GROWING RESILIENCE

Adapting for climate change in upland Laos

MAIN REPORT

NORWEGIAN CHURCH AID

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by
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SUMMARY

This is a preliminary assessment of options for upland communities in NW Laos adapting to climate change. Is based on limited information and undertaken within a brief time span. The general conclusions are that climate change is occurring in NW Laos and it will continue to occur and become more pronounced in the future. Based on the information available it appears that overall for Laos annual average rainfall has been declining (-3.209 mm/year, total -160 mm) and temperature increasing (+0.0.017C/year, total +0.85C) for the last 50 years, but there is considerable variation in regional patterns of change. The details of what may occur, especially with respect to changes in rainfall and temperature, can only be very roughly forecast at the present time. Given many caveats, it appears that in NW Laos in the next 40 years the rainy season may shift to starting later in the year, there may be a small increase in total annual rainfall, average mean temperature appears likely to increase by about another 1-2C.

The key concepts proposed to guide adaptation are identifying and undertaking activities that increase resilience and decrease vulnerability of upland agroecosystems. This study identified five common elements of upland community agroecosystems: i) sloping dryland cultivation, ii) village forests, iii) valley bottom irrigated rice cultivation, iv) valley bottom dryland cultivation and v) large and small livestock. The first two elements are severely degraded and historically overexploited, the last three have great potential for increasing food supply and security and are currently being under utilised.

NCA could assist communities in achieving these complementary goals – increased resilience, decreased vulnerability by developing a strategy to support the development of integrated valley bottom farming systems (irrigated and dry), including integration of small livestock, and active revitalisation and protection of village forests. This would reduce pressure on already severely degraded sloping land, now used to grow very low yield rice (and maize) crops, and open the possibility for reducing erosion and restoring these landscapes through crop rotations and soil protection measures.

This approach offers the possibility of increasing the resilience of community agroecosystems so they can flexibly adapt to a changing climate, while at the same time reducing community vulnerability to self-inflicted and increasingly severe landscape degradation.

Achieving this over a 3-5 year period would require NCA changing the emphasis, rather than the direction, of it current activities, and making an investment in training a cadre of younger people to work with communities in introducing and implementing the changes noted above.

In parallel, and to support NCA's and other NGO/donor village development activities it is suggested that NCA consider: i) initiating establishment of a "Climate Adaptation Knowledge Network" to actively gather, process and disseminate information about climate change and adaptation approaches and methods; and ii) explore opportunities for collaborating with other NGOs/donors to design, fund and conduct the training courses mentioned above. This would serve to significantly reduce fixed costs per participant, strengthen cooperation between all stakeholders, and help to build a 'critical mass' of well-trained practitioners (mentors) to foster and guide the processes of climate adaptation and agroecosystem stewardship.

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1. INTRODUCTION

Anthropogenic CO2 emissions have been growing about four times faster since 2000 than during the previous decade, and despite efforts to curb emissions in a number of countries which are signatories of the Kyoto Protocol. Emissions from the combustion of fossil fuel and land use change reached the mark of 10 billion tonnes of carbon in 2007. Natural CO2 sinks are growing, but more slowly than atmospheric CO2, which has been growing at 2 ppm per year since 2000. This is 33% faster than during the previous 20 years. All of these changes characterize a carbon cycle that is generating stronger climate forcing and sooner than expected. (http://www.globalcarbonproject.org/carbonbudget/08/hl-full.htm)

The above is a brief summary of what is happening globally, a subtle but major change in the composition of Earth's atmosphere which will affect Lao upland communities, and people and ecosystems everywhere on Earth.

It is assumed that the reader is broadly familiar with the concept and fact of climate change, being caused by anthropogenic (human caused) emission of Green House Gases (GHG), primarily carbon dioxide (CO2). The rise in global GHG began during the 18th century and rapidly accelerated in the second part of the 20th century. The sources of the GHG being emitted into the atmosphere the combustion of carbon-rich fossil fuel for industrial processes and transport, deforestation and land and forest degradation, and the expansion of irrigated rice cultivation and livestock production. The great majority of the GHG have been emitted by the 'developed' countries of the global North, but in the last decade China, India and Brazil of the global South have become world-class emitters of GHG.

To-date the main contribution to GHG emissions from Laos and neighboring countries has been deforestation, a small but significant addition that may soon be added to through major emissions from lignite-burning power plants.

1.1 SUMMARY OF THE TERMS OF REFERENCE

The Terms of Reference (ToR) for the study require the following activities to be completed, in addition to the preparation and submission of a report plus supporting materials. The NCA commissioned this study and report to complement the strategy and programme of work in Laos already being undertaking (NCA 2007 & 2008), to determine what additional programme elements may be required and feasible for preparing for climate change.

- Review existing documents on climate change relevant to the Lao PDR, including the recently launched National Adaptation Program of Action for Climate Change and the National Self Assessment for Environmental Management.
- Conduct meetings with key stakeholders and organizations working on environment and climate change in Lao PDR.
- Develop methodologies and undertake a brief survey of the potential effects of climate change, vulnerabilities and integration of adaptation strategies among the communities with whom NCA is working in Bokeo and Luang Nam Tha provinces.
- Conduct meetings with key stakeholders in Bokeo and Luang Nam Tha provinces.

- Make recommendations with a focus on enhancement of the adaptive capacity of communities working with NCA and the integration of adaptation strategies in future programmes.
- Make recommendations on potential pilot activities for new programme interventions.
- Participate in a review meeting with NCA Vientiane staff on the draft consultancy report.
- In conjunction with NCA staff, facilitate a workshop for key government counterparts focused on addressing 'knowledge gaps' identified by the study.

1.2 STRUCTURE OF THE REPORT

The following chapter provides an introduction to the key concepts used to define the proposed approach to climate adaption: increasing resilience and decreasing vulnerability. This is followed by a summary of the approach and methods used in the study. Chapter 3 focuses on the climate changes that have already occurred in Laos during the past 50 years, those that are expected in the coming decades and their likely effects on agriculture.

Chapter 4 presents a brief survey of approach to adaptation in the context of rural (upland) communities and rural development. This is followed by a summary of the recently completed Laos National Adaptation Plan of Action, prepared by GoL with the assistance of UNDP. The human ecology of the Lao upland is the main focus of Chapter 5, including a more details discussion of the current and possible future situations in Long and Pha Oudom districts. This chapter also summarises the findings of field work discussions with villages in these two districts regarding climate changes, seen through their eyes. The latter part of the chapter analyses the agroecological situation in the two districts, and then describes the five elements of their agroecological systems.

Chapter 6 analyses the broader factors affecting adaptation upland for communities, including: population growth, shortening fallow periods, soil erosion and nutrient loss, and lack of a cash economy. The second part of the chapter explores some strategic perspectives for each of the two villages, and discusses some 'possible futures'. The options for adaptation in NCA project communities are the focus of Chapter 7. This discussion identifies the main issues that need to be taken into consideration, including: scales and time frames, potential and caveats, agroecosystem planning, and the changing agricultural calendar. The latter part of the chapter is devoted to discussing how upland agroecosystems could be improved, with NCA assisting the communities through use of improved skills and practical knowledge.

Chapter 8 presents a preliminary assessment of NCA capacity building needs, proposing some fundamental principles and a generic approach for training a cadre of young mentors to guide and assist the proposed improvements in community agroecosystems. Chapter 9 provides a discussion of cross-cutting issues such as establishing a adaptation knowledge network, the need for improved information gathering for planning and monitoring, and very briefly overviews the study's conclusions and recommendations.

2. STUDY APPROACH AND METHODOLOGY

2.1 INTRODUCTION

In addition to a desk study on climate science and the current state of knowledge regarding climate change, a conceptual framework was developed to guide conducting the study and preparation of the report. The title of the report "Growing Resilience" reflects the importance of increasing upland communities' social and agroecological resilience as the main pathway for adaptation. Reducing community vulnerability to the vagaries of climate change – primarily more unpredictable and changing seasonal patterns of rainfall and increase in temperatures.

2.2 RESILIENCE AND VULNERABILITY

These are two key terms regarding the human ecology of upland communities in NW Laos. There is little doubt that these communities, despite their longevity, are increasingly vulnerable to the effects of all kinds of external social, economic and environmental forces. Some of these are slow acting, e.g. population growth and climate change, while some of them occur much more quickly, e.g. successive years of poor or unseasonal rainfall, the arrival of the 'rubber economy', in LNT and other provinces.

From the perspective of NCA, the communities they are working with and local governments, the current aim of the current assistance provided by NCA and others could be described as supporting activities that to increase resilience and decrease risks arising from vulnerability – even though it is not being undertaken with climate adaptation in mind. These two concepts – resilience and vulnerability - are related, but different.

Resilience is defined as:
"the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a different set of processes. A resilient [agro]ecosystem can withstand shocks and rebuild itself when necessary. Resilience in social systems has the added capacity of humans to anticipate and plan for the future."[1]

The challenge for these communities, with assistance from NCA and others, is to identify, plan and implement ways of increasing their resilience to climate change, without at the same time undermining the traditional socio-cultural basis of their communities. It needs to be recognised that achieving this without further affecting their traditions, already greatly changed by the 'closing of the frontier' for slash-and-burn and the eradication of large-scale opium cultivation and trade, may not be possible. The key will be finding ways to provide members of these communities, especially the younger generation, with adequate practical knowledge and skills for them to make informed choices about the direction and rate of changes needed to adapt their livelihoods.

A system - in this case the human ecological system of upland communities - is vulnerable to change if its current arrangements and management systems cannot flexibly adapt to externally driven change. Their vulnerability is therefore based in the history of the system and the direction of change. Their adaptive capacity is the ability of actors within a human ecological system (communities and external supporters) to increase the resilience of their livelihood systems. For example, given a decrease in weather predictability due to climate change, their adaptive capacity will determine the ability of these communities to change their agricultural, economic and other systems to cope with these inevitable changes.

2.3 APPROACH AND METHODS

Two main approaches have been used for the study. First, a desk and Internet study of the most recent finding regarding climate change and its potential effects. This includes a summary of global finding, and more specific information on SE Asia and Indochina, including Laos. During the latter part of

1 Wikipedia (http://en.wikipedia.org/wiki/Resilience_%28ecology%29), accessed 20 October 2009.

Photo: Jim Holmes/NCA Laos

this study we were fortunate to discover a source that provided long-term (1951-2001) for rainfall and temperature data for Laos and projections of changes in these key variables to mid-century.[2]

Second, field visits to a sample of the villages in Long District, Luang Nam Tha, and Pha Oudom District, Bokeo. The field work consisted of discussions with the leaders of the villages visited, similar discussions with government officials at district level, and broader discussions with staff from NGOs working in the province/distinct. Extended and detailed discussions were conducted with NCA field staff working on the project.

Much of the most recent information about climate change and mitigation and adaptation options and activities is available on the Internet. However, the volume of information is so vast that making good use of this information can be time consuming and often confusing. A degree of specialised knowledge about environmental and natural resource management, climate science and, in the case of dealing with changes in the livelihoods of rural communities, of agroecosystems and human ecology is essential. To make relevant information more accessible to non-specialist, a DVD with a selection of the material from the sources consulted was compiled as part of this report.

2 A parallel study sponsored by GTZ and conducted by CIAT is being undertaken on climate change in 4 provinces in Laos, including LNT. The results of this study will be available shortly after this NCA study has been completed. There have been useful discussions between the two studied, and it is fair to say there is broad agreement on the independently formulated conclusions and recommendations that have been reached.

3. LAOS - CLIMATE CHANGE PATTERNS AND PROJECTIONS

It is clear that limiting warming to 2ºC is beyond us; the question now is whether we can limit warming to 4ºC. The conclusion that, even if we act promptly and resolutely, the world is on a path to reach 650 ppm and associated warming of 4°C is almost too frightening to accept. Yet that is the reluctant conclusion of the world's leading climate scientists. Even with the most optimistic set of assumptions—the ending of deforestation, a halving of emissions associated with food production, global emissions peaking in 2020 and then falling by 3 per cent a year for a few decades—we have no chance of preventing emissions rising well above a number of critical tipping points that will spark uncontrollable climate change. (Hamilton 2009)

3.1 INTRODUCTION

This chapter focuses on the historical and anticipated changes in Laos' climate.

In 900 AD the vast and sophisticated Maya civilization, located in what is now Guatemala in Central America collapsed and vanished. The reasons for this sudden collapse have been the topic of research and discussion ever since the ruins were discovered. A recent paper (Coulter 2009), using advanced remote sensing and analysis techniques, has concluded that extensive deforestation declining rainfall and rising temperatures were the direct cause of the collapse. They concluded that: "Loss of all the trees caused a 3-5[C] degree rise in temperature and a 20-30 percent decrease in rainfall."

This is not dissimilar to the situation occurring with the loss of forest in the uplands of Laos, both in the north and south, plus loss of the continuing lowland forests in the south. The analysis also needs to take into account the almost complete loss of forests in the northern part of Thailand during this period, and the continuing devastation of forests in neighbouring Vietnam and Cambodia.

It is possible to hypothesise that the declines in rainfall and increases in temperature already being experienced in Laos are the result of two factors, one global the other local. Global temperature increases, now averaging about 1C, have been widely documented, and affect all of the countries in the SE Asia region. The declines in local rainfall have been less widely discussed, but it is apparent from the historical data that this has and is occurring in Laos. The rapid destruction of about half of Laos' forests (and especially those of Thailand) in the last 50 years may be an additive, contributing factor that is partly responsible for the continuing decline in rainfall, the changes in season rainfall patterns and rising temperatures.

3.2 CLIMATE CHANGE BACKGROUND

The first suspicion that human activities may have been changing the climate arose in 1896 when the Swedish chemist Svante Arrhenius recognised the role of CO2 in the climate. These ideas started to be framed as testable, scientific hypotheses that linked observations about changes in temperature, precipitation and seasonal patterns to changes in the composition of atmospheric gases, specifically

CO2 from burning fossil fuels (coals, oil, gas). More broadly, during this period scientific understanding of the processes at work in the atmosphere and oceans was increasing rapidly, as more and better quality observational data was collected through use of new observational methods, measurement technologies, mathematical tools and, exponentially by the 1970s, vastly more powerful computer hardware managed by ever more sophisticated software – with computing power doubling every 18 months.

3.3 HISTORICAL AND ANTICIPATED CLIMATE CHANGES IN LAOS

Recently an analysis of country-by-country climate data has become available on the website Climate Wizard (www.climatewisad.org).[3] This provides access to 50-km gridded rainfall and temperature data, rates of change for these variables annually and seasonally, for the period 1951-2001. In addition, it provides 50-km gridded maps of these forecasts of these variables for the period 2014-60, based on the IPCC's "A2" scenario; and will soon do so for the period to 2100.

It should be noted that the IPCC A2 scenario is not the most extreme of the family of scenarios they developed. The most extreme scenario "A1FI" (fossil fuel intensive) is based on GHG emissions rising more quickly and being reduced more slowly that the A21 scenario. In the last year it has become apparent that the A1FI scenario is much closer to the pattern of rapidly rising (about 3% p.a., twice as fast as emissions during the 1990s) GHG emission that has been occurring since 2000. Hence, the changes that the A2 scenario forecasts are markedly less severe than those for the A1FI scenario. Hence the rainfall and temperature changes provided by the Climate Wizard website underestimate the scale and rapidity of the changes occurring in the climate.

3.3.1 Changes in Rainfall and Temperature 1951-2001

The rainfall and temperature data in Figure 1 and Figure 2 show that, despite wide year-on-year fluctuations, average annual and seasonal rainfall has been declining in Laos for the last 50 years, while at the same time average annual and seasonal mean temperatures have been rising. (The Blue line is the 5-year moving average, the Red line the regression equation.)

