Assessing impacts of agricultural research for development in culturally diverse environments in the Northwest Highlands of Vietnam —

Sustainability, participation and communication

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Abstract

Since the late 1990s, various development efforts and research initiatives have been conducted by national research institutions and international development agencies for the economic development of the Northwest Highlands of Vietnam. A shift towards a research for development approach, which targets the immediate use of research outputs for development purposes, became apparent in the late 2000s. These agricultural research for development (AR4D) projects have adopted participatory processes in an attempt to better link the research with development. It is important to understand the contribution of these AR4D projects to rural development, not only in terms of knowing the extent of the impacts and their sustainability but also for informing appropriate agricultural policies and research for development strategies in the future.

Despite the importance of knowing the impacts of AR4D, the impact assessment of agricultural research initiatives in the Northwest Highlands remains problematic in regard to both the objectives and methods. This study developed a holistic impact assessment framework for the Highlands and tested the proposed framework in order to validate its appropriateness and gain insights into how AR4D underpinned by participatory processes can contribute to better changes in people’s lives. The results of the application of this framework would also help to inform future development policies and effective AR4D interventions with a particular focus on a highly culturally diverse region.

To achieve the overall objective, this study employed mixed methods largely based on qualitative data collection methods in combination with documentary research. The documentary research included a review of the literature on development theories and practices related to the impact assessment of AR4D projects. It also included an examination of secondary sources on the impact assessment approaches in agricultural research projects implemented by active research institutions and development agencies in the Northwest Highlands. The primary data was collected by primarily using qualitative methods such as focus group discussions (FGDs) with farmers, semi-structured interviews with farmers, and in-depth interviews with key informants including local leaders, agricultural extension staff and agricultural researchers who were actively involved in research projects in the Highlands. This was complemented by a limited amount of quantitative data derived from the interviews. The fieldwork was conducted in two districts of Son La province, covering the implementation sites of three agricultural research projects. The purposive sampling method was used for the selection of participants of both the FGDs and in-depth interviews. Three field trips to Son La were made, in December 2012, September 2013 and July 2014.

The initial findings were reported back to the participants in order to elicit their feedback and validate the data. All the gathered primary data and information was recorded, reviewed and translated into English. Thematic analysis was used for data analysis and interpretation of the research findings. This
involved cleaning the quantitative and qualitative data, coding the data based on its themes or patterns, and carrying out analysis with the assistance of the latest SPSS software.

The research results indicate that a conventional top-down approach with limited attention paid to the social complexity of the Northwest Highlands was used in most of the Vietnamese Government-funded and international agency-funded research projects. A short-term and economic focus was taken in the impact assessments of most research projects in the region. The impact assessment efforts aimed to measure direct research outputs, report scientific findings and analyse cost-effectiveness for donors and funding agencies rather than account for the sustainable livelihoods of the target communities. Weak mechanisms for sharing impact assessment results with and getting feedback from stakeholders was also identified as a major cause of a low level of contribution of impact findings to local livelihood development. These weaknesses also led to poor evidence on how the AR4D projects had contributed to – or rather, failed to deliver – sustainable impacts in the Northwest Highlands.

The research findings indicate that the framework that includes the five key components: 1) types of agricultural research, ii) key groups of assessment indicators; 3) impact assessment strategies, 4) methods and tools used for impact assessment and 5) communicating results to stakeholders can help to measure fully impacts of AR4D. This proposed holistic impact assessment framework utilising the sustainable livelihoods framework and participatory methods can help to assess the contribution of participatory processes in AR4D projects to subsequent development outcomes in different social contexts. This impact assessment framework can be utilized not only for the Northwest Highlands of Vietnam but also for other countries and regions with similar levels of socio-economic and cultural diversity. Using the sustainable livelihoods framework as a lens for identifying multiple livelihood impacts provides a better understanding of the complexities involved in social change and development, while participatory techniques enhance the participation of the target stakeholders in the impact assessment processes.

By applying the proposed impact assessment framework in three agricultural research projects in the Northwest Highlands, the study found that the AR4D project that had adopted participatory processes to conduct the research and facilitate the immediate use of research outputs for development achieved better social, human, economic and natural impacts for local communities than the other two projects. The findings suggest that the holistic framework would not work well if researchers lack good facilitation skills or a deep understanding of the local culture and power structures. They also indicate that researchers should pay attention to the flexible use and modification of the framework in order to adapt it to local contexts and to more comprehensively assess the impacts of AR4D in culturally diverse regions.
Declaration by author

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Publications included in this thesis
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Agricultural research for development, participatory communication, participatory process, impact assessment, sustainable livelihoods, the Northwest Highlands of Vietnam

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ANZSRC code: 160801, Applied Sociology, Program Evaluation and Social Impact Assessment (40%)
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Fields of Research (FoR) Classification
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FoR code: 1608, Sociology (40%)
FoR code: 2001, Communication and Media Studies (20%)
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>5MHRP</td>
<td>5 Million Hectare Reforestation Program</td>
</tr>
<tr>
<td>ACIAR</td>
<td>Australian Centre for International Agricultural Research</td>
</tr>
<tr>
<td>ADAM</td>
<td>Appui au Développement de l’Agro-écologie en zone de montagne du Vietnam (&quot;Support for agro-ecology extension in mountainous areas of Vietnam&quot;) Project</td>
</tr>
<tr>
<td>AFD</td>
<td>French Agency for Development</td>
</tr>
<tr>
<td>AR4D</td>
<td>Agricultural research for development</td>
</tr>
<tr>
<td>AusAID</td>
<td>Australian Agency for International Development</td>
</tr>
<tr>
<td>CACERP</td>
<td>Capacity Building for Central Region Poverty Reduction Project</td>
</tr>
<tr>
<td>CASRAD</td>
<td>Centre for Agricultural System Research and Development</td>
</tr>
<tr>
<td>CEMA</td>
<td>Committee on Ethnic Minority Affairs</td>
</tr>
<tr>
<td>CGIAR</td>
<td>Consultative Group on International Agricultural Research</td>
</tr>
<tr>
<td>CIAL</td>
<td>Local Agricultural Research Team of CIAT</td>
</tr>
<tr>
<td>CIAT</td>
<td>International Centre for Tropical Agriculture</td>
</tr>
<tr>
<td>CIRAD</td>
<td>French Agricultural Research Centre for International Development</td>
</tr>
<tr>
<td>DFID</td>
<td>UK Department for International Development</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organisation of the United Nations</td>
</tr>
<tr>
<td>FAVRI</td>
<td>Fruit and Vegetable and Research Institute</td>
</tr>
<tr>
<td>FF&amp;BS</td>
<td>Farmer field &amp; business school</td>
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<tr>
<td>FFS</td>
<td>Farmer field school</td>
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<tr>
<td>FGD</td>
<td>Focus group discussion</td>
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<tr>
<td>FPCs</td>
<td>Forest protection contracts</td>
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<td>FSIV</td>
<td>Forest Science Institute of Vietnam</td>
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<tr>
<td>GDD</td>
<td>Grassroots Democracy Decree</td>
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<tr>
<td>GTZ</td>
<td>German Technical Cooperation Agency</td>
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<tr>
<td>ICM</td>
<td>Integrated crop management</td>
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<tr>
<td>IDS</td>
<td>Institute of Development Studies</td>
</tr>
<tr>
<td>IFAD</td>
<td>International Fund for Agricultural Development</td>
</tr>
<tr>
<td>IPM</td>
<td>Integrated pest management</td>
</tr>
<tr>
<td>MARD</td>
<td>Ministry of Agriculture and Rural Development</td>
</tr>
<tr>
<td>MoLISA</td>
<td>Ministry of Labour, Invalids and Social Affairs</td>
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<tr>
<td>NGO</td>
<td>Non-government organisation</td>
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<tr>
<td>NIAH</td>
<td>National Institute of Animal Husbandry</td>
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<tr>
<td>NMRI</td>
<td>National Maize Research Institute</td>
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<tr>
<td>NOMAFSI</td>
<td>Northern Mountainous Agriculture and Forestry Science Institute</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
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<tr>
<td>PIA</td>
<td>Participatory impact assessment</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>PM&amp;E</td>
<td>Participatory monitoring and evaluation</td>
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<tr>
<td>PPRI</td>
<td>Plant Protection Research Institute</td>
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<tr>
<td>PRA</td>
<td>Participatory rural appraisal</td>
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<tr>
<td>R&amp;D</td>
<td>Research and development</td>
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<tr>
<td>R4D</td>
<td>Research for development</td>
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<tr>
<td>RRA</td>
<td>Rapid rural appraisal</td>
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<tr>
<td>RVCA</td>
<td>Rapid value chain analysis</td>
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<tr>
<td>SIDA</td>
<td>Swedish International Development Cooperation Agency</td>
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<tr>
<td>TBU</td>
<td>Tay Bac University</td>
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<tr>
<td>ToC</td>
<td>Theory of change</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Program</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organisation</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>VASS</td>
<td>Vietnam Academy of Social Sciences</td>
</tr>
<tr>
<td>VNUA</td>
<td>Vietnam University of Agriculture</td>
</tr>
<tr>
<td>WCED</td>
<td>World Commission on Environment and Development</td>
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Chapter 1  
INTRODUCTION

