR for more details):

a. In consultation and agreement with ICAM staff, prepare a detailed work plan and methodology for the action research based on the TOR and the consultant's proposal.

b. Review project documentation and secondary information relevant for the research.

c. Based on the documentation review and after consultation with CARE in Vietnam and ICAM staff, project partners, technical departments within the local government of An Giang and Soc Trang, members of academic institutions (e.g. Can Tho University Dragon Institute), NGOs operating in the MDR, suggest a list of criteria to define or operationalise 'climate resilient livelihood'.

d. Through a one day meeting, facilitate discussion and agreement on the list of criteria for 'climate resilient livelihoods' amongst ICAM staff, ICAM partners, the local government and other relevant stakeholders in An Giang and Soc Trang.

e. Based on the agreed list of criteria and the results from previous project assessments like the CVCA, collect detailed technical information about potential climate resilient livelihood options (including information about gender roles and implications) for the An Giang and Soc Trang context and targeting the main project beneficiaries.

f. With participation of communities and relevant technical departments, undertake purposive field work in a selected number of villages in An Giang and Soc Trang to assess the feasibility of the selected livelihood options and jointly select the most appropriate options per target village and per vulnerable group .

g. Refine the information about the options and make a number of detailed recommendations for the effective planning, implementation and replication of each selected option in the project area

h. Submit a draft report in both English and Vietnamese.

i. Present the findings at a validation workshop.

j. Submit the final report in both English and Vietnamese and should incorporate CARE's feedback.

The consultant worked closely with CARE staff and project partners to carry out these steps in an iterative manner. In consultation and agreement with CARE, the team prepared a detailed work plan and methodology for the research based on the TOR and the local context.

Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Steps	STEP 1 – Develop work plan and methodology																			
	STEP 2 – Collect and review project documentation and secondary information																			
				STEP 3 – Develop and agree on criteria to define climate resilient livelihoods																
								STEP 4 – Interviews with CC, DRR and SLA Experts												
								STEP 5 – Field work to collect information on existing and potential livelihood options												
								STEP 6 – Interviews with Govt and mass organizations												
											STEP 7 - Identify and refine findings regarding options and recommendations for implementation and/or replication										
																	STEP 8 - Validation			
															STEP 9 – Preparation of Final Report					

4. List of key informants interviewed

Date of interview	Name	Institutional Affiliation	Department	Job title
July 15 2013	Mr. Le An Tuan (PhD)	Dragon Institute, Can Tho University	Research Institute for Climate Change	Vice Director
July 19 2013	Ms. Huynh Thi Tuyet Ai	An Phu Women's Union		Chairperson
July 22 2013	Mr. Le Van Si	An Phu DoNRE	Natural Resource Management sector	Specialist
	Mr. Truong Chi Thong	An Phu DARD	Agriculture Policy Sector sector	Deputy Director
July 23 2013	Mr. Ngo Van Thi Mr. Pham Van Loi	An Phu Farmer's Union		Co- Vice Chairpersons
July 24 2013	Ms. Nguyen Thi Liem	An Giang Women's Union	Education and Awareness raising Sector	Vice Chairperson
	Mr. Vo Thanh Xuan	An Giang DoNRE	Mineral and Water Management	Specialist
	Mr. Ha Minh Don	An Giang DARD	Financial and Planning Department	Head of Financial & Planning Department
	Ms. Nguyen Thi Ngoc Dung	An Giang Farmer's Union	Social - Economy Sector	Head of Social and Economy Sector
July 25 2013	Ms. Ly Thi Sam	Soc Trang Women's Union	Economic Sector	Vice Chairperson
	Mr. Trieu Cong Danh	Soc Trang DoNRE	In charge of water and mineral Management Weather forecast and climate change	Deputy Director
	Mr. Pham Chi Nguyen	Soc Trang Farmers' Union	Social - Economy Sector	Head of Social and Economy Sector
	Mr. Luu Viet Son (Mr. Trinh Hiep)	Soc Trang DARD	Financial and Planning Department	Head of Financial & Planning Department and Vice Head of FPD
	Mr. Hoang Dinh Quoc Vu	Vinh Chau DARD	Planning and Agriculture Sector	Specialist
	Mr. Nguyen Van Lam Mr. Vo Van Den	Vinh Chau DoNRE	Mineral and Water Management	Specialists
	Ms. Pham Thi Huong	Vinh Chau Women's Union		Chairperson
	Bianca Schlegel	GIZ	Management of Natural Resources in the Coastal Zone of Soc Trang Province	Technical Advisor
	Ms. Pham Thuy Duong	GIZ		Technical Officer
	Mr. Nguyen Anh Dung	GIZ		Technical Officer

July 30 2013	Ed Boydell	CARE Australia		Climate Change Advisor
	Tracy McDiarmid	CARE Australia		Disaster Risk Reduction & Resilience Advisor
July 31 2013	Mr. Try Suphearac	Watthan Artisans Cambodia / A.N.D. – Artisan designer		Director
	Alan Flux			Advisor, Training, Project Development And Marketing
	Jeremy Carew-Reid	International Centre for Environmental Management (ICEM)		Director
	Simon Tilleard	International Centre for Environmental Management (ICEM)		ICEM Project Manager for the Mekong ARCC Project
	Andrew Wyatt	IUCN Viet Nam	Mekong Delta Programme	Mekong Delta Programme Manager
August 5 2013	Ms. Nguyen Thi Yen	CARE International in Vietnam		Disaster Risk Reduction and Climate Change Manager
	Ms. Vu Minh Hai	Oxfam		Resilience Technical Advisor
	Ms. Nguyen Thi Dieu Hien	Oxfam		Ben Tre Project Coordinator
August 6 2013	Justin Alick	Australian Foundation for the Peoples of Asia and the Pacific (AFAP)		Program Officer
August 7 2013	Mr. Nguyen Viet Nghi	CARE International in Vietnam		
	Mirko Gomez Arias	CARE International in Timor Leste		CBA Project Manager

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Integrated Community-based Adaptation in the Mekong Project

In order to support vulnerable communities in the Mekong Delta Region adapt to the emerging climate change effects and improve their climate resilience, CARE International in Vietnam is implementing the *Integrated Community-based Adaptation in the Mekong* (ICAM) Project in five communes of An Phu district – An Giang province and Vinh Chau district – Soc Trang province, from August 2012 until June 2015. Funded by the Australian Department of Foreign Affairs and Trade, the project is specifically targeting the most vulnerable in the two target provinces such as poor women, landless, land-poor, ethnic minorities and other vulnerable groups through the following three expected outcomes:

- Communities and local authorities have improved capacity to undertake gender-sensitive analysis and planning for community-based adaptation and disaster risk reduction.
- Improved community resilience through the implementation of sustainable, community-level, integrated CBA and DRR interventions that benefit vulnerable people, particularly women.
- A strong evidence base and strengthened civil society provide a foundation for the scale up of community-based, equitable and gender-sensitive adaptation in the Mekong River Delta.

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