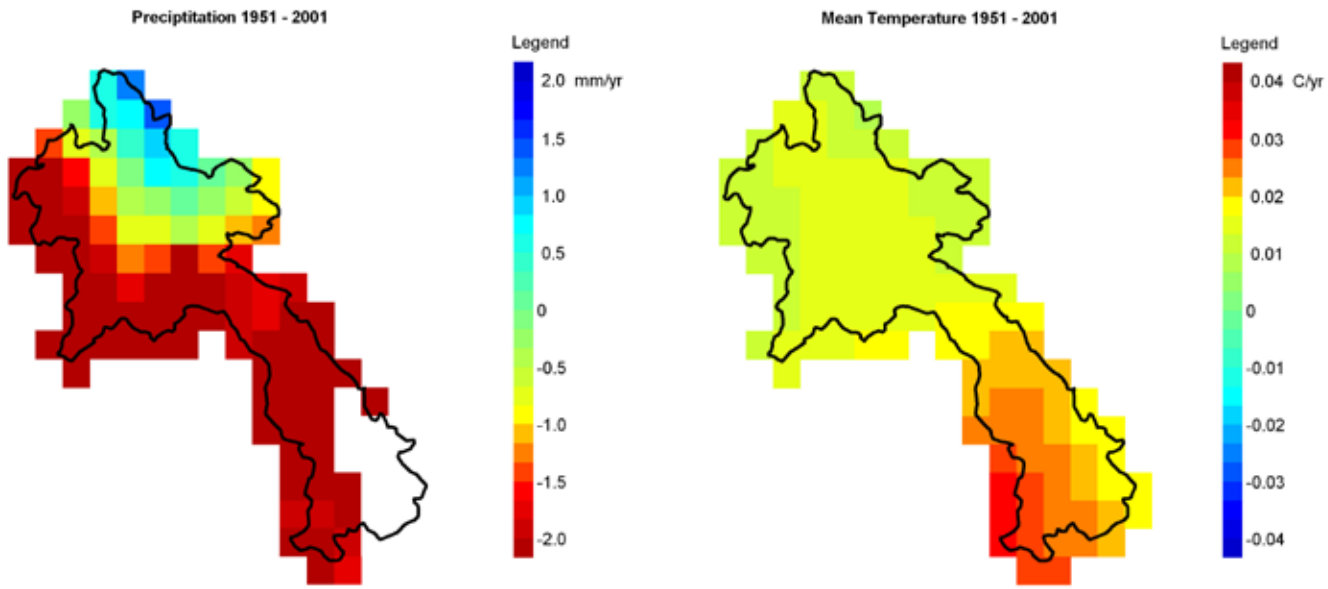
From the perspective of NW Laos, the most significant change is the decline in rainfall during this period. The graphs show that average annual rainfall in Laos has declined by -3.209 mm/year for a total of 160 mm during the last 50 years. During this same period the mean temperature has risen slightly, by an average of 0.017C/year for a total on 0.85C.

The seasonal changes in rainfall are of more significance for NW Laos, as these show that there has been an average decline of about -1.239 mm/year, i.e. of -62 mm by 2001 during the critical planting season of June, July and August (Figure 3 and Figure 4).

The data shows climate change is already steadily affecting Laos. From the perspective of farm communities the most serious declines in rainfall are occurring at planting time and afterwards, the most critical time of the year for upland dryland cultivation.

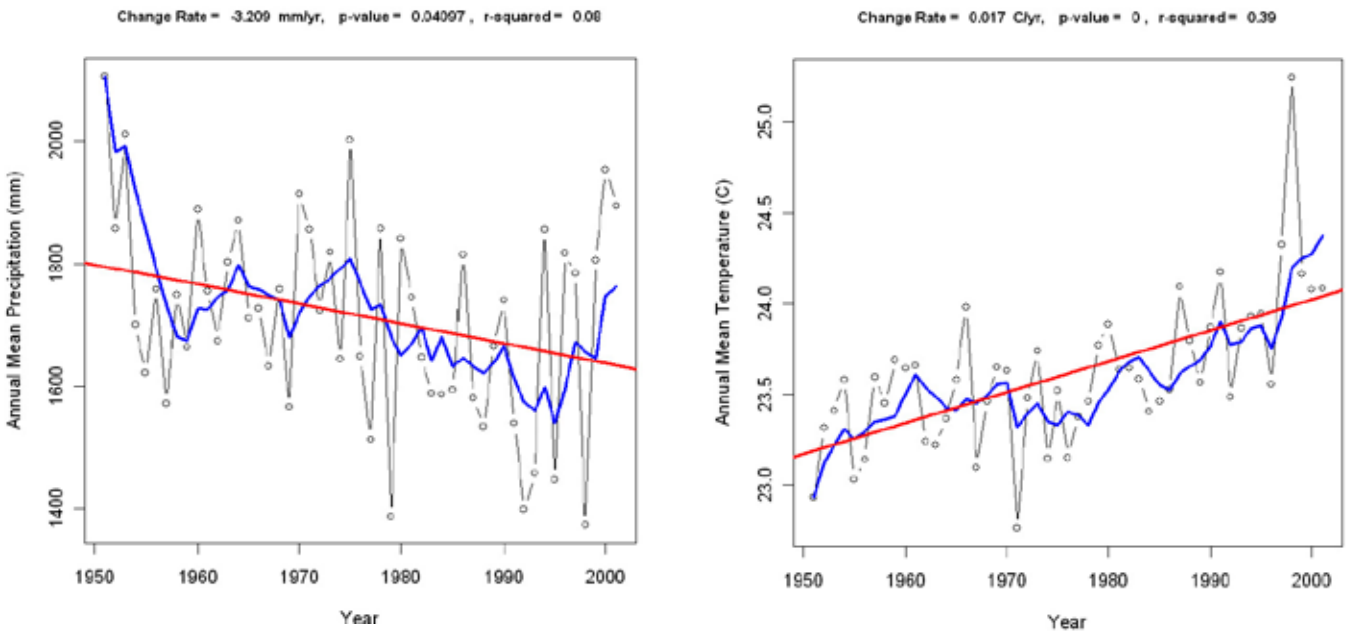
3 Established and operated by the Nature Conservancy (TNC) in conjunction with the Universities of Washington and Southern Mississippi.

Figure 1: Laos – Maps of Change in Annual Rainfall and Temperature 1951-2001



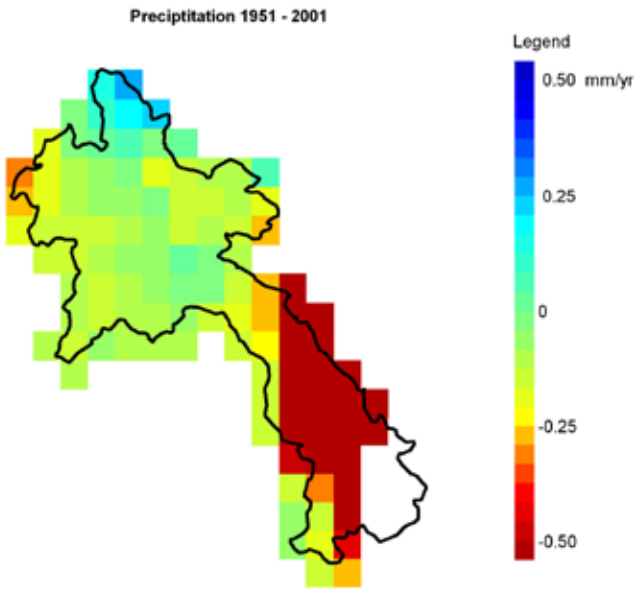
Change Annual Mean Rainfall 1951-2001 Change Annual Mean Temp. 1951-2001
Source: for this and following maps and graphs - Climate Wizard - http://climatewizard.org/

Figure 2: Laos – Graphs of Change in Annual Rainfall and Temperature 1951-2001

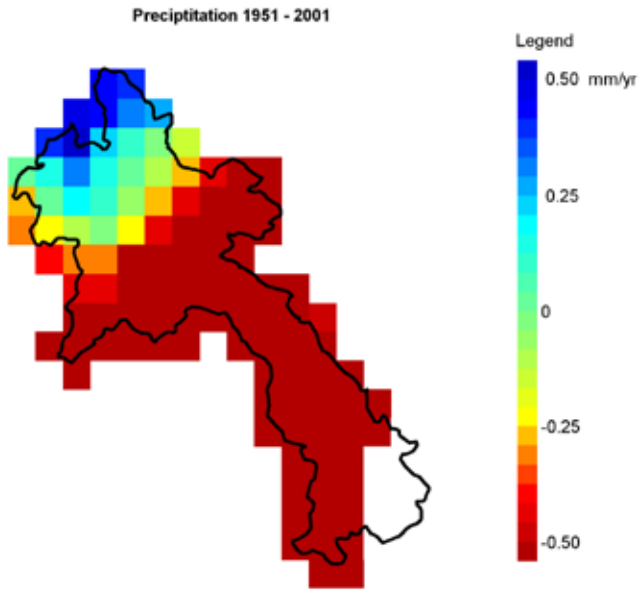


Change Annual Mean Rainfall 1951-2001 Change Annual Mean Temp. 1951-2001
-3.209 mm/year = -160 mm +0.017 C/year = +0.85C

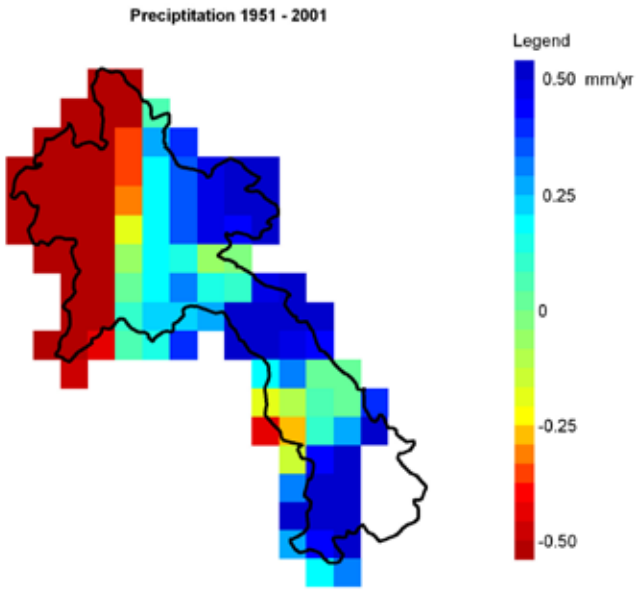
Figure 3: Laos – Map of Changes in Average Seasonal Rainfall – 1951-2001



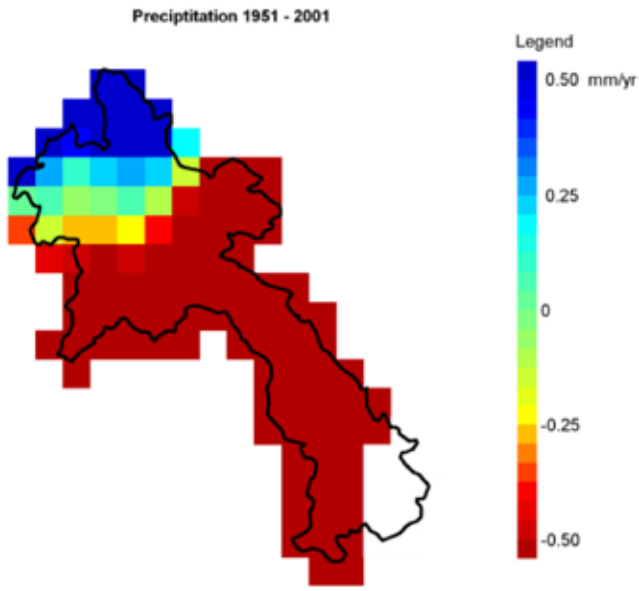
Dec-Jan-Feb



Mar-Apr-May

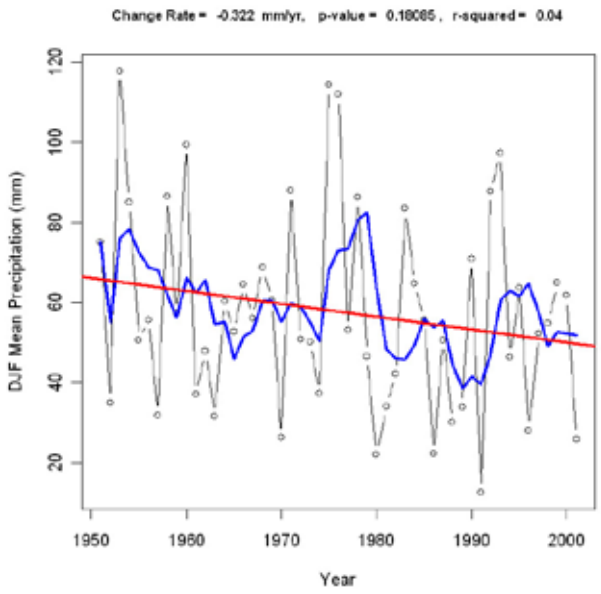


Jun-Jul-Aug

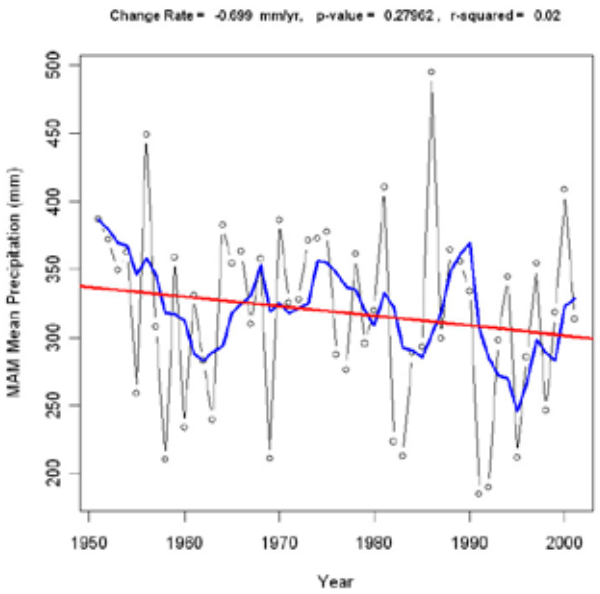


Sep-Oct-Nov

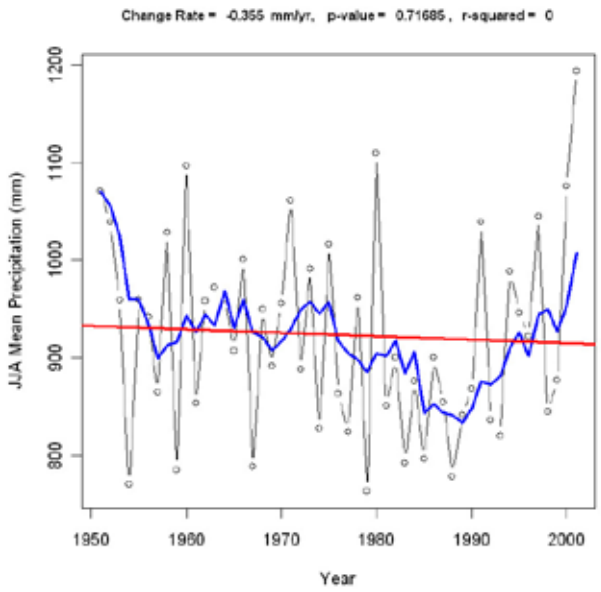
Figure 4: Laos –Graph of Changes in Average Seasonal Rainfall – 1951-2001



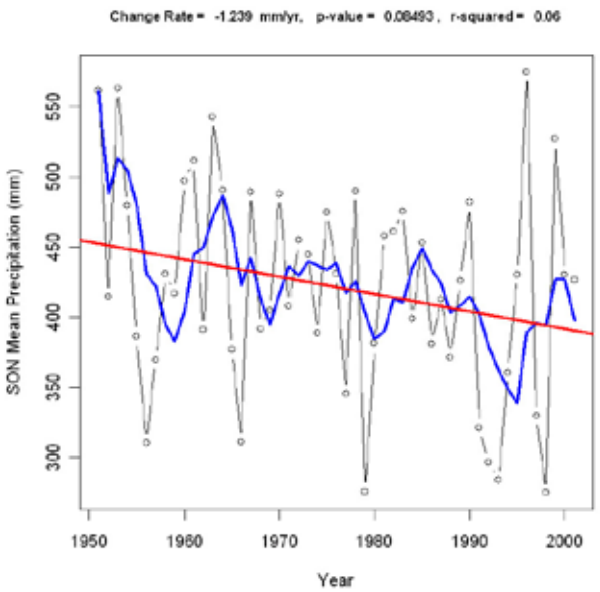
Dec-Jan-Feb



Mar-Apr-May



Jun-Jul-Aug



Sep-Oct-Nov

3.3.2 Future Changes in Rainfall and Temperature

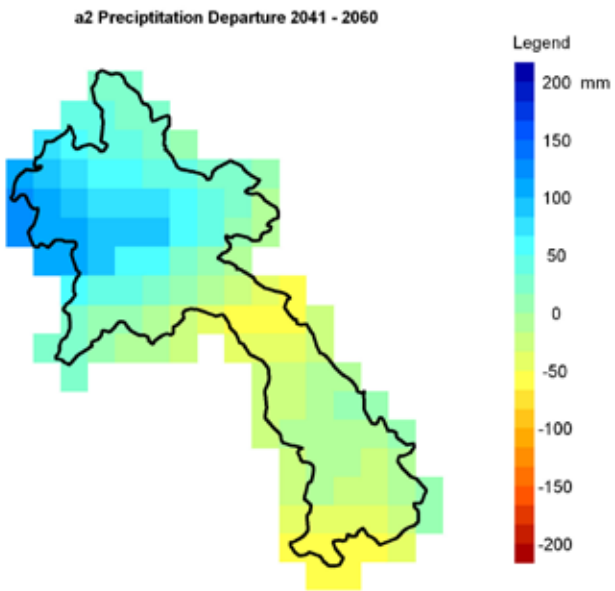
For the future the pattern of changes is expected to continue. The results illustrated below are based on one of the family of scenarios developed by the IPCC for the Fourth Assessment Report (AR4), which uses data on GHG emission up to about the year 2000, and based on these data scenarios of how the 'pathway' of changes in GHG emissions may evolve in the coming 20-100 years. Data on emissions for the period 2000-07 shows that GHG emission have been increasing faster that the highest scenario used in the IPCC models (Anderson & Bows 2008). Consequently, we can anticipate that change in patterns of rainfall and temperature will also likely occur *more rapidly* than the IPCC predicted.