1.1. Research background

The Northwest Highlands of Vietnam is home to over 30 ethnic minority groups such as the Thai, H’Mong, Muong, Dao, Khomu, Ha Nhi, Lao and San Riu, Khang, Si La and Giay (Duc Tuan, 2011). The Highlands is not only characterised by diverse culture and ethnicity, but also by the degree of connectedness to markets. A harsh natural setting, increasing population pressure, low economic condition and low education levels of local people are the major causes of unsustainable management of the agro-ecosystem in the region (Van de Fliert, 2008). Moreover, the participation of local communities and the utilisation of their knowledge have not been adequately considered by extension programs in the Highlands (Thai et al., 2011). These factors have led to unsustainable development of the Northwest Highlands. In the context of market development, the Highlands is challenged by significant socio-economic and environmental problems such as rising production costs, low market competitiveness, a widening poverty gap and soil erosion.

Recognising the problems of the Northwest Highlands, since the late 1990s, there has been a great deal of investment from the Vietnamese Government and international development agencies such as the World Bank, Food and Agriculture Organisation of the United Nations (FAO), Australian Centre for International Agricultural Research (ACIAR) and French Agricultural Research Centre for International Development (CIRAD) through various socio-economic development policies and research initiatives. Most of the agricultural research projects conducted by the Vietnamese Government and national and international research institutes have been aimed at economic development through increasing agricultural production and improving market engagement. The implementation of these projects has historically been top-down with a strong emphasis on the roles of external resources and a variety of media (e.g. leaflets, brochures, local radio, informational meetings, field-based training and workshops) in technological transfers. Little attention has been paid to local cultural identity and empowerment (Van de Fliert et al., 2010b, p. 8).

A shift towards a research for development (R4D) approach, targeting the immediate use of research outputs for development purposes, became apparent in the late 2000s. Unlike conventional agricultural research projects, the overall objective of recent agricultural research for development (AR4D) initiatives is the creation of long-term positive social, economic and environmental impacts in the Highlands. Participatory processes and participatory communication strategies have been adopted in these AR4D projects in an attempt to better link research with development, but with
varying approaches and processes towards stakeholder engagement, ranging from merely using farmers as field labourers to the involvement of farmers as co-researchers. Because of the increased consideration of the natural, social and economic characteristics, AR4D has been seen as a priority in rural and agricultural development strategies in the Northwest Highlands with a focus on increased agricultural production and market development, employment generation and income improvement (Tran, 2006; Van de Fliert et al., 2010b).

As for any development activity, assessing the impacts of AR4D projects is crucial in order to achieve sustainable livelihoods for local communities. The results of impact assessment are not only important for establishing the return of investment of R4D but also for learning how appropriate measures and strategies towards sustainable development should be formulated in the future (Cramb et al., 2003; Krall et al., 2003, p. 329). The use of a holistic impact assessment framework for AR4D underpinned by participatory communication strategies to support sustainable social change in the Northwest Highlands is necessary for a number of reasons. First, various studies have pointed out that the selection of an appropriate impact assessment method for a particular project could help to achieve good impact assessment indicators at different levels of contributions (Meinzen-Dick et al., 2003; Tran et al., 2008). Second, there is some consensus that the impact assessment of agricultural research should not only look at short-term economic gains but also at human, social and environmental impacts (Cramb et al., 2003; Van de Fliert et al., 2010a). Third, it is important to recognise local culture and diversity in impact assessment approaches in R4D projects (Binder & Schöll, 2009; Catley et al., 2008).

The impact assessment approaches traditionally applied in Vietnam have not paid adequate attention to measuring all the factors that contribute to the achievement of sustainable livelihoods for local communities. Moreover, it is generally assumed (but increasingly debated and largely unproven) that the participation of farmers enhances the applicability of research outputs. Understanding the contribution of a participatory approach to the sustainability of impacts is important for informing appropriate AR4D strategies in the future.

Over the past two decades, various impact assessment approaches have been adopted for assessing agricultural research projects the Northwest Highlands. However, the contribution of past and present impact assessment approaches to the development of the Northwest Highlands, and to the formulation of an innovative impact assessment methodology for such a culturally diverse region, remains questionable.
1.2. Problem statement

A holistic approach towards the assessment of the impacts of AR4D underpinned by participatory processes is important for developing countries in economic transition to help understand the support needed for sustainable change. The impact assessment approaches used in developing countries and regions, including the Northwest Highlands of Vietnam, are limited by weaknesses in regard to both their objectives and the methods used to achieve those objectives. These weaknesses tend to result in data with low validity and in findings with little ability to explain the wider set of indicators that define sustainable livelihood development.

A review of impact assessment approaches by Marasas et al. (2001, p. 201) showed that short-term and quantitative impact indicators are commonly used in mainstream assessment approaches. Most impact assessments focus more on the economic indicators of technology development and transfer than on the social, human and other development indicators that support sustainability in development (Ashley & Hussein, 2000; Mayoux & Chambers, 2005, p. 271). Many factors and relationships between technologies, vulnerability contexts and household resources, intervening institutions and livelihood strategies are not captured by conventional impact assessment methodologies (Adato & Meinzen-Dick, 2002). In addition, a criticism has been made of the overemphasis on internal management issues and the use of more quantitative impact indicators designed by outsiders to assess whether or not a project or program has met its initial set of objectives (Ashley & Hussein, 2000, p. 13). Mayoux and Chamber (2005, p. 275), for instance, report that, although both quantitative and qualitative research methods are used in existing impact assessment paradigms, quantitative surveys are more popular. They also emphasise that participatory techniques have been adopted as “fashionable and ‘politically correct’ frill” with little meaningful focus on qualitative aspects. Krall et al. (2003, p. 336) suggest that the feedback mechanisms in impact assessments should be improved in order to enhance the effectiveness of AR4D initiatives.