The analysis of rainfall and temperature changes for the future is based on the IPCC's AR4 A2 scenario. This shows that rainfall patterns (annual and seasonal) are likely to become more varied by 2041-60 with mean temperatures continuing to rise. These are illustrated below in Figure 5.

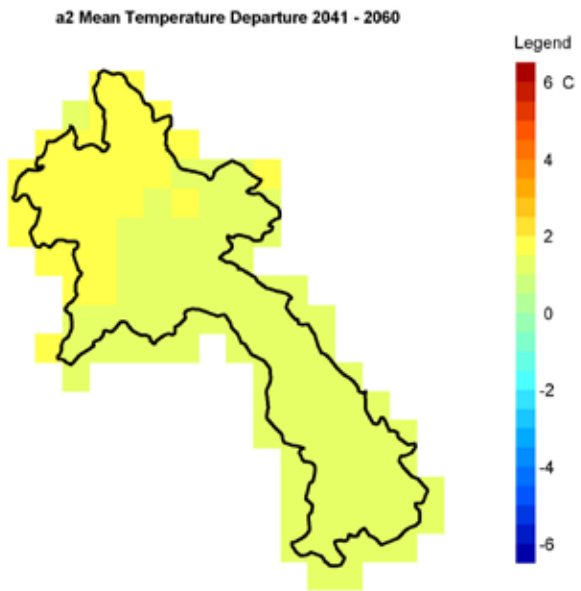
The good news is that rainfall in NW Laos may begin to increase in the coming decades. However, the seasonal maps studied suggest the increase in rainfall at the time of the current rice planting season (June) will be modest, with much heavier rain in the period September-November, which is also likely to be slightly warmer than at present.[4]

The maps provide a broad illustration that it is anticipated that rainfall and temperature will both increase somewhat in NW Laos by mid-century. However, the models suggest there will be marked differences in the degree of change for different regions of Laos and important seasonal differences. These forecasts should be interpreted with caution. It is likely that both the reliability and resolution of the models used to prepare these forecasts will improve rapidly in the coming few years.

Figure 5: Laos – Forecast Changes in Annual Rainfall and Temperature 2041-60



Forecast Average Rainfall Change 2041-60



Forecast Mean Temperature Change 2041-60

4 This has major implications for the agricultural cycle, one being that it may be advisable to plant rice slightly later (to take advantage of the rain) but use shorter duration varieties to avoid the heavier rain later in the year. These are discussed in Chapter 7.

4. FRAMEWORKS FOR ADAPTATION

4.1 INTRODUCTION

This chapter very briefly surveys approaches to climate adaptation, pointing to the need for approaches and methods for (upland) rural communities to be based on now well understood and accepted principles of participatory community engagement. It then summarises the recently completed National Adaption Programme of Action (NAPA) for Laos that was funded by UNDP.

4.2 BRIEF SURVEY OF APPROACHES

Approaches and methods for adapting to the effects of climate change are at an early stage of development. Moreover, the effects of climate change range from the sudden and dramatic – typhoons and flooding – to the slow and insidious – decadal changes in seasonal patterns of rainfall and temperatures. Further, the existing socio-technical capacity to analyse, plan and implement adaptation actions varies greatly.

For situations where the effects of climate change are dramatic and affect built-up areas with large populations and complex infrastructure, the approach generally involves a mixture of programmes to increase residents' awareness, put in place emergency response systems (for flooding, storms, etc.), steadily change zoning systems to move people, infrastructure and services away from vulnerable areas, and change building and related codes to make all structures and infrastructure less vulnerable. Where large scale inundation of important agricultural areas, due to sea level rises and the effects of more severe storms are anticipated, the approach is more complex, time consuming and expensive, and it is still unclear what will be feasible. These above two situations are both relevant for Vietnam: the central coast and the Mekong delta.

Although what needs to be done to achieve adaptation in these kinds of situations is already broadly understood, it will nevertheless be some years before the social, environment, organisational and economic aspects are more fully understood and a range of implementation, operational and management protocols established. Fortunately, significant organisational, technical and economic resources are available to undertake these activities, although they will nevertheless place a considerable additional burdens on the societies and economies concerned.

The same is not the case for the diverse agroecosystems that make up the majority of the food production systems in Asia. These systems are spread out across the landscape of each country – not concentrated in a city or a delta – and, generally, the effects of climate change will be slow and insidious. 'Natural' disasters – i.e. those not experienced before or of greater than historical severity – will punctuate the accumulating gradual effects and add disaster preparedness, management and recovery, to the challenges of adaptation. and the more remote the agroecosystem in question.

For high-energy, high-tech industrialised agricultural systems, of both the North and the South, considerable resources are already being deployed to assist in adaptation, e.g. breeding of new crop cultivars more tolerant of higher temperatures or drought stress, and a range of economic instruments made available to assist farmers, especially agribusinesses. For these systems the main adaptation challenges may well have more to do with disruption of timely delivery of inputs (fuel, seeds, chemicals) and outputs (transport delays), and increases in costs for these. However, because of the critical nature of ensuring uninterrupted supplies of food and other inputs for high density urban-industrial areas/ complexes, strong political pressure, plus ready access to technical and managerial resources, will almost certainly ensure that necessary resources are more-or-less available for designing and implementing adaptation programmes.[5]

5 At or above 3C increase in current temperatures the growth and yield of many important cereal crops declines sharply (Lynas 2007). If global average temperatures exceed 3C, or if large areas of industrial agriculture appear to be likely to experience 3+C increases, then additional efforts will be required to maintain production. The possible means for achieving this, aside from breeding heat-tolerant and drought-stress varieties, are not at all clear.

The situation for remote upland agricultural communities and agroecosystems is completely different. These communities are historically marginalised politically and socially, and virtually no research is directed to addressing their needs for new or improved crop or livestock varieties, agricultural extension services are ineffective to non-existent. All of these issues are commonly compounded by cultural and language difficulties, and further compounded by remoteness and difficult access, with many communities not accessible, even with 4WD vehicles, for long periods during the rainy season.

In brief – further details are contained in Chapter 7 – climate adaptation options for upland communities, like those in Laos, will of necessity be largely limited to changes and innovations based on the limited resources they currently have available. It is unlikely that national governments will have the resources and willingness, given already overstrained budgets and lack of technical resources, to be in a position to provide much assistance. While there will be some (modest) assistance from external sources, probably NGOs in the main, these communities are not likely to be accorded the priority, or financial and technical resources, on a scale that will be generally be made available for urban-industrial areas or industrial agriculture.

Hence, adaptation strategies for these communities will need to focus on what can be achieved with 'weightless' forms of long-term support, that is by providing information, training and mobilising community efforts. Moreover, given the relatively slow pace of climate change, this support will need to be programmed over several decades and, hence, need to take into account preparing and educating the children and grandchildren of today's adults to carry on the tasks of adaptation.

A consistent theme running through the limited amount of literature currently available on adaptation for (remote) rural communities in the South is that full engagement of the community in all aspects of the process is critical.[6] This engagement needs to go well beyond the lip service commonly accorded to 'community consultation' or 'community participation' by governments and donors, and requires, indeed demands, that effective means be found to achieve and maintain such engagement. This is especially important, as lack of supporting resources – other than those that are 'weightless' - is likely to be a central feature of adaptation for upland communities.

4.3 LAOS – NATIONAL ADAPTION PROGRAMME OF ACTION (NAPA)

Two key actions were initiated in late 2007 at COP 13 in Bali, Indonesia, these were designed to address critical issues ahead of the negotiations leading up to post-Kyoto negotiations to be conducted in the years prior to 2012.

The first was the decision to establish a fund and provide technical support for the preparation of National Adaptation Programme of Action (NAPA), with funding support to the least developed countries such as Laos. The second was the funding and technical support for trialing (demonstration) mitigation activities for REDD (reduced emissions from deforestation and degradation) in countries like Laos with significant areas of remaining forests.[7]

The main objective of the NAPA is to develop a country driven program to address immediate and urgent needs related to current and projected adverse effects of climate change in key sectors.

4.3.1 Laos – National Adaption Programme of Action

The NAPA process includes analysis of climate change and computer modeling of temperature and precipitation scenarios for the future, followed by identification of national-level policy and activity priorities. It emphasised that these are only outlines of possible priority activities, and the

6 See Douma, A. & Hirsch, D. (2007), especially Chapters 5 and 6 for a summary of the arguments.

7 Preparations for REDD demonstration activities have commenced in Laos, under the sponsorship of GTZ/KfW, World Bank and AusAID.

planning, time frames and budgets are at the level of 'guesstimates.' Ideally, this is the first step in preparing more detailed policies and activity plans, examples of which can be seen on the UNFCCC NAPA Project Database website.

The conclusions of the NAPA preparation process for Laos are that:

- The key sectors identified by Lao PDR are *agriculture, forestry, water and water resources, and human health*. (NAPA p. 8) (italics added)

The aim is that NAPA will provide a preliminary cross-cutting approach to climate adaptation activities, and will be embedded in national development policies and strategies for multiple sectors, including the:

- National Environment Strategy/National Environmental Action Plan (NES/NEAP),
- National Biodiversity Strategy to 2020 and Action Plan to 2010 (NBSAP),
- National Growth Poverty Eradication Strategy (NGPES),
- National Forestry Strategy and Integrated Agriculture Development Strategy, and
- Sixth National Socio-Economic Development Plan (NSEDP) from 2006-2010. (ibid)

4.3.2 Probable Effects of Climate Change To-date

The key changes noted in the report are:

- **Droughts**. According to data and statistics from the Department of Meteorology and Hydrology (DMH), from 1995–2005 drought conditions were characterized by higher and irregular increases in temperature.
- **Floods**. The water level reached in Vientiane on the 15 August 2008 was the highest recorded since records began in 1913. At 13.7 m above the gauge datum, it was 1 m more than the maximum levels achieved in 1966, 1971 and 2002.
- **Rice Yields**. The climate change from the CCAM climate model shows slight negative impact on the rain-fed rice productivity in Lao PDR. The simulated yield of rice productivity in Savannakhet Province would reduce by 10 percent under the simulated CO2 concentration of 540 ppm.
- **Extreme Events.** Based on farmer interviews carried in both Thailand and Lao PDR, extreme climatic events may cause a loss of rice productivity, for example, ranging 30-50 percent during a moderate flood year.
- **Health**. Therefore, if serious flooding events increase due to climate change, Lao is likely to experience an increase in both occurrence and deaths due to mainly stagnant water related, mosquito borne diseases.

Historically, the great majority of the damage from floods and droughts have occurred in central and southern Laos, according to the NAPA report (p. 24-6), with the northern provinces suffering much less. However, the relatively lower levels of damage reported may have due to other factors, e.g. remoteness and difficulty of communication with many areas in the north until the last 5-10 years.[8]

4.3.3 Possible Future Effects of Climate Change

The NAPA used climate forecasts prepared by SEA START to estimate climatic conditions with increasing levels of CO2, summarised as follows:

- Hot days, defined as the number of days with a maximum temperature over 33ºC, will increase by 2-3 weeks and the cool days, which are defined as days with a minimum temperature under 15ºC, will be reduced by 2-3 weeks throughout the region ... The summer time or dry season in the Mekong Region will be significantly longer in the future.
- The simulation results also reveal a trend of increasing precipitation from 10-30 percent throughout the region under future climate condition at CO2 concentration of 540ppm and 720ppm, especially in the eastern and southern part of Lao PDR. [9] [10]

8 It should be noted that the NAPA report did not make use of the more up-to-date results of the 2008 CSIRO study and, consequently, the IPCC AR4 climate change models and scenarios.

4.3.4 Selection of Priority Activities

The key sectors, as previously noted, identified in the NAPA report are Agriculture, Forestry, Water and Water Resources.

The NAPA guidelines (Sustainable and Cost Effective Development), were used in the study to facilitate the identification of four criteria for selecting climate change adaptation activities:

- Must deal with a variety of degrees of severity of impacts from climate change;
- Contribute to poverty reduction;
- Linkages with other Multilateral Environmental Agreements; and
- High value for economy and society.

The Lao NAPA team arrived at a longer list of ten criteria for selecting activities, not all of which appear to be closely related to reducing vulnerability or increasing the effectiveness of adaptation activities.

The criteria selected by the Lao NAPA Team are:

- Loss of lives and livelihood security
- Human health
- Food security and agriculture
- Availability of potable water for using and drinking (both volume and quality)
- Infrastructure development
- Cultural, historical and natural heritage
- Sustainable use and conservation of biodiversity
- Land use and forest protection (reduce and eradicate shifting cultivation by 2010)
- Other environmental amenities
- Administrative and personnel capacity building

These were used by the study to identify a total of 45 potential priority proposals, which were screened to arrive at twelve "Priority" proposals:

Agriculture

1. Strengthen the capacity of the National Disaster Management Committees.
2. Promote Secondary Professions in order to Improve the Livelihoods of Farmers Affected by Natural Disasters Induced by Climate Change

Forestry

3. Continue the Slash and Burn Eradication Program and Permanent Job Creation Program.
4. Strengthen the Capacity pf Village Forestry Volunteers in Forest Planting, Caring and Management as well as the Use of Village Forests.

Water and Water Resources

5. Awareness Raising on Water and Water Resource Management
6. Mapping of Flood Prone Areas
7. Establish an Early Warning System for Flood and Flood Prone Areas, and Improve and Expand Meteorology and Hydrological Networks and Weather Monitoring Systems.
8. Strengthen Institutional And Human Resource Capacities Related to Water and Water Resources Management.
9. Survey Underground Water Sources in Drought Prone Areas.
10. Study, Design and Build Multi-Use Reservoirs in Drought Prone Areas.

Health

11. Improve Systems for the Sustainable Use of Drinking Water and Sanitation with Community Participation in Flood and Drought Prone Areas.
12. Improve Knowledge and Skills of Engineers Who Design and Build Water and Sanitation Systems.

9 Almost every watershed has higher discharge under the climatic condition of CO2 concentration increased to 540 ppm, increasing further at 720 ppm CO2. In the dry year scenarios, many sub-basins have slightly less water under a CO2 concentration of 540 ppm, while discharge increases at a CO2 concentration of 720 ppm. (NAPA p. 27).

10 These results are very similar to those obtained by a parallel study (Varis et al 2009), in summary "The results from the climate change scenarios indicate that the Mekong Region will in the future become slightly warmer, but the duration of warm periods will extend much longer and cover much wider areas than currently. The rainfall estimates show fluctuation in the first half of this century, but then increasing trend during the latter half of the century. This increasing trend results from increasing rainfall intensity, as the length of the rainy season is estimated to be more or less the same than currently."

Photo: Jim Holmes/NCA Laos

A considerable amount of work, and technical and funding support, will be required to review the validity of these potential projects, gain official confirmation for projects to be designed, and then prepare detailed plans, schedules and budgets. Even when this work has been completed, which may well take one to two years, the result will still be a top-down approach to climate adaptation. While this approach may possibly be integrated with the range of national–level policies and strategies noted above, it will still not be ready for effective implementation at district and community level – a process which may take another few years to complete.

Hence, given the time delays involved in a top-down approach, it would be wise for organisations like NCA, focused on work at the district and community level, to commence preparing a bottom-up approach to adaptation. In general, this would be geared to specific local situations and needs, be based on extended local consultations so as to gain strong local support and be sufficiently flexible to selectively collaborate (at a later date) with a possible national top-down approach.

5. OVERVIEW OF THE HUMAN ECOLOGY OF THE UPLAND COMMUNITIES

5.1 INTRODUCTION

This assessment focuses on agriculture and the upland agroecosystems of NW Laos. It uses the results of the discussions with four villages in Long district and six villages in Pha Oudom district as the lens through which to gain a preliminary understand of how the climate is changing and the effects of these changes on agriculture and the environment.

Language difficulties were a constant limitation on the extent, depth and detail of the discussions that could be conducted – despite the willingness of local people to respond. Even from Lao to Akha/Khmu languages (and back) considerable difficulties exist in translating specific and specialist concepts, adding English complicates the process yet again. The difficulties were greatest in the Akha villages, as few members of these communities spoke Lao.

Accepting these limitations, discussions focused on gaining a broad understanding of whether or not local people thought the climate (rainfall patterns) in their area had changed during their lifetimes, and if so in what way. Later in the discussions we informed them that broader (global) studies showed that: i) the climate was changing and becoming even more unpredictable; and ii) that NCA would be working with them to assist them adapt to the coming changes.

Villages in two districts (Long and Pha Odoum) in which NCA have been providing long-term assistance were included in the field study.

The long-term work that NCA has been doing on health and education in the two districts is not discussed. This is not due to oversight or neglect, as the author considers this work to be very important, but due to lack of time for extended discussions with villagers. It is clear that improved health and access to basic education will make a valuable long-term contribution to the welfare of the communities in the two districts. Combining support for education with the school feeding programme funded by WPF, but administered by NCA, contributes to both the health and education of young people in these communities. Support for the non-formal education, by supplementing teachers' salaries, is providing young Akha people (mainly males) with access to basic Lao language conversational skills; it is considered unlikely they will ever be literate in Lao. NCA funding building schools and clinics provides the physical basis for these services to be delivered. Integrating health, and especially education, services with climate adaptation activities will be critical for the success of a long-term strategy.

5.2 THE CURRENT SITUATION IN THE UPLANDS OF LAOS

There is a wealth of specialist material already available on the Lao uplands, e.g. NAFRI 2005, this report does not aim to resurvey the range of anthropological, ethnographic and ecological literature available on upland communities in mainland Asia or Laos.[11]

In brief, the upland communities of Laos, at least those visited in Long and Pha Oudom districts, are remote from markets and almost all social services, except the most basic education and health services. They are almost wholly dependent on locally available natural resources, most of which are seriously degraded, and few members of the community have even season work in the broader 'outside' rural economy.

As noted elsewhere, there has been a long-term secular decline in rainfall, especially during the critical period for rice planting and growth (June-August) in NW Laos, and average temperatures have also been rising. The onset of the rainy season

11 The Information Services section of the NAFRI website (http://www.nafri.org.la) has a wealth of material in Lao and English languages available including: 1. A repository has all major publications and reports; 2 The Lao Agriculture Database - Repository of major research and development reports related to agriculture and natural resource management in Laos; and 3 NAFRI Library Information System - on-line catalogue of the NAFRI library. In addition, there is now a repository of material in Lao language on agricultural extension and extension methods at www.lao44.org. Three important policy briefs were published by the Sub-Working Group on Uplands Development in 2008 ("Improving Upland Farming Systems", "Rural Land Management and Administration" and "Pro-Poor Institutional Development").

is now reportedly (see below) uncertain – previously it occurred at the end of May-early June - and the rainfall pattern during the season unreliable and very variable.

5.3 CLIMATE CHANGE AND UPLAND VILLAGES

The discussions with members of the communities visited focused on potential changes in the climate and the range of effects this was having on agriculture, forestry and the general environment. While it was not assumed at the outset of discussions that the climate had changed, it quickly became obvious that changes in the timing and reliability of rainfall were uppermost in the minds of most villagers we encountered. Without much in the way of prompting they explained how difficult the last two years had been in terms of rice farming due to late and unreliable rains, and how these problems had been compounded by plagues of rats in both years.

A significant sign of how precarious their food security situation has become is that while we were conducting the field work the first distribution of rice – 30 kg per person for all people in 22 villages in Long and 7 villages in Pha Oudom – had just commenced; there will be a second distribution in some villages in Long district. This is not the first time that these communities have needed food aid, an application was prepared for Long district last year but was not successful. The rice is provided by the UN World Food Programme (WFP) and distribution managed by NCA with support from local government. WFP cannot and will not provide long-term food aid to supplement local production shortages, so increasing staple food production is a critical issue. The longer-term WFP school feeding programme is an indication of deep structural problems concerning staple food production; these are exacerbated and complicated by a rapidly increasing population.

5.3.1 Long District

Four villages in Long District were visited between 12-15th October 2009, see table below. The villages were selected by the NCA Long team as being representative of the conditions of the 26 villages in which NCA has been working for many years. These villages were located along the road leading north from Meung Long (district town), up to the intersection with the Mekong river and the Burmese border – 60 km by road but about 30 km 'as the crow flies'. The people in three of the villages were from the Akha ethnic group and in one village from the Kui ethnic group.

The results of the discussions are summarised in the table below. It is clear that local people are aware the climate has changed – which they perceive mainly as delays in the onset of the rainy season and unreliable rainfall – during the last two years. Interestingly, they did not generally think there had been any changes prior to the last two years. Although it is not documented in the table, passing comments were also made about the shortening of the fallow-cultivation cycle during recent years, a shortening driven by local social and economic factors rather than by the government LUPLA policy.

5.3.2 Pha Oudom District

Six villages in Pha Oudom district were visited on 18-19th October 2009; one village, which is due to relocate to the same location as Ban Kang (where the NCA sub-centre is located) was not visited. These communities are spaced along the new road constructed with NCA support. The people in five of the seven villages are from the Khmu ethnic group, while two villages are from the Lamet ethnic group.

Long District, Luang Nam Tha Province

Village:	Present Climate Situation	Past Climate Situation
Ban Pha-ngoi (Akha)	Rain starts at the beginning of May but is not reliable, starting and stopping. Patterns vary from year to year. The rainy season also depends on the year, in some years the rain lasts until the beginning of November.	Rains came in about the second week of May, it was raining reliably.
	Effect on Agricultural and Forestry Systems Agricultural production has decreased. Villagers do not understand the trend of changing weather; they don't know what to do to adapt to the change of weather, which crops to grow in relation to the changes.	
Village:	**Present Climate Situation**	**Past Climate Situation**
Ban Aiseng (Kui)	Some years, it starts to rain in May, while some years, the rain comes later than May, maybe June or July (and the rain is not reliable).	In 2003, the wet season produced a lot of rain, especially the rainfall came together with hail.
	Effect on Agricultural and Forestry Systems Last year rice production was worse but corn production was good, this year the rice production is good - they estimate about 15 households have not enough rice. Food situation now is getting better compared to when they were young, as well as now many facilities are in place like rice mill, electricity, torches, etc.	
Village:	**Present Climate Situation**	**Past Climate Situation**
Ban Jamai (Akha)	Now the rain comes in the end of May, but is not reliable (less rain in the beginning but heavy in September).	Before there was a lot of rain, it started in May through to November.
	Effect on Agricultural and Forestry Systems Villagers start cultivation the same time as before. Agriculture production last year was worse but this year is better, they prefer to grow groundnut and maize, but afraid of marketing problems. Normal rain is good for their agriculture (not lower or heavy rain).	
Village:	**Present Climate Situation**	**Past Climate Situation**
Ban Houythummy (Akha)	This year too much rain in October, it started in April but was not reliable (starts and stops).	No idea
	Effect on Agricultural and Forestry Systems No idea	

Source: Field Notes, 13th to 20th October 2009.

Pha Oudom District, Bokeo Province

Village:	Climate Change Trend	Effect on Agricultural and Forestry Systems
Ban Phouvieng (Khmu)	The climate has changed in the last 2 years. Not enough rain when planting rice, but too much when they harvest. Also the temperature is warmer this year. Previously, the wet season started at the end of May; the amount of rain was greater than now and more reliable. **Agriculture Production Situation and New Crops** Now, there are about 7 varieties of rice the villagers usually grow, the longest variety about 7 months to harvest, the quickest one about 5 months. In the future they would like to grow agar-wood.	Now not enough water for agriculture activities - shortage from January to June. Forest now is reduced due to shifting cultivation; rotation before 13 years but now up to 15 years of upland rice cultivation rotation. [considered to be unlikely] **Initial Reaction by Villagers** Villagers grow some vegetable crops like cabbage, chili, in the valley bottom alongside the river.
Village:	**Climate Change Trend**	**Effect on Agricultural and Forestry Systems**
Ban Kang (Khmu	The climate has changed over last 2 years now the rain is less, and water level in the river has fallen. Previously, the rains started at the end of May and continued until November and was reliable. **Agriculture Production Situation and New Crops** This village has about 7 varieties of rice; with normal rice production they use 8 (30 kg) bags of rice and harvest about 300 bags. Last year 8 bags of rice seed, and got only 50 bags because of rats; this year they estimate 150 bags from 12 bags of seed.	Now they lack water for about 5 to 6 months. The rotation period now is about 6-7 years, but before was about 12 years. **Initial Reaction by Villagers** Some vegetables grown in valley bottom.
Village:	**Climate Change Trend**	**Effect on Agricultural and Forestry Systems**
Ban Kalom (Khmu)	The climate has changed in the last 2 years, the season is now 'winter' but it is still hot, and the rain is not reliable. Before the rain came on time, starting in April or May; before unlikely to rain in January or February, during clearing rice fields. **Agriculture Production Situation and New Crops** Not mentioned	Private company provides seed for maize and sesame, villagers grow these and sell back to the company, this year maize production is very low due to rats. The rotation period now is about 6-7 years, while before was about 8-9-10 years. **Initial Reaction by Villagers** Some vegetables grown in valley bottoms.

Village: Ban Thin (Lamet)	**Climate Change Trend** The weather in the last 2 years has changed as the rainfall is now unreliable. Before that, it rained normally, starting in June or July, but especially in 2004 it rained very hard with floods and caused land slides and erosion.	**Effect on Agricultural and Forestry Systems** Rice now not producing seed, also rat destroyed their crops. This village was resettled in 2 years ago, but use new land for agriculture.
	Agriculture Production Situation and New Crops They would like to grow mangoes, oranges, beans and cabbage alongside the river using river water. As well they want to raise cows and goats due to availability of grass.	**Initial Reaction by Villagers** The villagers grow some vegetables, cabbage, pineapple, etc. in the valley alongside the river.
Village: Ban Deau (Lamet)	**Climate Change Trend** In the last 2 years, they have no rain when cultivation normally starts; it rains late and is not reliable. Before that, in some years there is no rain like this, but not for as long as this.	**Effect on Agricultural and Forestry Systems** NTFP is available like palm nut, rattan, bamboo, mushroom, etc
	Agriculture Production Situation and New Crops When rice production is not good, they grow sesame, and industrial trees; in the valley bottom they grow corn and vegetables. Next year they will grow agar-wood, palm nut, and nurseries.	**Initial Reaction by Villagers** Also some vegetables grown in the valley bottom.
Village: Ban Mai (Khmu)	**Climate Change Trend** The climate has changed in last 7-8 years as even in July it is not raining, the rains are not reliable. Before that, it was raining on time, started in May until October	**Effect on Agricultural and Forestry Systems** In the past, the rice harvest was complete in October; now they are still harvesting in October. Rotation period before = 10 to 11 years, but now = 9 to 10 years. NTFP includes: palm nut, mushroom, cardamom, bamboo, bark, etc.
	Agriculture Production Situation and New Crops Next year if the weather is like this year, they will grow sesame, corn, cassava, pumpkin, chili in addition to rice.	**Initial Reaction by Villagers** Also some vegetables, bananas, etc. grown in the valley bottom.

Source: Field Notes, 13th to 20th October 2009.

5.4 REGIONAL AGROECOLOGY

The uplands of Laos can be fairly accurately described as an ecological 'disaster zone'- with most of the forests having been destroyed within the last 50 years or less, and the last significant forest remnants disappearing in the last 10-12 years, according to what village informants. In broad terms, the forests of NW Laos have all but disappeared. While commercial logging – legal and illegal – is responsible for much of this destruction, traditional 'slash-and-burn' agricultural practices are also responsible for much of this loss.

5.4.1.1 Long District – Agroecological Situation

According to local people the last of the (larger) forests in these areas was destroyed by slash-and-burn agriculture some 10-12 years ago – so as to grow upland dry rice and opium.[12] In this context it is more accurate to speak of 'slash-and-burn' than 'swidden' agriculture, as after about five years when the fertility of the soil is exhausted, the people clear a new area and the destructive cycle starts again.[13] In modern parlance this is called 'pioneering' as opposed to 'rotational' swidden agriculture – but slash-and-burn describes it more accurately.

The traditional Akha agroeconomy was supported by three elements: upland dry rice cultivation, gathering NTFP (mushrooms, bamboo shoots and grubs, leaves, animals, birds, fish, etc.) from the forests and streams, and growing and selling opium. As far as can be determined no other major forms of agriculture, e.g. vegetables or orchards, were practiced. The cash from the sale of raw opium was used to purchase supplementary food and all other items.

With the demise of the forests, and the food sources they provided, these communities became even more dependent on cash from opium. The loss of the forests also meant that there was no new, fertile land to be 'opened up' for upland dry rice cultivation, and yields from existing fields probably rapidly fell as the rotational cycle shortened. The government's nation-wide programme, supported by external donors, for elimination of opium steadily removed the Akha's last remaining traditional source of livelihood, until by about five year ago large-scale opium cultivation had ceased.

Akha communities are located along the ridgelines or just below the crest of the ridges. While this makes travel from one community (by foot or vehicle) to another relatively easy, it usually means the communities are far from ready to access water sources. The communities themselves consist of a cluster of raised, timber framed and bamboo roofed and walled houses, with each house, outbuildings and its immediate territory rather like an 'island' surrounded by a bamboo palisade.[14] In most of the communities, erosion has rutted and gullied the usually steep hillsides between these 'islands', requiring cautious movement whether by foot, car or motorcycle.

Commonly there is a period of 2-4 months prior to the harvest, i.e. June to September when some households in almost all of the villages face some degree of rice shortage. At the end of the dry season there is another period of 2-3 months (March-May) when villages are short of water.

5.4.1.2 Pha Oudom District – Agroecological Situation

While there are topographic and environmental differences between Pha Oudom and Long districts the similarities are far greater. It is clear that most of the forests in the district have been replaced by bamboo-dominated scrubland, although the apparent extent of the areas which are even more severely degraded appears to be somewhat less. Secondary forests are now only apparent on the

12 Many of the steeper, less accessible slopes are still forest covered, but are a small portion of the total landscape. However, these are not suitable – access, poor soils, etc. – for cultivation. In general, observation of the landscape shows that there are few potentially accessible areas that have not been cleared and cultivated. Much of the landscape is degraded to the point of now being covered by depauperate (bamboo) scrub, rather than secondary regrowth forest.

13 The slash-and-burn practices of the Akha and Hmong – "pioneering swidden" - are identical in practical terms.

14 One of the long, steady achievements of the NCA project in Long has been to convince communities to raise their houses on stilts, so that there is separation between humans and domestic animals (especially pigs). Reportedly, this has resulted in major and sustained improvements in people's health status and general public health.

more steep and inaccessible slopes; local people report that these continue to be exploited for timber.