Looking specifically at impact assessment practices in agricultural research including AR4D projects in the Northwest Highlands, carried out by various authors such as Dao et al. (2006), Do et al. (2010), Ha et al. (2010), Tran et al. (2009) and Lindner and McLeod (2008), it was found that these approaches followed global impact assessment trends. The main weaknesses of most impact assessment initiatives in the Highlands were identified as a short-term and economic focus, top-down communication approach, overemphasis on direct research outputs and the analysis of cost-effectiveness for donors, gaps in researchers’ understanding of local culture and languages, and poor feedback mechanisms. These weaknesses led to unconvincing evidence about the contribution of past and current impact assessment approaches of agricultural research projects to the development of the Highlands.
Although AR4D projects play an important role in the development of the Northwest Highlands, few attempts have been made to assess the effectiveness of existing impact assessment approaches in AR4D in the region and how they contribute to understanding the need for follow-up research and development initiatives. Local governments, development agencies and research institutes all have limited understanding about the significance of impact assessment for the effective support of sustainable development. Therefore, this study's analysis of current impact assessment strategies and testing of alternative impact assessment approaches in order to develop a holistic impact assessment framework for AR4D in the context of the Highlands represents a significant step forward. An appropriate impact assessment framework will help to increase understanding of the contribution of participatory processes in AR4D projects in the Northwest Highlands. It will also contribute to the formulation of suitable development strategies for the Highlands. Such an impact assessment framework could also be utilised for other regions with similar levels of socio-economic and cultural diversity.

1.3. Objectives and significance of the study

Objectives
The overall objective of this study is to develop a framework for assessing the impacts of AR4D projects showing how the processes that guide research projects targeted towards development objectives contribute to a broad set of impacts that define sustainable livelihoods. The results of the framework can be used to inform agricultural development policies with a particular focus on culturally diverse regions at various stages of transition towards market-oriented agriculture. Accordingly, this study has three specific objectives:

Objective 1: To examine and analyse existing frameworks and approaches to the impact assessment of AR4D projects in the Northwest Highlands of Vietnam;

Objective 2: To develop an impact assessment framework for AR4D that helps to analyse the contribution of stakeholder engagement processes in research towards sustainable impacts;

Objective 3: To validate the utility of such an impact assessment framework for AR4D.

These research objectives are addressed by pursuing the following five interconnected research questions (RQ):

RQ1: What frameworks and approaches have been applied to assess the impacts of AR4D projects in the Northwest Highlands over the past decade, and what are their strengths and weaknesses in terms of informing agricultural development policies?
RQ2: How, if at all, do these frameworks and approaches explain the contribution of participatory processes towards sustainable impacts?

RQ3: What methods and key indicators can be identified to assess the impacts of AR4D from a comprehensive livelihoods perspective in a region at variable stages of agricultural development and social change?

RQ4: What strategies can be formulated to utilise impact assessment findings towards influencing development policy, decision-making and practices for the Northwest Highlands?

RQ5: What are the potential uses of a new impact assessment framework for the various stakeholder groups engaged in AR4D in the Northwest Highlands?

Significance of the study

The findings of this study will enhance the understanding of both existing impact assessment frameworks and approaches and the impacts of AR4D projects underpinned by participatory processes in the Northwest Highlands of Vietnam. This improved understanding will contribute to the formulation of appropriately targeted development policy and strategies for the Northwest Highlands. Based on original analysis of existing impact frameworks and approaches, a holistic impact assessment framework that can analyse fully the contributions of AR4D projects underpinned by participatory processes in the regions is developed. This holistic impact assessment framework will be a resource for assessing the impacts of participatory processes in other AR4D projects, which are conducted in areas and regions with socio-economic and natural conditions similar to those of the Northwest Highlands.

1.4. Contents of the thesis

The thesis comprises eight chapters. The introductory chapter laid out the rationale for the study, providing the background information, problem statement, objectives and research questions. Chapter 2 presents an overview of agricultural and rural development in poverty-stricken regions of Vietnam, thus providing the background information for the research. Chapter 3 discusses the theories and practices relevant to the impact assessment of AR4D projects. This chapter mainly deals with Objective 1 and aims to answer RQ1 and RQ2 of the research. The selection of the research strategy and the data collection and analysis methods for this study are described in Chapter 4. The validity and reliability of the research results are also discussed in that chapter. Chapter 5 presents the holistic framework developed in this study for assessing the impacts of AR4D projects underpinned by participatory communication strategies. Objective 2 is mainly addressed in this chapter. Chapter 6 provides information about the three agricultural research projects in the Northwest Highlands.
selected for the validation of the proposed holistic impact assessment framework. In Chapter 7, the research findings from applying the framework are analysed. Chapter 5, Chapter 6 and Chapter 7 focus mainly on dealing with RQ3, RQ4 and RQ5 to achieving Objective 3 of the research. The major conclusions drawn from developing and validating the holistic impact assessment framework for AR4D projects in the context of the Northwest Highlands are stated in Chapter 8. These conclusions inform valuable lessons about how AR4D underpinned by participatory communication strategies could generate better livelihood impacts on target communities and how an appropriate impact assessment framework can help to identify and measure these impacts. The limitations of the study and recommendations for future research are also discussed in the final chapter.
Chapter 2
BACKGROUND

2.1. Agricultural and rural development in Vietnam

2.1.1. History of agricultural and rural development

Vietnam has a total natural land area of 33 million ha and a population of approximately 87 million people as at 2010 (General Statistics Office of Vietnam [GSO], 2011). As the majority of the territory is hills, mountains and surface water area, agricultural land per capita is among the lowest in the world with less than 0.3 ha per capita as at 2009 (World Bank, 2010, p. 35). The country has experienced tremendous difficulties and faced many challenges in socio-economic development progress because of long wars and chronic poverty. According to the 2009 general census on poor households and marginally poor households, the total population of Vietnam was 85,846,997 people with 54 ethnic groups including Kinh (85.7%), Tay (1.9%), Thai (1.8%), Muong (1.5%), Khmer (1.5%), H’Mong (1.2%) and others (6.4%) (Ministry of Planning and Investment, 2010). The literacy rate was 94% of the population aged five years and above (Ministry of Planning and Investment, 2010). Agricultural labour accounts for 70% of rural labour and about 50% of the total labour in the country (Nguyen, 2010).

After the reunification of the country in 1975, the rural areas experienced a period of agricultural collectivisation managed by a centralised planning mechanism. By the end of the 1960s, 40,422 cooperatives were established all over the North of Vietnam with a membership of 2.4 million farm households (86% of total farm households) (Tran, 1998b). Following the directions of the Vietnamese Government, collectivisation was expanded to the Central and the Southern regions. By the end of the 1980s, 83% of households in the Central region had joined agricultural cooperatives. The cooperative development process in the South was slower and on a smaller scale, with 272 agricultural cooperatives set up by the end of 1979 (Tran, 1998b). However, the collectivisation and central planning mechanism proved to be problematic and hindered the development of the country through weak economic management, disincentives for farmers to engage in production and the waste of time, land and other resources for agricultural production, leading to economic inefficiency in agriculture (MacAulay et al., 2006; Tran, 1998b).