The traditional Khmu economy in Pha Oudom was similar to that of Long, the major exception being that opium was not cultivated (reportedly, the Lamet did cultivate opium), this probably resulted in a more diverse mix of crops being cultivated and, it is reasonable to speculate, made the communities more open to experimenting with new crops. In contrast to Long, there are no opportunities, as far as is known, for establishing irrigated paddy fields in the valley bottoms, due to lack of (semi-)perennial streams. However, this does not prevent this fertile land being used for dryland rice, other staples, vegetables and orchards, and small livestock.

The all but two of the villages being assisted by NCA are located on the ridgeline, with two new villages of the Lamet 'immigrants' located in valleys. A number of the villages have been voluntarily relocated, so as to move them closer to the new water supply that NCA has provided. The structure of the villages is different from those of the Akha, with the land inside the village being kept swept clear, no palisades around the houses and (probably because of different soils) lacking the deep gullies common to Akha villages.

Some households in all of the villages face rice shortages before the October harvest, reported for 2-3 months in July-September. For 3-4 months at the end of the dry season (March-May) most villages also have a water shortage, this has been alleviated by the new water supply, but it was unclear if this continued to provide water during this period.

5.5 AGROECOLOGICAL SYSTEMS

Our discussions with villagers from 10 communities, plus existing knowledge of agroecological practices in upland Laos, helped clarify the roles that various elements of the local agroecosystems play in supporting these communities. Five major agroecological 'elements' were identified:

- Sloping dryland cultivation
- Local forests - gathering and hunting in
- Irrigated valley bottom rice cultivation
- Dryland cultivation in valley bottoms
- Large and small livestock husbandry

Each of these agroecosystem elements is discussed below, and its potentials and problems noted. The role each might play, singly and in combination, is discussed in Chapter 7.

5.5.1 Sloping Dryland Cultivation

Sloping dryland cultivation is a basic form of agriculture for all of the communities visited, and almost all other upland communities in Laos. In general, sloping lands are used to grow rice on steep (>25%) sloping land; more recently, maize (corn) and sesame have been introduced as cash crops. These fields are the key element in the swidden fallow-cycle that communities have maintained for centuries, and allowing a sufficiently long fallow is the key to maintaining soil fertility by minimising erosion and nutrient leaching.

In the last few decades the length of the fallow cycle has shortened, in most areas, from (at least) 12-13 years, to 7-8 years, then to 5-6 years and, recently with the implementation of LUPLA, to possibly 3 years. Even at 5-6 years it is doubtful if soil fertility can be maintained at a useful level for more than a few cycles. In this regard it is important to emphasise that only after a period of many fallow-cultivation cycles would it be possible to reliably conclude that a shortened fallow duration was 'sustainable', i.e. possibly 50-100 years. However, that of a shorter 'unsustainable' fallow duration should become obvious within one or two cycles, but the degradation will probably be irreversible. The degradation resulting from the involuntary 'experiment' with shorter fallows are already obvious, and are likely to become more so in the next few years.

As a consequence, productivity of the land has been declining, labour inputs, especially for weeding, have increased steadily and declining

soil fertility and soil health have made rice plants more susceptible to water-stress and attacks by insect pests and diseases. Farmers have tried to counter the latter using pesticides, but given lack of knowledge about pests and diseases, and lack of understanding of how pesticides work and how dangerous they are to all life forms, the results, in terms of protecting the rice crop, are usually disappointing and expensive.

With the land 'frontier' now firmly closed and the swidden cycle shortening, it is difficult to envisage how farmers will manage to avoid yields (steadily) declining if current practices are continued. It is already apparent that crop losses and much lower yields, such as experienced in the 2007-08 and 2008-09 seasons, when reportedly yields were halved in many (most?) upland locations in these two districts, are likely to become more common. Unpredictability in the onset of the rainy season and unreliable rainfall patterns, including rain immediately before or during harvesting, are already causing losses, and growing confusion and worry in these farming communities. The unpredictability of the rainy season and variability in rainfall is anticipated to increase as a result of climate change.

If no short- to medium-term solutions to the problems of declining soil fertility (shortened swidden cycle) and unreliable rainfall (climate change) can be identified – then alternative means of growing staple food will need to be identified and implemented, if these (and other upland) communities are to remain viable. Potential approaches to such solutions are discussed in Chapter 7.

5.5.2 Local Forests - Gathering and Hunting

Local forests as a source of food, fuel, medicines, building materials and NTFPs reportedly remain important for all the communities visited, but they also report that the range and amount of these 'free goods' has been declining. They also report that the extent and quality of the forest has been declining; some communities were honest and

Photo: Jim Holmes/NCA Laos

insightful enough to accept responsibility for this decline. Most communities report that most of what they harvest is consumed, with only some specialised goods (e.g. mushrooms, barks, bamboo shoots) being seasonally sold. It is unclear how much hunting is undertaken, but given the decline in forest area and quality, the amount and size of the game available is certain to have declined even more rapidly than forest area and quality.

Close observation of the upland hillsides reveals that what appear to be 'forests' are now in fact scrublands dominated by large clumps of bamboo, with woody species very much in the minority. In

some locations in both districts, degradation has gone further and the remaining vegetation is a mix of grasses and broadleaved plants, with few trees or even bamboo present. Dense stands of secondary(?) forests on the whole now appear to be limited to steep and more inaccessible slopes, usually along the banks of watercourses.

The decline of forest extent and quality also means that many other species of plants and animals have lost their habitat, hence there has been a significant loss of biodiversity in the uplands. The consequence for humans is that a vital source of day-to-day subsistence has been progressively lost, and the security-buffer that the forest 'food bank' provided in times of drought or other disasters has been severely run down, making the communities more vulnerable. The loss of biodiversity also means that the remaining patches of forest ecosystems are now more vulnerable to drought, and less resilient to the increases in average temperature and changes in rainfall patterns that climate change will bring.

To-date little attention has been given to assessing and better managing the remaining forest resources. Hence, they remain both over-exploited, because their capacity to provide goods and services is unknown but easily exceeded, and their potential underutilized because active management of the resources available has not been consciously incorporated into community or project planning.

5.5.3 Irrigated Valley Bottom Rice Cultivation

In some places in Long district, and no doubt in many others, small areas of irrigated rive fields have been developed in valley bottoms. These systems depend on a small dam or weir to divert water into a very basic, contour-following irrigation system; irrigation is only possible during or for a short period after the rainy season. NCA has assisted several communities in Long district develop these systems, which provide an important supplement to rice cultivation on sloping hillsides.

The soil in the valley bottoms is with little doubt the most fertile available in the uplands. As noted earlier, soil and nutrient eroded from the hillsides ends up in the valley bottoms, leading to the situation of poor hills, rich valleys. The fertility of this soil is critical for both irrigated rice crops and other forms of valley bottom cultivation, but it appears that it is potential has not been fully realised or exploited.

Water diversion is a key factor, but the small rock-and-log or concrete dams are easily washed away after one or two wet seasons and have to be rebuilt. While local materials can be used for the rock-and-log dams, these are labour intensive and sufficiently large rocks and logs may not be available. Concrete dams are generally more effective, but have their own drawbacks: they are generally too expensive for the local community to afford; require location where the bed and abutments can be keyed into existing bedrock underneath and at the sides; and are easily washed away during the wet season, few of them, reportedly, lasting more than a few seasons. Once a dam is destroyed, irrigated rice cultivation ceases, although rain-fed cultivation is still possible and should provide good yields given the high soil fertility.

An alternative to dams is weirs, one of which was seen in Long district. This consisted of two large (approximately 5m x 1.5m x 0.7m) slabs of concrete set in the bed of the stream. The upstream block was about 0.5 m higher than the lower block and was notched in the middle to direct dry season flow. The weir was just high enough to divert some of the water into an irrigation channel, but it's low profile and the absence of a blocking wall made it much less vulnerable to being washed out during rainy season floods; the design needed to be keyed into the streambed, but did not need to be located where abutments could be keyed into the rock as with a small dam. This weir had, reportedly been in place for 5-6 years. It would seem this type of weir is a design that may be more durable, especially as NCA has been asked to fund replacing a small dam slightly further downstream that was washed away after only two years.

To-date, aside from providing funding and technical advice for constructing small dams, it appears that the agricultural potential of irrigated rice in the valley bottoms, with other crops grown on the same land during the dry season, has not been fully explored or exploited.

5.5.4 Dryland Cultivation in Valley Bottoms

Regardless of whether or not irrigation is possible, the fertile soils of the valley bottoms is one of the most important, but underutilised, resources available to upland communities. In the limited time available it was not possible to visit more than a few locations, and farmers were generally vague about the crops that were currently being grown in the valleys. By observation it appears that banana groves may be one of the most common current uses, with some communities reporting sweet potatoes, maize, cassava, pumpkins and gourds and some fruit trees are also grown, some areas were also used as grazing for cattle.

The reason for the lack of attention to the potential of valley bottom land is unclear, but may well have to do with the cultural focus – obsession may be a more accurate term – with rice cultivation, and lack of familiarity with other crops and cultivation systems. This limited perspective was more apparent in the Akha than the Khmu communities, and the newly arrived Lamet who have established their villages in the valley bottoms, make much more active use of valley bottom land.

5.5.5 Large and Small Livestock Husbandry

NCA has provided cattle, goats, pigs and chickens to the villages they are assisting. To complement this with provision of improved grass species, training for farmers in basic veterinary services and preparation of improved feed mixtures, continuing technical support has also been provided. In almost all villages this livestock was observed, and in a number of villages pig sties – ranging from individual pens to quite large structures – were observed.

Interestingly, in Long district only four of the villages have been found to be suitable for raising cattle, the grazing areas is located away from the village and the work is being undertaken as a cooperative effort by small groups of families. This suggests there is limited opportunity for introducing cattle successfully in the degraded upland environment. Cattle have other disadvantages, in comparison to small livestock, they are: 'lumpy' investments whose death or illness can easily nullify the investment of money and effort, require large amounts of relatively nutritious fodder, with a long period between birth, maturity and reproduction; they also tend to be the exclusive preserve of males, although women commonly make substantial labour contributions to their raising and maintenance. Experience in other countries suggests that small livestock are a more rewarding alternative, though less prestigious than cattle, make use of a wider range of food sources, and benefit from the closer attention they receive from women, who tend to take responsibility for them.

Pond fisheries offer another possibility that may be worth exploring. Many of the valley bottoms have nearly permanent access to water, a wide variety of easily accessible nutrients and in-ground ponds with low raised walls can be lined with either plastic (low cost) or with cement.

The potential of small livestock, for improving human nutrition and cash income, has begun to be exploited but much more could be done by integrating them with cultivation of bottom land, and using them to add and recycle nutrients from vegetation unsuitable for human consumption.

6. PRELIMINARY ASSESSMENT OF ADAPTATION ISSUES IN THE UPLANDS

6.1 INTRODUCTION

There are a range of issues that are common to all of the upland communities in northern Laos. The main ones apparent to the author are briefly discussed below. It should be noted that all of these can be classified as 'structural issues' which require broadly-based changes in approach for resolution, only some of which can be developed at the local level.

6.1.1 Population Growth

In upland communities population growth and growth rates are key factors in determining how much food needs to be grown and whether it is possible to do so with the land resources and technology foreseeable available.

No time-series statistics are available at the village level that would allow calculation of population growth rates. What is striking is the large numbers of healthy young children in every village visited. Their numbers and their state of health (no runny noses, no scabby legs, no wormy bellies) suggests that infant (under 5 y.o.) mortality may have fallen significantly in recent years, some (most?) of the decline undoubtedly due to NCA's health activities. If the population growth rate is 2% p.a. (roughly equal to the national rate) then population size will double in 36 years, if it is 3% p.a. then it will double in 24 years; it is possible that the growth rate in the uplands may exceed 3%. Given that food security is already precarious, any increase in population size will multiply pressures on an already degraded landscape, now farmed with destructive techniques, further accelerating degradation and lowering yields.

Regardless of the actual growth rate, observations indicate that there is an urgent need for a more active reproductive health programme as part of NCA's health efforts. Given that continuing degradation and climate change may well make the food security situation even more precarious, limiting the rate of population growth is arguably one of the most important, and cost effective, long-term adaptive activities available to NCA.

6.1.2 Shortening Fallow Periods

Based on the information available to the team, traditional fallow periods in the uplands of Laos were typically 10-12 years in duration, i.e. each parcel of land was cultivated for about one year every 10-12 years. During the last decade, according to what was reported, this period has shortened to 7-8 years and further shortened to 5-6 years in some locations (Long).

The consequences of this can be readily seen on the hillsides of the region, with large areas of land no longer returning to secondary regrowth forest during the fallow period, but seemingly caught in a depauperate 'bamboo scrub' climax, where woody species do not have an opportunity to regrow and whole hillsides are dominated by thick stands of bamboo. This 'stalled' regeneration would seriously limit the species diversity and richness of the landscape, given the domination of the ecosystem by bamboo. In turn this would limit the number of other plant and animal species, hence NTFPs, available as sources of food or cash for local communities. More generally, this change will make the landscape more vulnerable and less resilient to environmental changes, and may also have negative effects of the quality of the soil regenerated during the fallow period and, hence, water retention capacity.

The shortening, as far as can be determined, has been driven by two simultaneous factors. First, the 'closing of the frontier' as international borders have become less porous during the last few decades, the extension of government authority, and the increasing determination of other upland groups to defend 'their' territory and resources. Second, population growth within the communities has increased pressure to cultivate larger areas of land and exploit forest and other resources ever more intensively.

The immediate, and growing, consequence, is that the fertility of newly (re)opened fallowed land has progressively declined during the last decades. Declining fertility has also made cultivation, usually of upland dry rice, more labour demanding

as weedy species are better able to compete with the emergent rice plants.

Implementation of LUPLA (which has not occurred everywhere) has now dramatically shortened the fallow period, nominally at least to three years. It remains to be seen, at least in these two districts what the specific effects of the further shortening of the fallow period might be, the general negative effects are already well understood. The issue is whether this could inadvertently lead to a slow-motion collapse of upland traditional agriculture. This would probably have the unintended consequence of forcing communities to more intensively exploit the already diminished and degraded remaining forest resources.

6.1.3 Soil Erosion and Nutrient Loss

There is ample evidence that rates of soil erosion, and associated nutrient loss, are a continuing and probably mounting problem in upland Laos.[15] Given the steep topography of most of this area, any loss of vegetative ground cover, or especially severe rainfall, greatly accelerates this process. Naturally, clearing land for cultivation is a major cause, especially when the fallow periods of swidden agriculture are shortened, as noted.

This is resulting in a situation which we have characterised as 'poor hillsides, rich valleys'. Much of the soil eroded from the hillside ends up on valley floors, much of it is, of course, carried away by rivers and in floods. However, given the large area of the hillsides in comparison to the valley bottoms even a small increment can be significant. It is reasonable to conclude, and direct observation supports this, the fertile valley bottoms (bottom land) now constitutes a potentially major, but currently underutilised, resource for intensive integrated agriculture.

6.1.4 Lack of a Cash Economy

The almost complete absence of even small stores selling even minor consumer goods, or basic hardware and other tools, is quite noticeable. This is a clear indication that these communities remain at the best semi-subsistence, with substantial amounts of cash entering the local economy seasonally with the sale of cash crops or livestock, or from seasonal wage labour in the 'outside' economy.

There is nothing romantic about these almost 'cashless' village economies. Aside from lack of access to essentials, e.g. soap, other 'health products', basic tools and hardware, it means that villagers do not have access to supplies of seeds and other agricultural products needed to cultivate new, alternative crops, or access to markets to sell the products they grow.

To begin to address this lack NCA has arranged for contracts to start working with some of the communities to provide seed and purchase and transport maize and sesame. Much more work needs to be done on this aspect of the village community, to explore ways in which they could be better connected to the district-level economy. In addition, identifying ways that farm families or cooperative groups can gain access to credit for agricultural inputs and other productive investments is an area that requires further investigation.