Since the mid-1980s, the Vietnamese Government has undertaken significant reform of policies and the country has undergone a rapid socio-economic development process. In 1981, the passage of Directive No. 100–CT/TW by the Central Committee of the Vietnam Communist Party on the mode of contracting final products to individuals or groups of labourers in agricultural production sectors
was a starting point for the socio-economic transformation of the country (MacAulay et al., 2006; Tran, 1998b). In December 1986, the Sixth National Congress introduced a wide-ranging set of reforms known as *doi moi*\(^1\). The Government recognised a number of failures that had resulted from central socio-economic planning, especially in the rural and agricultural sectors (Bui & Nguyen, 2006; MacAulay et al., 2006). The de-collectivisation of agriculture and the allocation of land to individual households are identified as the main factors in the success of *doi moi* policies in the rural agricultural sector (Saint-Macary et al., 2010). An improved economic climate created good conditions for the success of the new agricultural policies (Henin, 2002). In spite of weaknesses in implementation, the de-collectivisation process in the agricultural sector helped Vietnam to achieve a dramatic economic growth rate of about 7% in the 1990–2010 period (Nguyen et al., 2010b; World Bank, 2011, p. 10) and a rapid reduction in the poverty rate from almost 60% in 1993 to about 14% in 2008 (World Bank, 2010, p. 15), enabling the country to reach the status of a lower-middle-income country by 2009 (World Bank, 2010, p. 15).

On April 5, 1988, the Vietnamese Communist Party Politburo implemented Resolution 10, which recognised the importance of private property rights and the need for each region to design a suitable development model for its own natural, economic and social environment conditions (Castella et al., 2006a, p. 147). Resolution 10 stimulated agricultural production and restored the ownership of the means of production (production cattle and equipment) to individuals. This privatisation scheme was a key starting point for transforming Vietnam from a centrally-planned economy to a market-oriented economy.

Following *doi moi*, the Vietnamese Government issued many new development policies for agricultural and rural development. The Land Law (2003) (following revisions in 1993, 1998 and 2001) is an important legal and practical framework for land management in Vietnam. This framework confirms the State’s rights to ownership and management of land, prescribes land classification and planning, and sets guidelines for the allocation of land use rights to individuals, households and economic and administrative organisations. It also establishes the rights and obligations of land users, and sets out the administrative procedures on land management and use (World Bank, 2010). Decree No. 13/CP (1993) on agricultural extension established the nation-wide agricultural, forestry and fishery extension. This institutional arrangement provides a mechanism for the operation of extension activities, implemented by both the professional extension system and voluntary organisations. Moreover, the Law on Forest Protection and Development (2004) addresses forest planning, allocation and forest ownership transfers, and the rights and obligations of forest owners. It also establishes the principles, responsibilities and methods of forest protection,

\(^1\) *Doi moi* means reform, renovation or transformation.
development and use, thereby creating a legal framework for sustainable resource management and poverty reduction in Vietnam (Bui & Hong, 2006). Although there have been debates on the efficiency of decentralisation, the issuance in May 1998 of Decree No. 29/CP on the Exercise of Democracy in Communes, known as the “Grassroots Democracy Decree” (GDD), set up the legal framework for increased transparency, participation and accountability at local government levels (Centre for International Economics, 2002; Geppert et al., 2002). As amended in July 2003 by Decree No. 79/2003/ND-CP on the Exercise of Democracy in Communes (Government of Vietnam, 1998b, 2003), the GDD has been seen as essential for participatory planning, monitoring and evaluation of development activities (UNDP & VASS, 2006).

Over the past two decades, the Vietnamese Government, international development agencies and NGOs have carried out various socio-economic development projects and long-term development strategies as well as massive agricultural extension activities (Bui et al., 2004; Government of Vietnam, 2008). Like most developing countries, Vietnam has been driven by a modernisation paradigm in which concomitant top-down technology transfer and diffusion models are preferred for development. To push the socio-economic development, massive capital and technologies have been transferred into the rural and agricultural sectors to improve infrastructure systems, housing and agricultural and forestry production.

To mention some examples, Program 135 for the socio-economic development of communes in ethnic minority and mountainous areas of Vietnam was initiated in 1998, expanded in 2006 and terminated in 2010 (Ha, 2009; World Bank, 2009b). Millions of US dollars were invested in the Greening the Barren Hills Program (Program 327) and the Five Million Hectare Reforestation Program (5MHRP) (Program 661) with the focus on greening barren land and protecting existing forest areas (Government of Vietnam, 2001; World Bank, 2010). The government’s annual investment per target commune increased from VND860 million in 2006–2007 to 1,364 million in 2010 (Tri Dung, 2010). In the 2006–2010 period, the National Target Program for Poverty Reduction was also carried out by the Vietnamese Government with the total investment amount of VND43,488 billion (approximately USD2,600 million) for agricultural production development, capacity building and livelihood improvement (MoLISA, 2009). Together with these investments, the mass media was adopted for the transfer of scientific knowledge in order to change attitudes and behaviours and build the capacity of local people.

In the new context of market integration, the Vietnamese Government made efforts to carry out comprehensive rural development programs that paid attention to the key elements of rural agriculture, namely, agriculture, farmers and rural areas. The new rural development policy, known
as Tam nong\(^2\) or Resolution 26 on Agriculture, Farmers and Rural Areas, aimed to re-orient socio-economic development with a new vision of the role of agriculture, rural areas and farmers in the context of industrialisation and modernisation. In 2010, the Vietnamese Government set up the Socio-Economic Development Strategy for 2011–2020 with the overall objective of:

striving to turn our country basically into a modern industrialised country by 2020; with stable, democratic, rule-governed, and consensual politics-society; the people’s spiritual and material life is enhanced remarkably; independence, sovereignty, unity and territorial integrity are maintained; Vietnam’s position in the international arena continues to be heightened; and a firm premise will be created for the country to develop further in the next phase. (Government of Vietnam, 2010)

In line with the implementation of Tam nong and the Socio-Economic Development Strategy for 2011–2015, the National Target Program on new rural area development by 2030 was introduced as a longer-term development strategy for achieving comprehensive rural development in Vietnam. Because of the government’s efforts to introduce projects, programs, policies and development strategies for the development of disadvantaged regions, there has been a remarkable improvement in accessibility to markets, healthcare, education and other public facilities in these target rural areas (Castella et al., 2005b, p. 309).

2.1.2. Successes and challenges in agricultural and rural development since doi moi

Because of reform policies and socio-economic development programs, within 10 years after doi moi Vietnam had transitioned from a country facing chronic food deficiency to being the second largest rice exporter in the world and a leading agricultural product supplier in world markets for coffee, pepper, cashews and seafood. In the 2006–2009 period, Vietnam exported on average about five million tons of rice, more than one million tons of coffee, 0.7 million tons of rubber and about 0.15 million tons of cashews annually (GSO, 2011). These successes have contributed to the overall socio-economic development of Vietnam in recent years. The country has achieved an average economic growth rate of about 7% for the past 20 years (GSO, 2011).