6.2 STRATEGIC PERSPECTIVES

By Western and mainstream Lao standards the people in these villages would be classified as 'poor' and their livelihoods and welfare as precarious. Despite their objective conditions there is nevertheless a lot of laughter and joking between the members of the community and spirits are high. They are well aware of their current situation and the fact that is probably becoming more serious. They are conscious they need to take action, but are uncertain of what to do or how to do it.

6.2.1 Situation for Long District.

In Long the decline of tradition forms of upland economy, due to destruction of forests, soil depletion, lack of new areas to cultivate and the demise of the 'opium economy', are now being accelerated by the arrival of the 'rubber economy'.

15 A rule-of-thumb is that eroded soil contains about twice the amount of nutrients as in the parent material, due to nutrients being dissolved by water and carried downhill.

Photo: Vegard Giskehang

The key short term impact is the conversion of land from dry land agriculture (largely upland rice) to rubber plantations of all sizes. Depending on the location – but especially near roads - this is having a growing impact on food security and, consequently the viability of the affected communities.

This rapid granting of rubber concessions started in the late 1990s and gathered pace in 2003, expanding rapidly in 2007-08. By 2011 the first of these plantations will start producing latex, and by about 2015 all of the area planted to-date will, in theory, be in production. This will lead to a revolutionary change in the economy of Long District, and the four northern provinces of Laos (LNT, Phongsaly, Oudom Xai and Bokeo) all adjacent to China. One of the key effects will be the demand for labour – mainly young people - to maintain the plantations, tap, and eventually, process rubber latex.

This issue is discussed here as it provides the immediate backdrop against which the issues and challenges of climate change need to be considered, i.e. a fundamental shift in the social economy of Long District and LNT Province. If it is accepted that traditional Akha communities are becoming ecologically unviable, with few if any longer-term prospects for young people, rubber plantations represent a relatively attractive modern economic opportunity for young workers and their families. In brief, young people will move closer to plantations, some of them becoming waged plantation workers. This process may be speeded by government deciding that whole villages should be relocated closer to plantations, so as to expand the supply of labour and focus delivery of services (health, education) on these new sources of economic development. These changes will, of course, severely threaten the viability, probably survival, of Akha culture and traditions.[16]

In Long District (and others) large areas of land have been granted as concessions for rubber plantations. These range from a vast 10,000 ha tract in western Long, to dozens of medium-sized concessions (20-100 ha) and hundreds (possibly thousands) of small (0.5-5 ha), scattered plots on which local communities, individual families or local investors have planted rubber. Official records of the locations, area and ownership of these plantations are, to be polite, very incomplete. Recent studies suggest that in LNT province there

16 I am indebted to Adrian Schubeck and Klaus Goldnick of GTZ for insights from extended discussions with them on these issues; any misinterpretations remain my responsibility!

could be as much as 60,000 ha in total, and in Long District, which has the largest estimated area of rubber concessions, at least 20,000 ha; it is likely the area will continue to expand, albeit without official permission.

In the near term the most important issue is the degree to which plantations have been and are being established on land previously used for food production; the medium-term issue is the effect on employment and young people (local and immigrant) moving to work on plantations. The lack of any data on actual current land use patterns, the location and extent of concessions, and the actual area already planted makes it impossible to estimate the effects on food production. This situation regarding data is unlikely to change in about next 3-5 years. After this time, as the rubber trees mature, it may be possible to use remote sensing imagery to analyse the extent of the plantations, but this will not likely make it possible to estimate the area of land converted from food production. This imagery could, however, provide insights into where plantation labour will likely be in demand and where new communities will emerge, some of them plantation 'company towns' with wage/indentured labour and barracks.

The ever increasing loss of land area for food production in upland areas, mainly dry rice but including maize and livestock grazing, intersects directly with continuing declines in production arising from soil erosion and nutrient loss, the 'closing of the frontier' for slash-and-burn and forest destruction. As noted earlier, it is also highly probably that long-term declines in rainfall and increases in temperature and seasonal unpredictability are already exacerbating declines in food production and security.

The potential strategic consequences for local government and NCA programmes are twofold. First, the exodus of young people from traditional upland Akha communities, seeking employment in plantations, albeit unwillingly, will further undermine local food production, making these communities unviable. In compensation, they may well remit part of the wages to their communities, either in cash or kind. Second, population movements, voluntary and/or involuntary, brought about by the new 'rubber economy' will lead to (require) a relocation of service infrastructure and personnel towards plantation locations. These economic and demographic shifts are likely to far outweigh the short- to medium-term effects of climate change on Akha communities, and require the local government and NGOs like NCA to rethink their whole development strategy and approach.

6.2.2 Situation for Pha Oudom District.

Pha Oudom lacks any new external driving force like new 'rubber economy' in Long district; reportedly only about 300 ha of concession have been granted for rubber. In Bokeo province as a whole it is estimated that there may well be about 16,000 ha of (mainly) rubber concessions. The irrigated rice communities in the broad valleys have a stable economy, and with the steady expansion of transport and communication links increasingly easy access to the wider economy and society. The upland communities, in contrast, are barely in touch with the economy of these valleys, and the 'outside' world remains somewhat of a mystery.

In discussions there was no one who could suggest what new economic or social 'catalyst' might be available to the district to increase the level of economic activity and provide new employment and economic opportunities. That said, it is possible that the 'rubber economy' may also start in the district in the coming few years, as opportunities for concessions in other districts and provinces are exhausted. Given the time between planting and production, this would suggest that the effects would be seven or more years away, aside from the possible loss of land for food production.

6.3 POSSIBLE FUTURES

Unless positive steps are taken, the degradation of the landscape in the two districts will certainly continue and accelerate under growing population

pressure, damaging cultivation techniques and climate change. Reduced rainfall, but more severe storms, and increased temperatures leading to more rapid erosion and nutrient loss are likely to undermine the fragile food security situation for all the upland communities in northern Laos.

NCA may be able to assist the communities they are working with to reverse the process of degradation locally, the report suggests an potentially feasible approach, but they have very limited ability to deal with the more widespread metaproblem that affects all of the upland is Laos. This will require concerted action on the part of many parties – NGOs, donors and government - and a major shift in policy and reorientation and revitilisation of agricultural services. In the near term, the most NCA can do will be to encourage and support local government agricultural extension services taking a more effective approach and, as suggested, taking the lead in initiating an active knowledge network to address climate adaptation issues.

6.3.1 Long District

It is suggested that NCA (and other NGOs) may soon be presented with the need to choose one of three possible strategies for Long district, not just with respect to adaptation to climate change but in terms of the focus and balance of their overall district strategy.

First, for the next 3-5 years continue as before. This is definitely not a 'do nothing' strategy, as there much work remaining to be done with respect to education and health, although drug-related activities are less important than previously. The point here is to wait until the effects of the new 'rubber economy', especially those that may lead to major population shifts, become more apparent, so that activities can be relocated or added so as to take into account the scale and geography of these new demands.

Second, move as quickly as possible (given funding and staffing constraints) to develop a new strategy for adapting the agroecology and economy of upland communities to address the need for new sources of own-grown food, fodder and fuel. This would mean scaling-up agricultural support activities, once a new strategy had been agreed and the necessary staff trained. This would, it could be argued, offers the best chance for Akha communities to remain viable in the face of continuing ecological degradation and the exacerbating effects of climate change. If effective, this approach may offer sufficient economic incentives (due to increased agricultural productivity and production) and challenges to, at least partially, counterbalance the attraction of becoming a labourer on a rubber plantation.

Third, a partial combination of the above strategies, except for initiating an analysis of the locations and size of major rubber plantations and when they are likely to start production, hence the anticipated sources of growing labour demands. The results of this analysis would be used to commence preparations for reorientation of project activities and services. This analysis would be complemented by an analysis of the likely effects on labour availability in upland communities – in anticipation of the probability that many young males may well choose to work as wage labourers in rubber plantations, rather than remain in traditional communities.

6.3.2 Pha Oudom District

After discussions with a range of knowledgeable people in the district, but with little additional information available, it appears the economic situation in Pha Oudom is stable (not to say stagnant) and prospect for major changes still some years away. These changes, e.g. extensive rubber concessions, would likely only affect the upland communities indirectly by providing a potential source of employment for young people. Hence, unlike Long district, NCA and its partners are not likely to have to make any strategic choices in Pha Oudom.

7. POTENTIAL ADAPTATION OPTIONS FOR NCA PROJECT COMMUNITIES

7.1 INTRODUCTION

Any proposal for adaptation activities in NW Laos, including the villages with whom NCA is working, needs to take full account of existing realities and to the extent possible those likely to prevail for the coming 10-20 years. In summary these are:

- Remoteness, distant from town and markets;
- Difficulty of access, extreme especially during the wet season;
- Lack of electricity and communication facilities;
- Low levels of formal education, limited Lao language fluency (speak, read, write);
- Marginal and declining agroecological viability of uplands;
- Negative environmental impact of slash-and-burn practice and policy; and
- Lack of skilled, experienced and active government agricultural extension staff.

It is reasonable to anticipate that NCA's activities in NW Laos may only continue for another five years. Even if this proves to be incorrect and they continue for longer, this is a realistic planning horizon for implementing a programme of activities to prepare communities to adapt of climate change. This implies that well before the end of this period (2015) a sufficiently large cadre of people in NCA project communities, and to the degree possible local government, need to have received effective training in practical methods for working with their fellow community members to assess what needs to be done, and planning and implementing critical adaptation activities. It is anticipated that the majority of these activities, given the currently vulnerable situation, will be directed to maintaining and improving food production and security; complementary public health activities, especially reproductive health and family planning, will also be important.

7.2 SCALES AND TIME FRAMES

Adapting to climate change is a new and daunting challenge for humankind. The scale of the metaproblem is unprecedented, and the timeframe is also well beyond anything we have previously experienced. About the only near certainties are that the nature of the effects will be disruptive of our existing production, social and economic systems, more often than not unpleasant – generally, hotter and less predictable weather patterns and climate – lead to major additional expenses, and in many cases be life threatening. Moreover, many of the plants and animals in the environment, and the ecosystems they form and the habitats they inhabit will become extinct within about a human generation.

It is now accepted by the scientific community that the climate is more sensitive to GHG than thought only a few years ago and that levels of CO2 in the atmosphere need to be quickly reduced to about 350 ppm (parts per million), but we are now at 387 ppm and climbing rapidly. We are not certain how quickly these changes will occur, but based on what we currently know there will be accelerating changes for the next 50-100 years. If we manage to radically reduce (i.e. by about 80%) GHG emission quickly (i.e. within the next 10 years) it will still many decades before the effects cease to increase and the climate stabilises again. Failure to radically and quickly reduce GHG, again based on what we currently understand, is likely to lead to a largely uninhabitable world where global average temperature has increased by more than 4C (Lynas 2007).

From the perspective of NCA and other NGOs, governments and all other organisations, needing to prepare strategies and make plans on such a large scale and for such a long duration is unprecedented. Further, knowing in advance, when making plans and implementing adaptation activities, will be most effective (or least harmful) is also well beyond accumulated knowledge and experience. It has to be assumed that NCA and similar organisations will not still be continuing to operate in the Lao uplands 20 years, so strategies for continuing adaptation activities and preserving what has been learnt also need to be considered.

Two principles, an institutional framework and training a cadre of young 'adaption mentors' are suggested as means for providing guidance in the near-term. The two principles are focused on food supply, food security and health status – as without these aspects of community welfare largely intact all other activities will be under threat, including the survival of the community itself. The two principles are i) identifying approaches which strengthen resilience; and ii) identifying approaches which have a good chance of minimising vulnerability. In general, actions that increase resilience will also serve to reduce vulnerability. The institutional framework is establishing and operating a 'Climate Adaptation Knowledge Network'. The purpose of the network will be to actively gather process and disseminate existing and new (practical) knowledge between all participants, using different forms of media as appropriate, and to provide the initial basis for institutional memory about what has worked and what has not and why. Training the 'adaptation mentors' would be a practical means for transmitting to NCA project communities (and others) the skills and knowledge needed to strengthen the resilience of their agroecosystems.

No specific time frames are proposed for the approaches and activities discussed below, as this is a preliminary exploration of options for adaptation. In general terms, it is anticipated that a general strategic framework, covering a period of about 10-20 years, will need to be prepared, and more detailed plans then made for an initial period of 3-5 years, i.e. the more usual project planning timeframe. During this initial period considerable work will need to be undertaken, in parallel with adaptation activities, to: more clearly identify realistic adaptation options and pathways, resource needs, opportunities and constraints, environmental assessment and monitoring systems to track the effects of climate change, and initiate establishing a knowledge network. These strategic planning, assessment, monitoring and knowledge management activities may require about a year to complete.

7.3 BUILDING RESILIENCE POTENTIALS AND CAVEATS

The following sections describe and explore the options available for increasing the resilience of upland communities in Long and Pha Oudom districts, to continuing (accelerating?) environmental degradation and the increasing effects of climate change.

The 33 communities that NCA is working with, and almost all of the other upland communities in Long and Pha Oudom districts, are close to totally dependent on the natural resources within their territories. These are exploited by farming, or gathering and hunting in the remaining forest areas. In economic terms, almost all of these communities can be characterised as semi-subsistence, and cash exchanges play a minor role in day-to-day activities; seasonal inputs of cash are received for sales of NTFP and contract-grown products like maize.

The obvious insight to be drawn from this is that all potential strategies that aim to maintain or improve long-term welfare in these communities needs to: i) take into account the potential and limitations of the remaining local natural resource base; ii) recognise this base continues to be degraded, both by human actions and natural processes; and iii) that changes in climate will likely progressively exacerbate natural degradation processes and, quite possibly, make the negative consequences of inadvertent human actions more severe.

A fourth, overarching but often overlooked, issue also need to be taken into account. The processes of natural degradation and the negative effects of inadvertent human actions are in practical terms irreversible. Human actions can slow the processes of natural degradation, e.g. forest, soil and nutrient losses, and human actions can also speed up these processes. Slowing these processes increases resilience and reduces vulnerability, and vice versa. Hence, it is vital that careful consideration be given to identifying and understanding possible unintended or inadvertent negative consequences

that could arise from human actions; unanticipated positive consequences may be regarded as a fortuitous blessing.[17]

Given the assessment that available natural resources in the upland have been severely degraded, the challenge will be identifying what resources remain available to assist in rebuilding the agroecology and what human capabilities are available locally and what financial and technical assistance will be required over what time span.

7.4 AGROECOSYSTEM PLANNING

It remain unclear to the author to what extent committing time and resources to whole-village (participatory) land use planning may be of actual use to the community or NCA in planning activities. Formal Land Use and Land Allocation plans were prepared by NCA for 16 or more of the villages in 2002-03. Reportedly, although these documents were formally approved by the village heads, they have not since been used for planning village activities. Repeating such a procedure, with the same outcome, would seem to be a waste of time and resources.

It may be sensible, and more feasible and effective (assuming the recommendation of this report are accepted and funding can be found) to focus on specific locations where project interventions will take place, i.e. community forests and valley bottom land. These are relatively small areas, where detailed participatory assessment – facilitated, initially, as part of the ToT course - of what could be achieved and the best means to do it would be of direct practical benefit. Such assessments, including analysis (sketch mapping) would cover at least - for forest areas: use of traditional knowledge to identify useful species that are 'missing', analysis of needs for timber for building, fuel and for sale, etc.; and for valley bottoms: existing crops, trees and other vegetation, analysis of soil samples, and assessment of water availability – and could be conducted quickly and inexpensively. The results would provide information of direct use for working with farmers to plan what crops, trees, livestock, etc. could be grown, identify potential markets, establishment and operations costs, the potential yields, products and income might be realistically expected, and how each valley bottom agroecosystem might be managed, i.e. social arrangements.

A major advantage of this approach to land use planning, really agroecosystem planning, is that it would be tightly focused and small scale, and could be conducted flexibly on an ad hoc basis, in contrast to the substantial resource demands for whole village planning. This would allow the assessment and planning to take place with little advance notice when the members of the community - those who would farm the relevant valley bottom, or start work on an area of forest – were ready to take action.

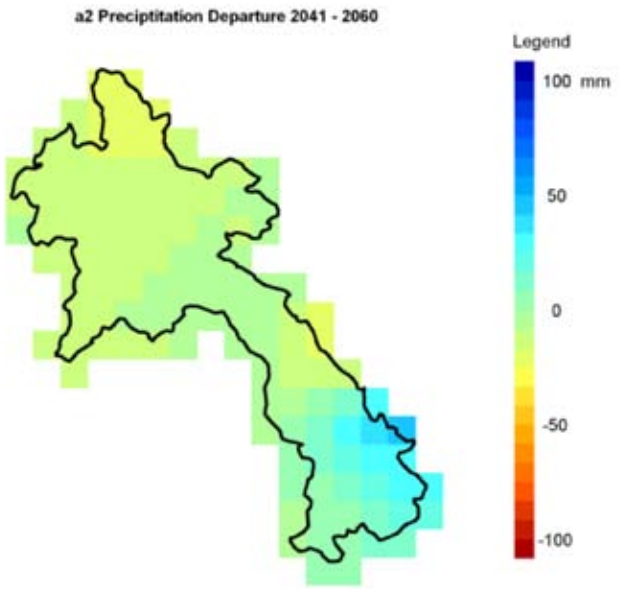
7.5 CHANGING AGRICULTURAL CALENDAR

The historical climate data on average rainfall and temperature for the period 1951-2001 shows that the rains in NW Laos are concentrated in the period June-August. Based on this traditional seasonal pattern farmers expect to prepare their fields and plant rice in the period May-June and, depending on the growth period of the rice variety planted, harvest in the September-October period. Discussions during field work clearly showed that at least for the last two years this pattern has been disrupted, with the rainy season starting later, the rains being patchy and unreliable, with some heavy rainfall occurring in October when farmers expect a dry period before of the harvest. Whether this pattern will continue in the coming years is unknown, but if it does then farmers may well need to alter their traditional cropping calendar to adapt to these changes.

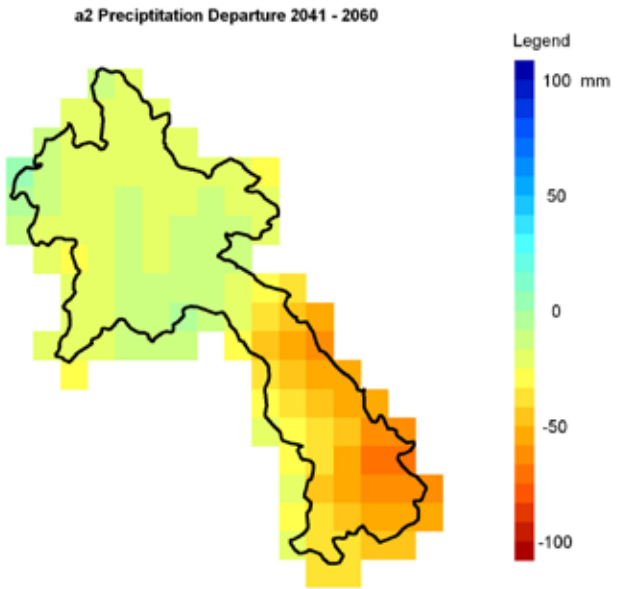
As noted earlier, the IPCC A2 model forecasts that the timing of the rainy season in northern Laos will shift to later in the year, beginning possibly

17 In Kalimantan, Indonesia, experience gained there has questioned the value and need for participatory map making of whole village territories, and suggests a more strategic and focused approach is more effective (Anau et al 2004).

Figure 6: Laos – Forecast Changes in Seasonal Rainfall 2041-2060



Dec-Jan-Feb



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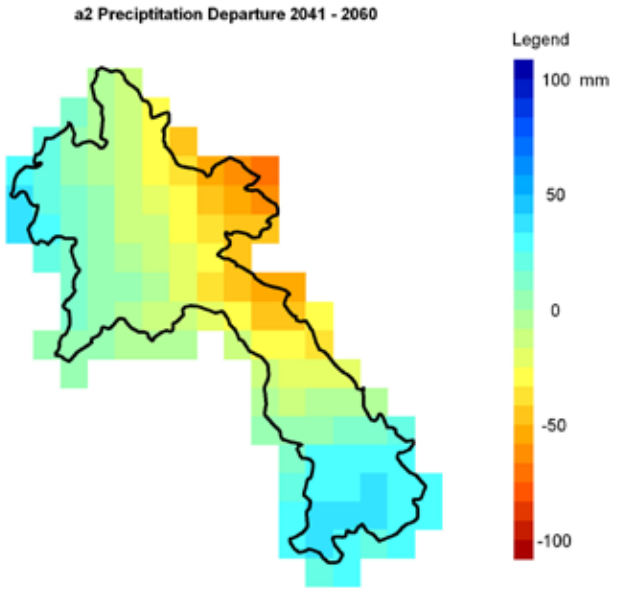
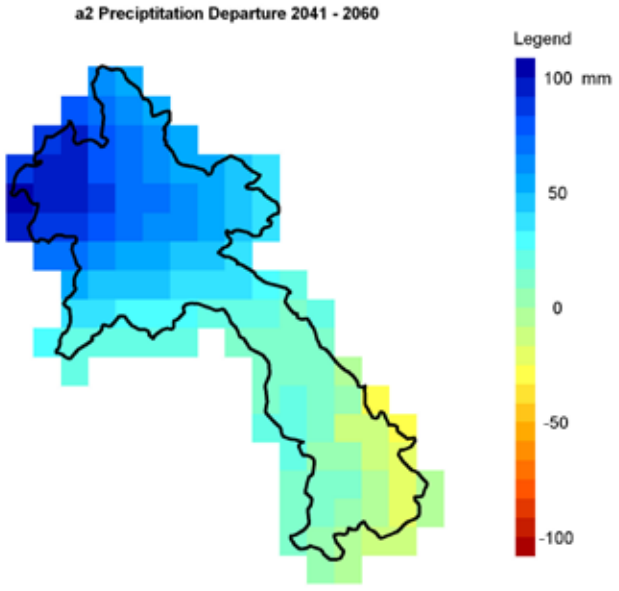
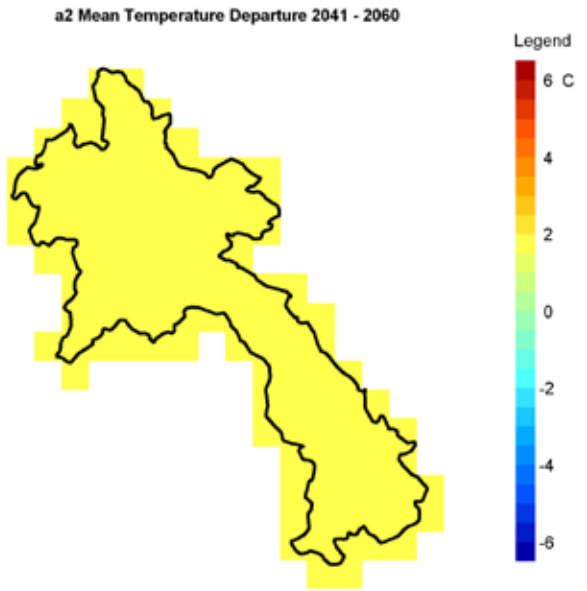


Jun-Jul-Aug



Sep-Oct-Nov

Figure 7: Laos – Forecast Changes in Seasonal Temperatures 2041-2060



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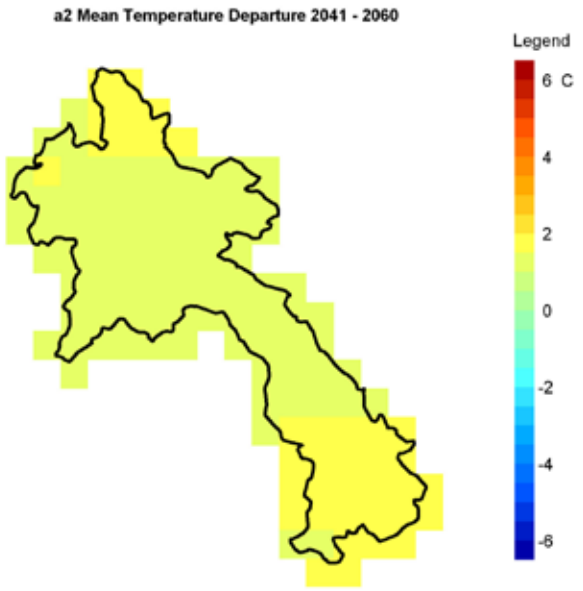

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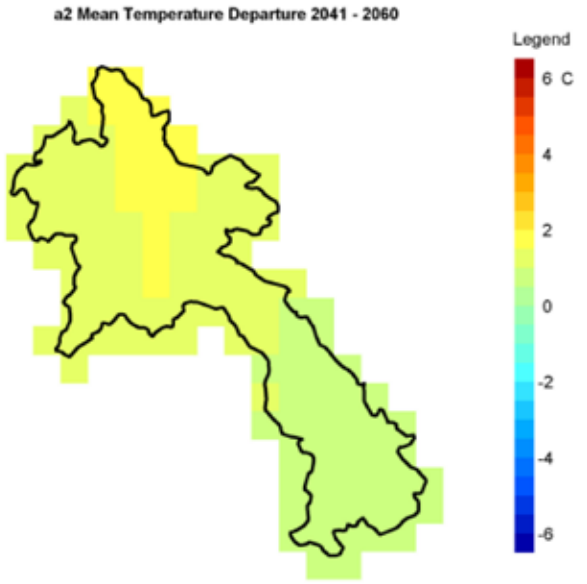

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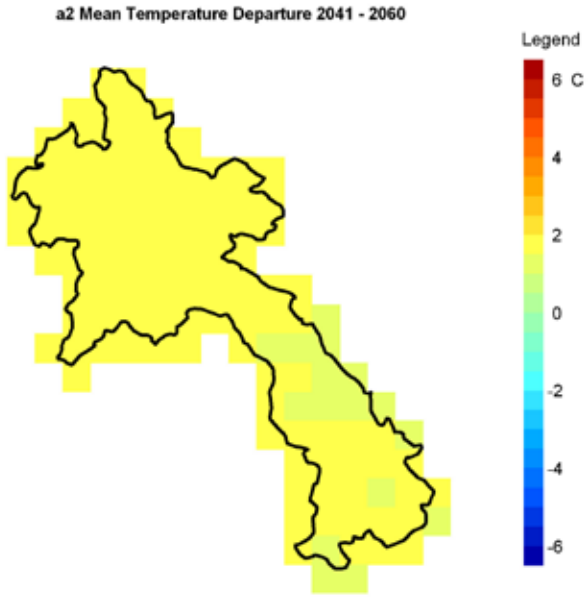

Sep-Oct-Nov

in August-September rather than in May-June as traditionally (Figure 6).

The model also forecasts that temperatures in northern Laos will be higher than at present by about 2C, for the period September-February (Figure 7).

One of the key means for communities to adapt to the changing climate is to progressively adjust their cropping calendar so as to minimise the negative effects of changes in the timing of the rainy season. This will mean actively studying the changes as they evolve over the years, and making adjustments as necessary. In the upland this will be made somewhat easier than in the lowlands, as the increase in winter temperatures will extend the growing season until later in the year.

7.6 IMPROVING AGROECOLOGICAL SYSTEMS

The general approach proposed for consideration is that of Low External Input Sustainable Agriculture (LEISA - http://www.leisa.info/). The Canadian IDRC has prepared a series of source books and practically-orientated supporting information that can be used to explain principles and practices, and also be used to prepare training courses for field staff.[18] A recent article by Michael Alteri (2009) lays out the general argument as to why small farmers are more productive and resilient to climate change that larger farmers, but more importantly strongly emphasises the role that providing farmers with access to what is called "AKST" (Agricultural Knowledge, Science and Technology) can play in improving production and welfare, and protecting or restoring the environment.[19]

7.6.1 Sloping Dryland Cultivation

Traditionally sloping dryland was used to cultivate rice and, for some ethnic groups including the Akha, opium. Large-scale opium cultivation is now a thing of the past, having been effectively eliminated between 1996 and 2004 by donor-assisted government programmes. Dry rice is still widely cultivated, increasingly complemented by cash crops like maize and sesame.

There are a range of rice varieties with three ranges of maturation: 120-130 days, 140-150 days and 170-180 days, all of them unimproved varieties. The varieties with the longer durations, while reportedly yielding more, also leave the crop exposed for longer periods to water stress and pest losses. Planting plots of varieties with different maturation dates, each of which has it own particular advantages, is another approach to minimising risks. One clear means of increasing rice production, without any major external inputs, is by popularising shorter duration improved varieties. Planted early in the rainy season, shorter duration varieties also offer the possibility of using residual soil moisture with a short duration (e.g. 50-60 day) post-harvest catch-crop of peanuts or legumous ground cover.

Undertaking the necessary research and extension work for identifying the right rice variety(ies) for each type of location, and then underwriting farmer-trials would be probably the best way of both ensuring that farmers had seed stock for appropriate varieties available and popularising new approaches to rice cultivation. Training farmers in Integrated Pest Management (IPM) using the FAO developed Farmer Field School method, would assist them understand the ecology of rice cultivation and pests/diseases (which they currently do not know about) and avoid losses by 'growing a healthy crop' (Pontius et all 2000).

Reducing risks and ensuring a harvest, if it is anticipated that the rainy season will be late or

18 See: this pages of the IDRC website http://www.idrc.ca/en/ev-84706-201-1-DO_TOPIC.html to download the three volume set of source books. (Participatory Research and Development for Sustainable Agriculture and Natural Resource Management) The following resources on the IDRC website also contain useful resources An Introduction to the Human Development and Capability Approach (http://www.idrc.ca/en/ev-143029-201-1-DO_TOPIC.html); and: Communities, Livelihoods, and Natural Resources (http://www.idrc.ca/en/ev-97782-201-1-DO_TOPIC.html).

19 The AKST report (Agriculture at a Crossroads - Global Report) can be found at http://www.agassessment.org/.

unreliable, by having seed stock for alternative crops available, e.g. maize, sesame – is another means of decreasing vulnerability and increasing resilience. The level of post-harvest losses is unknown, but any low-tech methods for (further) reducing such losses would obviously improve food security.

Given the (drastically) reduced fallow cycle, identifying means for maintaining soil mass, fertility and health is critical. There are a broad range of methods for doing this, including rotations with nitrogen fixing cover and forage crops.[20]

7.6.2 Revitalising and Protecting Local Forests

The degraded state of local forest is one of the key issues that needs to be addressed, while at the same time realising that this is likely require a medium- to long-term commitment by the community to both revitalise and protect their local forests. It is notable that communities currently just exploit available forest areas with no or little thought given to maintaining their productivity. This attitude is leading to accelerated degradation and undermining community food security. The direct roles that forest play in communities' welfare is summarised in the following table.

Increasing the amount of food and other products available from the local forest would help reduce pressure on other parts of the agroecosystem, in addition to restoring the forest 'food bank' to boost food security. The revitilisation and possible expansion of forest areas would clearly assist protect the remaining biodiversity and may also have beneficial effects on stabilising the local micro-climate.

In the Lao uplands our discussions showed that there are areas of local forest – now much reduced – that each community considers it 'owns'. There are also many areas of residual forest on steep hillsides, usually on either side of a small valley, gully or watercourse. These are all potential candidates for enrichment and protection.

Broadly, three complementary and parallel approaches are suggested. First, identification by the community of the range of plant species that have traditionally been considered important for food, medicine, fuel, fodder and building materials. This could be undertaken by tapping the knowledge of older people, particularly women, in the community to identify these species and their uses. This would be followed by determining which of them was now missing from the local forest. NCA could then use its own network of project villages to identify which other village forests still had these species present, and obtaining seed, cuttings or plants from them for reintroducing into the local forests. The task would be to actively manage those parts of the forests where collections of reintroduced plants have been planted and using these for further plantings. This process might take one or two years to complete. The second aspect is identifying the areas of forest that the community has a strong traditional claims to, and making their goal of protecting and enriching these areas public knowledge and, to the degree possible, formalising the protecting the existing and now regenerating forest,. Third, making an assessment of the species used for fuel and building, or to be grown for sale, and how much of each species the community anticipates will be needed each year, and how long each species will take to mature. This would provide the information necessary for planning the active management of major forest resources.