At constant 1994 prices, the GDP growth rate of the agriculture, fishery and forestry sector was 8.44% in 2005 and 5.32% in 2009. GDP share of agriculture, fishery and forestry also gradually decreased from 40.17% in 1985 to 29.04% in 1995. It then went down to about 21% in 2005 and about 18% in 2013 (GSO, 2000, 2011, 2014). The reduction in the GDP share of the agriculture, fishery and forestry sectors indicates the growth of the services and industrial sectors, which are often dominant in developed countries. Since the 1990s, the Vietnamese Government has made significant efforts to

\(^2\) Tam nong means the Agriculture, Farmers and Rural Areas Program.
implement various forestation programs. As a result, although the forest cover of Vietnam dropped from 43% of total area in 1943 to about 17% in the late 1980s (William & Huynh, 2005), it recovered again to about 40% in 2009 (World Bank, 2010). The livelihoods of farmers, especially those living in rural upland areas, have improved. The average growth rate per capita from 1986 to 2007 was 5.2%, compared to 2.7% for low and middle-income countries and 2.0% for high-income countries (Dang, 2010, p. 2). The household poverty rate in Vietnam dropped rapidly between 1990 and 2010 as illustrated in Figure 2.1.

Figure 2.1: Household poverty trends in Vietnam between 1998 and 2011

Source: GSO (2012)

Despite some successes in agricultural and rural development since doi moi, the agricultural research and technological transfer pathway in Vietnam remains problematic and constrains the development of the agricultural sector. Three main issues are identified. First, the agricultural extension system remains weak. Agricultural extension services have been carried out mainly with a top-down approach (Castella et al., 2006b, p. 112; Van de Fliert et al., 2007, p. 251). Top-down agricultural extension and one-way “lecturing” is seen as one of the root causes hindering the effectiveness of agricultural extension services in Vietnam (Thai et al., 2010; Van de Fliert et al., 2007), resulting in a high dependency of local people on external resources (Tran et al., 2008). In addition, although the number of agricultural research projects has increased steadily over the last two decades, the capacity of agricultural staff, especially local extension staff, is still limited (Castella et al., 2005a, p. 180; Nguyen, 2009, p. 52; Pham et al., 2010, p. 67). According to the director of the Vietnam Academy of Agricultural Sciences, by 31 December 2012, there were 34,747 government extension workers in the country (Nguyen, 2012). This amounted to an average of only one extension worker per 280
farming households. The government’s extension service was also reported to focus mainly on poverty reduction and hunger elimination rather than marketing and agricultural commodity production (Nguyen, 2012; Vo, 2012, p. 4).

Second, the investment in agricultural development is still not enough to meet the needs of agricultural and rural development. Investment in agriculture as a proportion of the government’s total annual investment decreased from 13.9% in 2000 to 7.5% in 2005 and 6.7% in 2009, while the annual contribution of agriculture to GDP remained stable at about 20% (Pham, 2012). Funding for agricultural extension is limited, at an annual amount of approximately USD20 million or only USD2 per farming household per year (Nguyen, 2012, p. 1). The investment in agriculture in 2011 was reported to meet only 40% of the needs of the agricultural sector (Pham, 2012).

Third, there have been overlapping mandates among agricultural research agencies, development agencies and NGOs (Stads & Nguyen, 2006, p. 1), leading to an inefficiency in resource use for rural and agricultural development. The agricultural research system has been geographically centralised, leading to a limited connection with Vietnam’s rural development programs and strategies. The private sector seems to have limited participation in the country’s agricultural research system (Nguyen, 2009; Stads & Nguyen, 2006).

Vietnam’s agricultural and rural development sectors are facing difficulties and challenges in long-term sustainable development. In Vietnam, economic growth is concentrated in urban areas while the majority of the population lives in rural areas where people often face difficulties in accessing markets (Müller et al., 2006). The economic gaps between lowlands and highlands, rural and urban areas, and ethnic minority and majority groups are widening in the country (Dang, 2010; Minot et al., 2006; Nguyen, 2010). In addition, unstable uses of natural resources such as land and forests have been making negative impacts on the environments and livelihoods of the rural poor (Müller et al., 2006; Tran et al., 2006). In the 2000–2007 period, Vietnam lost an annual amount of about 72 thousand ha of agricultural land, of which 41 thousand ha was paddy land used for industrial purposes (Nguyen & Dao, 2010, p. 826).

Poor access to markets and weak competitiveness in the world market regarding food quality and quantity are other problems faced by Vietnam’s agricultural sector in the present context of international economic integration (Castella et al., 2005b; Henin, 2002; World Bank, 2009b). Conventional top-down communication approaches are applied in most agricultural research projects (Geppert et al., 2002; Hoang et al., 2006, p. 524), while it remains unclear how bottom-up communication approaches should be used in agricultural extension programs and development policies and what are the critical factors hindering agricultural and rural development, especially in disadvantaged rural areas (Van de Fliert et al., 2007).
2.2. Rural development approaches in extreme poverty regions

2.2.1. Mainstream rural development programs and strategies

Being aware of the social, economic and natural difficulties in the poorest regions, including the Northwest Highlands, the Vietnamese Government and international development agencies have conducted many development projects and programs in rural and agricultural fields (Le, 2010b). These efforts have been made to improve the livelihoods of people in disadvantaged areas with the major focuses on: improving access to basic infrastructure and markets; enhancing primary education, especially for ethnic minority people; developing and conserving indigenous cultural values; sustaining the environment (e.g. forest and soil protection, biodiversity conservation); and ensuring social equity and environmental sustainability (Bui et al., 2004; Tran, 2006).

Program 327 and the Five Million Hectares Reforestation Program

According to William and Huynh (2005) and Müller et al. (2006), the poorest areas have high topographic variations, are located farthest from markets, have more forests and are home to ethnic minority groups whose livelihood strategies traditionally depend on forest resources. Therefore, dealing with forest problems must be a consideration in developing sustainable livelihoods for the poorest, in particular the highland people (Meyfroidt & Lambin, 2008). Through Program 327 in the 1993–1998 period, the Vietnamese Government attempted to change shifting cultivation practices in the uplands including the Northwest Highlands. Since 1994, a core objective of this program was to protect forest in critical areas and in areas where slash and burn cultivation practices persisted. This was followed by Program 661, or the 5MHRP, which began in 1998 with the objective of achieving five million ha of new forests by 2010 in order to sustain the environments and improve the livelihoods of people, especially ethnic minority groups in the Highlands (Bui et al., 2004; Nguyen, 2007).

Both Program 327 and the 5MHRP initiated cash incentive mechanisms for rural people in the Northwest Highlands to protect forests and develop plantation forests (Government of Vietnam, 1998a). However, it is argued that Program 327 and the 5MHRP were limited in supporting highland farmers, especially the poor who were dependent on forests. This was due to the weak impact of the cash incentive mechanisms, low level of attention paid to sustainable livelihoods and the weak communication approach to mobilising local people’s participation in the programs (Bui et al., 2004). Program 327, for instance, focused on environmental protection while the 5MHRP did not specify the economic benefits people would receive from the forests they looked after. The programs expected long-term forest protection, while local communities were more concerned with the provision of immediate basic needs for their daily survival. In terms of communication, these
programs used top-down approaches in which people were informed rather than invited to discuss, resulting in the low participation of local people in identifying and prioritising their socio-economic development needs (Castella et al., 2006a).

**International Fund for Agricultural Development project on forest protection**

In the late 1990s, the International Fund for Agricultural Development (IFAD) implemented the Development Project for Ethnic Minorities in Ha Giang province. One of the main components of the project was to support existing forest programs in critical watershed areas, principally by developing participatory protection models and issuing forest protection contracts (FPCs) for critical protection forests. As a result, the project funded FPCs for 20,000 ha of forests. By signing FPCs, local farmers were paid for the protection and improvement of forest areas over five year periods (IFAD, 2001). This mechanism worked rather well and individuals became more aware of their responsibilities for forest protection and conservation. However, the economic incentive mechanism of the project failed to attract the interest of local people due to a lack of effective participatory communication approaches to help people understand what they would be paid for (Nguyen, 2007, p. 37). This led to a high dependency of local beneficiaries on the project funds and a lack of attention to managing resources that could contribute to sustainable livelihoods.

**Program 135**

Program 135 for the socio-economic development of extremely disadvantaged communes was established in 1998. It was the continuance of Decision No. 134/2004/QD-TTg (Program 134), which aimed to solve the urgent problems of limited production land, housing and fresh water in poor communes in ethnic, mountainous and remote areas. The second phase of Program 135 commenced in 2006 under the government’s socio-economic development program for 2006–2010. The overall objective of Program 135 was:

> to radically accelerate production and promote market-oriented agricultural development, to improve in a sustainable manner the socio-cultural life of ethnic groups in the most impoverished communes and villages to narrow the gap in living standards among Vietnam’s ethnic groups and regions; and to eradicate hunger in the targeted areas and reduce the poverty rate to below 30% by 2010. (Ha, 2009, p. 3)

To achieve this objective, the program was designed to deal with the major causes of poverty faced by poor ethnic minority groups. The root causes were identified as limited financial and physical resources (poor infrastructure, low capital and small landholdings), weak human resources (lack of knowledge and skills, low literacy rate and conventional subsistence agricultural practices) and limited access to services (extension and market information). Social problems (health problems,
large family size, unemployment, and sparse population density) and high vulnerability to risks (difficult natural conditions, disconnectedness to markets, and emerging environmental problems) were also considered as important causes of poverty (Government of Vietnam, 2005, 2006). A large investment was also made in improving the infrastructure for the target communes through building and upgrading roads, schools and health clinics, small-scale irrigation, marketplaces and clean water supply facilities (Vietnam Academy of Social Sciences, 2007).

It was reported that Program 135 led to great achievements. After the first implementation phase, most of the target communes had car road access to their centres. More than 85% of the target communes had primary and secondary schools and healthcare (Government of Vietnam, 2005). By 2006, 1,644 poor and mountainous households in the country had benefited from the program (Government of Vietnam, 2010, p. 29). In the second phase of the program, according to the results of its mid-term evaluation, a decentralisation scheme was established in most of the provinces involved in the program. Local communes were empowered as investors in changing, implementing and monitoring projects under the program. The program also implemented an extensive communication strategy to disseminate information relating to the implementation and management of activities and set up mechanisms to encourage people to participate in planning, monitoring and evaluating development activities. According to the government’s Committee on Ethnic Minority Affairs (CEMA (2009b), the program had been effective and reasonable, and the infrastructure improvement activities were the most successful component.

However, there were some weaknesses of Program 135. First, the allocation of resources was sometimes insufficient (Centre for International Economics, 2002). The program paid more attention to investing in improving infrastructure systems while there was a limited budget for building the capacity of local leaders and people, leading to the inefficient implementation and management of programs at the local level (Government of Vietnam, 2010, p. 22). In addition, the investment for each commune was based on average planning figures without looking into variations in the natural, social and economic conditions (CEMA and UNDP, 2009, p. 37; Ha, 2009, p. 25). There were overlapping activities among the different projects and programs at target communes (Dang, 2010, p. 3). Although Program 135 expected to involve different stakeholders in the planning, implementation and management of activities at the commune level, the participation of local people in planning, implementing and monitoring of activities was limited (Ha, 2009, p. 24). Top-down information dissemination caused a low level of participation by local people in the planning and managing of activities (Swinkels & Turk, 2006, pp. 8, 19). There were no or limited channels to get feedback from local communities nor a long-term scheme for information exchange and sharing among stakeholders (Dang et al., 2007).
Moreover, the program’s communication strategy focused on the overall management of the projects, rather than on the gathering and dissemination of information on the monitoring and evaluation of the projects (CEMA and UNDP, 2009). The communication strategy was mainly implemented in the Vietnamese language, without making any attempts to overcome the language barriers faced by ethnic minorities (Dang et al., 2007, p. 7). The integration of different development programs, implemented by both the government and NGOs, was also weak due to variations in development objectives, management mechanisms and financial capacity (Ha, 2009, p. 25). Dang et al. (2007) report that the dissemination of the policy and results of the program was mainly delivered to media systems (e.g. newspapers, TV, radio) and local authorities rather than to local communities. There was also a lack of effective information-sharing among the different projects and programs implemented in the same areas in the Northwest Highlands (Tran et al., 2008).

Resolution 30a on sustainable poverty reduction

Another important recent program (ongoing at the time of writing) is the implementation of Resolution No. 30a/2008/NQ-CP (Resolution 30a) which aims to support rapid and sustainable poverty reduction in the 62 poorest districts of the country (Government of Vietnam, 2008). The program focuses on improving income through agricultural production development by introducing new techniques and technology transfer, strengthening knowledge and education and vocational training, and upgrading the infrastructure system. After two years, the program gained initial success (Dang Khoa, 2011). In Son La, by the end of 2010, VND127 billion (approximately USD6 million had been spent in the program on 61 construction works including building and upgrading roads and irrigation systems; more than 50% of communes in the province had car-accessible roads to communal centres and 8,582 households were supported with the costs of materials and labour to build permanent houses (Minh Thu, 2011).

However, the attainment of sustainable livelihood development in the implementation of Resolution 30a remains problematic. It is uncertain that the project can achieve both rapid and sustainable poverty reduction because financial resources are limited while there are increasing numbers of the poor who need support from the program. In addition, the program is being implemented at the same time as the national targeted program on hunger elimination and poverty reduction, making it a challenge for local areas to balance the specific mechanisms of Resolution 30a and other projects under the national targeted program (CEMA and UNDP, 2009, p. 48). The program also requires strong decentralisation in project activity management at provincial and district levels but the capacity of officials at those levels remains limited (Minh Thu, 2011).

Moreover, participatory approaches in the implementation of Resolution 30a have not been well designed and implemented (Dang et al., 2007). People are still passive in agricultural production and
trading activities, leading to the low effectiveness of the program in many areas with a high poverty rate and diverse culture. Fixed regulations for the implementation of activities in different geographical and topographical regions have resulted in difficulties in the implementation process (Minh Thu, 2011). It has been pointed out that some government guidelines for the implementation of Resolution 30a have not been synchronised or released in a timely manner, causing a slow progress in implementation compared to the plan (Tran et al., 2008). In addition, the implementation of activities under the program is affected by the limited capacity of local leadership, especially at communal and village levels (CEMA, 2009b, p. 59). Finally, the lack of consideration of the vulnerability contexts (such as natural disasters causing serious damage and losses to soil, infrastructural systems and houses) in target areas has made it difficult for the program to achieve its initial objectives (Phan, 2011).