7.6.3 Irrigated Valley Bottom Rice Cultivation

The value and vulnerability of irrigated rice cultivation in valley bottoms has already been mentioned; suggestions for a more durable weir design were also offered. There are three further steps that could be taken to increase and stabilise production from these fertile lands. First, making improved seed of traditional varieties available to farmers, especially varieties with short to medium maturation periods (i.e. 120-140 days), and providing them with training in the best methods of cultivating these varieties. Second, using the Farmer Field School (FFS) approach to assist farmers understand the ecology of their rice fields

20 e.g. Cover Crops in Hillside Agriculture: Farmer Innovation with Mucuna (http://www.idrc.ca/openebooks/269-4/).

Direct Roles of Forests in Household Livelihood Strategies

Poverty aspects	Function	Description
Safety net	Insurance	Food and cash income in periods of unexpected food and income shortfall
Support current consumption	Gap-filling	Regular (seasonal, for example) shortfall of food and income
	Regular subsistence uses	Fuelwood, wild meat, medicinal plants, and so on
	Low-return cash activities	A wide range of extractive or "soft management" activities, normally in economies with low market integration
Poverty reduction	Diversified forest	Forest activities that are maintained in economies with high market integration
	Specialised forest strategies	Forest activities that form the majority of the cash income in local economies with high market integration
	Payment for environmental	Direct transfers to local communities from off- site beneficiaries

Source: Stern et al p. 98. Based Arnold (2001), Kaimowitz (2002), Angelsen and Wunder (2003), and Belcher, Ruiz¬perez, and Achdiawan (2003)

and better manage pest and disease problems (i.e. Integrated Pest Management). Third, working with farmers to develop a crop calendar that makes use of the land all year round through careful crop rotations that maintain or improve soil fertility, especially if they are able to integrate their cropping system(s) with small livestock and make active use of composts.

7.6.4 Dryland Cultivation on Valley Bottom Land

The extent of areas of valley bottom land suitable for more intensive cultivation are much greater than those where irrigation is possible. Much more intensive integrated cultivation of these valuable resources for food, fodder and cash crops is possible, but it is anticipated this will require extended assistance from NCA, supplemented by practical advice from external training and technical specialists.

In general, the aim would be to create a valley bottom poly-culture agroecosystem that integrates arable crops (grains, vegetables and tubers) with tree crops and small livestock. This type of system, when carefully implemented, has the great advantage that it provides a wide range of different products throughout the year and is more resilient to delayed or below average rainfall. One serious drawback may be that severe flooding will in some years wash away some or all of the arable crops

and some of the tree crops, in compensation floods will deposit a layer of fertile silt.

At this point in time two major approaches are suggested. First, a basic survey of the bottom lands that are available to each community, their areas and the crops and vegetation that are currently being growing there and, to the extent possible, a rapid assessment of soil types and fertility. Second, a participatory assessment by the community of the types of crops (arable and perennial) they would like to grow there, and what forms of assistance they might need to achieve this. This will likely require outside assistance, either by an external specialist familiar with the cropping potential of such locations or by a local person who has received practical training in these skills; in the medium term, establishing local expertise will be essential.

As far as possible the crops and trees selected should complement those being grown in other parts of the village agroecosystem, including other valley bottom areas. Consideration may also be given to growing crops that can be sold, either directed, e.g. broom grass, or after processing in the village, e.g. pickled garlic. There is a wide range of practical information available on polycultural farming, a considerable amount already in the Lao language (see www.lao44.org), that can be used to assist in identifying crops and training farmers.

Consideration should also be given to types of crops that have not been grown in the area before, in particular herbs and species that require the cooler climate of the uplands and the more fertile soils of the valley bottoms. There is a steadily rising demand for these, ensuring that prices are favourable and stable or rising. Intensive cultivation of selected herbs and spices, linked to village processing and packaging with innovative marketing, could provide a reliable source of income from low-volume, high-value products with a long shelf-life and low transport costs. Priority might be given to herbs and spices suitable for the rapidly growing East Asian market.

7.6.5 Large and Small Livestock Husbandry

As previously noted, it appears that raising cattle, although very popular, is only feasible in a minority of locations; 4 out of 26 villages in Long district. However, pigs, goats and poultry (chickens, ducks, turkeys), and others species like frogs and rabbits, require much smaller areas for growing fodder and are simpler to manage. The potential of fish ponds needs to be explored. Cattle, particularly calves under about one year age, could be easily integrated into valley bottom farming, and improved nutrition would improve their health and speed-up growth and maturation, hence reduce time-to-market.

While there are advantages to allowing most livestock to free-range, production can only be reliably increased when they are penned or fenced, and provided with nutritious diet and improved veterinary care; stall feeding also makes collection of dung for composting easier. These kinds of conditions are most easily met if small livestock are integrated with valley bottom farming

7.6.6 Increasing Value Added Production

Wherever feasible, taking into account potential markets and the economics of production and transport, consideration needs to be given to identifying crops and other products that can be sold. The range of items may not be large, especially initially, but the added cash income could make an important contribution to paying essential health and education costs, or providing new facilities, tools and equipment for families or the community. In addition, it would proved additional income earning employment and will also add to the range of skills of community members.

8. PRELIMINARY ASSESSMENT OF NCA CAPACITY BUILDING NEEDS

8.1 INTRODUCTION

This is necessarily a very preliminary assessment of capacity building needs, as a thorough assessment of current staff capabilities has not been undertaken, nor have the goals objectives and strategy for addressing adaptation needs been formulated. Hence, this assessment is generic and focuses on guiding principles.

Based on the assumption that NCA has approximately a five-year time frame in which to develop the necessary capabilities at the community level, it is the needs of the communities that are taken as the starting point for defining NCA staff capabilities.

As has been implicit in the discussion so far, adapting to climate change will affect virtually every aspect of peoples' lives, both those in upland communities and elsewhere. The rate which communities will need to adapt will quite likely generally be slow, but as the effects of global warming are not understood in detail there may well be sudden and unpredictable changes that will require rapid action.

The disciplinary focus is on skills related to increasing the resilience of agroecosystems, given that the most obvious and quickly felt effects of climate change will occur in the environmental systems on which food supplies and food security depends. The major elements of these systems have been described and a range of approaches and methods proposed for strengthening them and also increasing the economic diversity of upland communities, so as to provide opportunities for additional income and skills development.

It is important to note that the approach to training, and the methods and materials developed, would provide staff with knowledge and skills that will significantly enhance NCA's capacity for undertaking all aspects of its current project. Hence, the investment in capacity building will be broadly beneficial, and, it can be anticipated, provide a firm basis for the communities to continue to improve their welfare and environment beyond the end of the project.

8.2 FUNDAMENTAL PRINCIPLES

Three general principles are strongly advocated. First, all training, including that of trainers, should be conducted using Adult Education principles and practices. Second, all training should be field-based, with classroom work reserved for specific tasks or issues. Third, all training should be conducted for groups of farmers or members of the community, so as to develop skills in group problem identification, analysis and strategy/solution formulation, and so as to enhance farmer and community solidarity and their confidence is being able to solve problems and overcome difficulties.

As a general principle all training courses should be conducted using well proven methods of adult education or androgogy. This has important differences from the kind of instruction that is used to teach children (pedagogy) and the types of training that are conventionally used for agricultural extension (i.e. demo plots and training and visits – T&V). Using methods that work with children is not appropriate or effective with adults, and results in boredom and frustration for the trainees, and a serious waste of time and resources by the organisation. The 'demo plot and T&V' approach was shown to be almost totally ineffective about 30 years ago. Given this, there is no rationale for continuing to use it, especially when much more effective and economic methods are available.

Almost all of the skills that farmers and communities will require to increase the resilience and decrease the vulnerability of their agroecosystems are practical and field-based. Hence, the 'classroom' should be the farmers' fields or the forest, for example. Group work in these situations places the real world situation right in front of the group, allowing the trainer to guide the members of the group through the process of identification, analysis and solution formulation. This ten provides the group and individual with the skills to follow

Photo: Jim Holmes/NCA Laos

the same steps in making innovations or tacking problems in their own fields.

Experience shows that a group with a maximum size of 25-30 farmers is the largest that can be effectively handled by one trainer, unless they are particularly skilled and experienced. From this larger group, smaller groups of 4-5 farmers can be formed as working teams to tackle specific exercises, with the small group then presenting their findings to the larger group for discussion and reflection. These groups, which can be formed and reformed based on the task at hand and the participants preferences, can also provide the basis for their members working together to address larger problems in the farming landscape or community.

8.3 A GENERIC APPROACH

The goal of capability building for planning, implementing and managing adaptation is for the necessary practical knowledge and skills to be located within the NCA project communities. To the extent feasible it would be worthwhile to also increase the capabilities of local government and NGO staff, but this should not be allowed to hinder or delay the essential community-focused training. In this regard, a 'Climate Adaptation Knowledge Network' may provide a means for making training more widely available, especially if the focus for the wider group is on the 'Training of Trainers' (ToT) as the second step in the process.

A realistic preliminary objective might be to have the first cohort of properly trained trainers

complete their training by late 2010, ready to begin the process of scaling-up the effort both at the community level and through further ToT courses. Ideally, the best of the first cohort of trainers would be selected for further training, especially in advanced training skills, and by about mid- to late-2011 be almost ready to be 'Master Trainers' capable of organising and delivering ToT courses independently.

Trainers will require skills and knowledge about both technical and training (adult education). The range and depth of practical technical skills and agroecosystem knowledge required for them to be effective trainers is considerable. Moreover, in addition to gaining these skills and knowledge it is vital that ToT participants also master the range of training skills necessary for them to be effective trainers.

Given that trainers will be usually working in remote villages without easy access to back-up support for technical information or training methods, it is essential that they be capable of operating independently. In the initial stages, during and following completion of their ToT course, it will probably be best for them to work in teams of two or three. This way they will provide mutual support for one another and collectively possess a broader fund of technical knowledge.

8.4 TRAINING OF TRAINERS

Experience from other locations (e.g. USAID's Environmental Services Project in Indonesia) suggests the initial ToT will need to be about 3-4 months in duration. This would be a full-time, intensive field-based course where the trainers and participants would spend most of their time working with upland communities. The course would be based on a curriculum developed by the trainers, with guidance and assistance of experienced external advisors.

It is anticipated that the curriculum would require about 2-3 months to prepare, and once this is completed another 1-2 months would be required to prepare course materials, and identify and gain agreement from communities to participate in the training process. Identification and selection of the first cohort of ToT participants might require about one month. Hence, by about late-2010 the first ToT would have been completed, and the new graduates would be ready to start work in the communities.
Given NCA's modest resources and the fact that there are only 33 communities participating in the project, the number of participants in the first ToT could be limited to 10-15 people. The number of participants could be increased to a maximum of about 30, if NCA can collaborate with other NGOs to fund, design and deliver the ToT.

By the end of 2011 it should be possible to identify sufficient young people from the communities who are suitable and motivated to participate in a ToT. In this way, the necessary skills and knowledge would become 'embedded' in the community, and it is possible that these people could then begin to earn (part of) their livelihood by providing training to other communities.
A decision on whether to prepare and conduct a training course for Master Trainers could be made in mid 2011, depending on the perceived demand, the number of potentially suitable candidates, and the level of collaboration achieved and funding available.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 INTRODUCTION

It is possible for NCA to make a substantial contribution to assisting the upland communities it is working with adapt to climate change, even with the modest resources available, and especially if complementary funds can be added through collaboration and/or new funding. The key lies in focusing on providing them with 'weightless' assistance in the form of new skills and knowledge, not only practical skills but also capacity for group observation, analysis and strategy formation for tacking new challenges.

The time scale involved in adapting to climate change – steady action over decades – require that the means for adaptation will need to be 'absorbed' into the communities in the form of new skills and knowledge, and this requires training younger people who can then, in turn, pass their skills and knowledge on to their neighbours and children. It also requires clear recognition that substantial additional financial, physical resources or infrastructure are unlikely to ever be available to upland communities. In brief, they have to do the best they can with what they have.

These two factors make it important that the assistance NCA may choose to provide has the potential for spanning decades, albeit indirectly, and focuses on building community resilience largely within the limits of the resources currently available. As these communities are almost wholly dependent on their agroecosystems, and food and other goods from these are the key to community security, these are the places to focus attention and available resources. The approach suggested here is building the human skills necessary to identify and make use of these resources, and achieving those through establishing a well-trained cadre of young people to transmit these skills to the communities.

What is being proposed requires a change in emphasis in NCA's current strategy and activities, not a change in direction. This is because addressing issues of adaptation requires a strategy that is essentially the same as NCA's for sustainable community development, which has as one of its elements improving environmental management and conservation.

9.2 GROWING RESILIENCE

The conceptual framework to this approach has been described in Chapter 7, and does not need to be repeated here. However, this is just the first step, and the approach suggested needs to be carefully peer reviewed and assessed. If, in general terms, it is judged to be valid and practical, then a more detailed draft strategic plan, with specific and integrated goals, objectives and strategies need to be prepared, accompanied by a draft implementation schedule and budget. Separate strategies will be required for Long and Pha Oudom districts, as their history and current situations are quite different. However, there are also common aspects in each situation that need to be identified, so they can be addressed in similar ways when preparing strategies.

To the extent possible these plans need to be prepared by the NCA teams working in each district, with external assistance as required. Part of the preparation needs to be directed to identifying and discussing with potential collaborators the principles under which cooperation would be feasible and possible, and preparing documentation for potential formal agreements. It would also be politically correct and sensible to engage the government in the preparation process, to the degree feasible, and seek to locate the approach within the policy 'umbrella' offered by the recently prepared NAPA for Laos. Given the new PLUP guidelines[21] available in Lao and English languages, it would be important to see how these might be integrated with the strategy.

21 "Participatory Agriculture and Forest Land Use Planning at Village and Village Cluster Level" (MAF 2009)

9.3 CLIMATE ADAPTATION NETWORKING

The challenges faced by the communities NCA is working with are going to be repeated with variations all across northern Laos (and elsewhere). Communities that have NGOs like NCA already assisting them will be in a relatively favourable position, compared to those who have to depend on their own resources and limited support from government.

Communities, NGOs and government will all be struggling to design and implement responses to a class of metaproblem that has not been faced before, with a time-scale far longer than they are familiar with (decades, not years). Moreover, it is not at all certain that the NGOs working in a given district, province and/or region will still be working there five or ten years from now, in addition new NGOs are likely to commence work during this long period. These factors make it essential that consideration be given to two aspects of this problem, so as to: i) the lessen the burden of individual organisation and ii) ensure that a collective 'institutional memory' of approaches, analyses, methods, plans, activities and results is established and maintained.

This might best be achieved by establishing a network linking as many as possible of the stakeholders who are working on various aspects of climate adaptation. Depending on the approach agreed by those involved, e.g. communities, government agencies, NGOs, multi- and bi-lateral donors, schools, academic and scientific organisations, media and private sector organisations. The network might best be established through a formal 'letter of agreement' between the stakeholders as a separate organisation and supported by contributions (e.g. funds, logistics, equipment, personnel) from members of the network.

Broadly, the tasks of the network would be to collect, analyse, re-present and translate, and disseminate relevant information and practical knowledge about climate adaptation as it relates to upland communities and their agroecosystems.

9.4 INFORMATION STATUS AND NEEDS

The amount of project-related information available from NCA is very limited, and this severely constrained the extent to which the scale of climate adaptation challenges could be analysed or quantified. As noted later in more detail, it is suggested that NCA undertake a systematic identification of the variables that will needed for the design, planning, implementation and monitoring of climate adaptation activities, specifically focused on agroecosystems and key areas of public and reproductive health. These include at least the following: more complete time-series data, regularly updated, for key demographic and socio-economic variables; and sketches of land use and land use changes for each village,

In essence, it would be advisable to consider preparing a *human ecology* profile for each village, describing how the people in the community make use of and interact with their environment. Members of the community, particularly younger people, should be fully involved in surveying, collecting and preparing each profile; the exercise might best be structured and conducted as on-the-job training, and those involved paid a stipend for their contributions. This material, updated as needed, could become the basis for village adaptation planning and monitoring.

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- Gender Based Violence
- Livelihoods and Trade
- Climate Change Adaptation
- Access to Quality Health Care
- Social Mitigation of HIV and AIDS

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