2.2.2. Participatory approaches for rural livelihood development

Prior to 1986, Vietnam followed the Soviet model of central planning in which a centralised and top-down management structure was implemented even in activities that required grassroots participation. The economic crisis in the late 1980s, caused by the favoured modernisation development paradigm, forced the Vietnamese Government to change approaches to communication for development (Pham, 2007). The use of the bottom-up communication approach in Vietnam started in the late 1990s with the issuance of the GDD. As mentioned above, the GDD is seen as the first legal framework to enhance the participation of people in local government activities as well as to promote democratic principles at village and commune level with the slogan “the people know, the people discuss, the people do and the people supervise” (Pham, 2007). The GDD is seen as a positive step for changing local leaders’ attitudes towards people-centred decision-making processes (Duong, 2004, p. 33). Under the guidance of the GDD, the participatory communication mechanism has been institutionalised to improve communication between local governments and communities and households. Agricultural and rural development projects and programs have also been guided towards “grassroots democracy and local governance” (Ha, 2009). Various studies on the effects of the GDD show that it has made positive impacts in all communes and that the GDD provides a formal framework for enhancing community participation in development processes (Ngo & Ho, 2008).

The efficiency of the GDD in practice has been the subject of some argument. The GDD is believed to be a form of ideological democratisation rather than empowerment (Larsen, 2011). In addition, according to Duong (2004, p. 24), there have been inconsistencies in the implementation of the GDD throughout the country and a lack of commitment to it by local leaders. Other criticisms include that there are no clear mechanisms to measure the quality of participation nor any clear mechanisms to enhance participation, especially the participation of disadvantaged groups such as ethnic minority
people and women, in development activities (Duong, 2004, p. 25; UNDP & VASS, 2006, p. 21). These limitations have led to the formal participation rather than the true participation of local people in decision-making processes in most government-funded rural development projects and programs.

Since the early 1990s, there have been great efforts not only by international donors (e.g. the FAO, GTZ and SIDA) and NGOs (e.g. Plan International, Oxfam Hong Kong and World Vision) but also by the Vietnamese Government to use participatory processes for rural development in poor areas of the country. Despite the limited scale of application, the participatory process proves that the involvement of local stakeholders is a decisive factor for development. For example, in the Integrated Food Security Project in Quang Binh province implemented by the People’s Committee of Quang Binh and GTZ (Schröder-Breitschuh & Kaufmann, 2002), the participatory approach including participatory rural appraisal (PRA) was used for baseline surveys to make village development plans and annual commune development plans. The results of the project showed the importance of institutionalising processes at higher decision-making levels in order to improve the efficiency of lower level agencies. Some stakeholders have suggested that the use of participatory planning at a wider scale should be formalised through legislation in order to create a common socio-economic planning system (CACERP, 2004; Tran et al., 2008). However, it has been reported that participatory planning processes are time-consuming and could be difficult for local communities with low capacity to deal with. In addition, participatory planning processes rely on the facilitation skills of local leaders and active community members; yet those human resources are still weak (Tran et al., 2008).

Oxfam Hong Kong was successful in identifying priority sectors for its development interventions after negotiations with local governments and other agencies to identify broader and possible socio-economic development support service to local communities (Nguyen et al., 2009). Responsibilities were divided between different agencies complementing each other such through projects such as Program 135 and other rural development programs. Planning started with a survey using PRA tools. These helped to mobilise and combine different resources for development activities. The experience of Oxfam Hong Kong in Quang Tri province showed that it was very important to involve stakeholders from all management levels (commune, district and province) in order to gain a common platform of understanding (Tran et al., 2008, p. 16). Enhancing the equal participation of men and women, and the rich and the poor, would help to make good socio-economic development plans. However, the Oxfam Hong Kong planning process was criticised for not being integrated in the governmental planning process, and there was little evidence of self-reliant community groups acting on their own and proving their independence of outside initiatives (CACERP, 2004).
Funded by the Swedish poverty reduction programs, the *Chia se*³ project was an ambitious initiative to transform a top-down development planning system into a bottom-up system. The project was carried out from 2003 to 2008 by the Ministry of Planning and Investment in Ha Giang, Yen Bai and Quang Tri provinces. Under this project, the guide for socio-economic planning at commune level was developed in 2008 (Tran et al., 2008). According to the guide, it is important that the socio-economic planning process involves the participation of all stakeholders including district, commune and village level stakeholders. It provides an opportunity for discussion and cooperation among stakeholders on the mobilisation of resources, sets out measures for the implementation of annual socio-economic plans and defines the responsibilities of each level for producing the most feasible and practical local development plans (Dang et al., 2007; Tran et al., 2008).

Unlike conventional approaches to annual socio-economic planning in communes, the new planning process encourages local people and leaders to use various PRA tools such as observation, village and asset mapping, village history, seasonal calendar, Venn diagrams, in-pair comparisons, problem trees and focus group discussions (FGDs) for making local development plans. These PRA tools help to encourage communities to have their voice in the planning process for their socio-economic development. However, this guide has not been widely applied due to its complicated procedures and complex design of socio-economic development indicators, while the capacity of both local people and commune leaders is still weak (Tran et al., 2008).

Plan International in Vietnam also sees PRA techniques as good tools for socio-economic planning. Plan International’s Pro-Poor Participatory Development Project (PPDP) was developed as a continuation of the three year GDD Project that had been implemented since 2008 in Thai Nguyen, Quang Tri and Ha Giang provinces. The PPDP worked with local authorities on increasing capacity to support inclusive planning and facilitate the engagement of local authorities and villagers in socio-economic planning and implementation in target communes and villages (Poulsen et al., 2008). The PPDP activities concentrated on training local beneficiaries and authorities at village, commune and district levels. Trainings were carried out in order to improve the understanding of local people about GDD and to utilise PRA in village and community planning (Tran et al., 2008). After the first phase of the PPDP, local project communes could build better quality village and commune development plans compared to the ones produced conventionally. Utilisation of PRA techniques in development planning has helped to empower local stakeholders by mobilising the participation of many different groups, particularly disadvantaged groups (such as children and poor households), to promote grassroots democracy and strengthen solidarity among community members. Participatory planning capacity of local leaders has been improved. In addition, attitudes towards specific target groups have

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³*Chia se* means “share”.

also been changed by involving children in planning activities at the village level (Poulsen et al., 2008).

However, while there is agreement that participation is necessary and desirable, the participatory methods in local socio-economic development planning used by Plan International has been criticised as a slow and cumbersome method, requiring many resources (Poulsen et al., 2008). It has also been pointed out that the Plan International participatory planning approach had a strong focus on economic development but paid limited attention to the mobilisation of local financial and physical resources for development. In addition, the PRA results at villages were written in the Vietnamese language which a large number of local ethnic minority people cannot read (Poulsen et al., 2008). Although participatory planning was believed to be effective for making village and commune development plans, transferring these plans to higher levels (i.e. district and province plans) was difficult due to there being no institutionalisation of the process for using participatory planning methods at higher levels (Poulsen et al., 2008). Finally, there was also weak coordination among the development projects of international development agencies and NGOs (e.g. Chia se, Plan International) which have promoted participatory socio-economic planning in the same areas (T&C Consulting, 2011, p. 8).

2.3. The Northwest Highlands – a poverty-stricken region in rapid transition

2.3.1. Overview of the Northwest Highlands

The Northwest Highlands is characterised by high diversity, steep mountain ranges and sloping highlands. The topography is highest and most rugged in the northwest and lower in the southeast area along the border with China in the plateau region. The Highlands comprises six provinces: Son La, Lai Chau, Dien Bien, Hoa Binh, Yen Bai and Lao Cai. The total natural area of the Highlands is 5.073 million ha, which accounts for 15.32% of the whole country’s natural area (NOMAFSI, 2012, p. 1). The total population of the Highlands in 2010 was 4.15 million, making it the region with the lowest population density (82 people/km²) in the country (GSO, 2011). The Highlands is also identified as one of the poorest regions in the country. According to the latest general census on poor households and marginally poor households, the poor and marginally poor household rate of the region stood at about 36% compared to about 14% of the whole country (MoLISA, 2014).

Before the collectivisation period (1986), ethnic minority groups in the Highlands were mainly engaged in shifting cultivation practices (involving burning a section of forest and then growing cash crops like rice or maize in the rich soil, causing quick degradation of the soil) (Castella et al., 2006a). The livelihoods of most rural people in the Northwest Highlands still depend mainly on agriculture
Agricultural production is a primary source of income for the majority of households in the Highlands (Minot et al., 2006; Tran et al., 2006). Figure 2.2 shows a map of the Northwest Highlands.

Figure 2.2: Map of the Northwest Highlands

As the largest province in the northwest of Vietnam, Son La province typifies the social, economic and cultural characteristics of the Highlands. The province is home to various ethnic groups such as the Kinh, Thai, H’Mong, Muong, Dao, Ha Nhi, Lao and San Riu. The presence of 12 ethnic groups in Son La makes the province very diverse socially, economically and culturally (CEMA, 2009a; Dao, 2011; Duc Tuan, 2011). Despite an annual economic growth rate of more than 10% over the past decade, the poor household rate in Son La is still much higher than in other provinces of the country. According to the latest poverty standard established by the Vietnamese Government for 2011–2015, the poor and marginally poor household rates in Son La were 27.01% and 11.86%, respectively (MoLISA, 2014). Most of the poor households are ethnic minority households living in poor and remote areas of the Highlands. Although the province has achieved an annual poverty reduction rate of 3% to 5%, poverty reduction and hunger elimination remain a major concern of the province for the coming decade.

In spite of the difficulties of a diverse climate, sloping lands, lack of water for production in dry seasons and distance from markets, the Northwest Highlands has the potential to grow many

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4 Poor households earn VND400,000 ($20)/person/month for rural households and VND500,000 ($25)/person/month for urban households. Marginally poor households earn VND501,000–VND650,000 per person per month for rural households and VND501,000–VND650,000 per person per month for urban households (MoLISA, 2011).
agricultural products such as maize, rice, high-value temperate fruits, flowers, vegetables, livestock, and forestry products. In the last decade, due to better access to markets through upgraded road systems and the implementation of various agricultural development projects and programs, concentrated agricultural production areas have been established in the Northwest Highlands. The area of annual cash crops, especially maize, in the Highlands has increased rapidly in recent years.

Between 2005 and 2011, the cultivated area of maize in the Northwest Highlands went up rapidly by approximately 1.5 times. The adoption of hybrid maize was considered the most important agricultural innovation of the twentieth century for the Highlands, contributing to increases in the maize production area and farm income (Friederichsen & Neef, 2010, p. 575). Son La province has the highest level of maize production in the country because of its favourable conditions, rapid application of advanced production techniques, high-yielding varieties and accessibility to markets (Friederichsen & Neef, 2010; Tran, 1998a). The growing trend of maize production in the six provinces of the Highlands from 2011 to 2015 is shown in Figure 2.3.

![Figure 2.3: Maize production in the Northwest Highlands](image)

*Source: GSO (2011)*

The total number of beef cattle also went up from 271,000 head in 2005 to 376,000 head in 2010 (GSO, 2010). In 2012, the tea production area of the Northwest Highlands was reported to be 25.708 ha, accounting for about 20% of the total tea production area of Vietnam (NOMAFSI, 2012). Fruits, especially temperate fruits, are also good sources of diversified income in the Highlands (Minot et al., 2006).
2.3.2. Challenges in agricultural and rural development

Being the most vulnerable and poorest region in the country, the agricultural and rural development of the Northwest Highlands faces more socio-economic and environmental problems than the lowland regions of the country. Although rapid growth of the market economy has pushed up the socio-economic development of the Highlands, it has also generated social, economic and environmental challenges including wide economic gaps between regions and among different ethnic groups, market integration barriers, environmental problems and communication problems in agricultural extension.

Poverty and economic gaps

Poverty has a broad meaning and is defined in different ways. Most definitions focus on the lack of access to the resources and services necessary to sustain livelihoods and weak capacity to cope with external vulnerability contexts and shocks. According to the United Nations, poverty refers to: i) a lack of basic living (food, clothes, education, healthcare and clean water) and productive resources (land and credit) to ensure sustainable livelihoods, ii) powerlessness (lack of participation in decision-making processes), and iii) susceptibility to violence (Gordon, 2005). Poverty can be interpreted as insufficient access to a means of living which includes economic and material resources, health and education resources, communication resources and physical resources (Binder & Schöll, 2009; Tao & Wall, 2009; Thomas, 2003). Poverty is also associated with socio-cultural remoteness (Epprecht et al., 2011). The AusAID definition of poverty emphasises levels of deprivation regarding lack of access to basic livelihood resources (food, water, shelter and clothing) and services (healthcare, education and supports from state and society) and incapacity to deal with vulnerability contexts and adverse shocks (AusAID, 2001).

In Vietnam, the poverty rate varies between the lowland and highland areas, rural and urban areas, men and women, and ethnic minority and majority groups (Le & Rambo, 2001). The recent boom in market development has raised incomes in urban areas, while rural areas have been left behind. Rural poverty is much higher than urban poverty (Nguyen, 2010). The poverty rates are highest in highland areas such as the Northwest, North Central and Central Highlands where ethnic minority groups live (Dang, 2010). It has been estimated that the rural poverty rate is about six times higher than the urban poverty rate and nearly 90% of poor households live in areas which are often affected by natural calamities, leading to high vulnerability (Nguyen, 2010).

The main reasons for the widening economic gaps between urban and rural areas and majority and minority groups are identified as: i) limited access to markets, ii) fewer employment opportunities, iii) less access to education, and iv) poor healthcare facilities in rural areas (Centre for International Economics, 2002; Müller et al., 2006; Ravallion, 2008). Low income diversification due to language barriers, low education, cultural differences and lack of access to credit sources is also significant
(Minot et al., 2006, p. 97). In addition, in the Northwest Highlands, the increasing opportunity to profit from maize and other cash crop production attracts more people to engage in agricultural production. The economic gap between late migrants to the Highlands (mainly Kinh\textsuperscript{5} people) and indigenous people (ethnic minority groups such as the H’Mong, Dao and Nung) is getting wider (Dang, 2010, p. 5). Kinh people use their advantages in capital, education and market access to mobilise land resources for production and become involved in agricultural commodity trading activities. Therefore, they tend to retain socio-economically privileged positions in the region, leading to impacts on the livelihoods of local ethnic minority groups (Friederichsen & Neef, 2010).

Other important reasons for the widening economic gaps in regions such as the Highlands, which are not widely discussed in the literature, are communication facilities and approaches. Although an effective communication strategy has been seen as a key factor for the success of community-driven development programs (Swinkels & Turk, 2006, p. 9), investment in communication facilities in the Highlands is still limited.

**Market integration barriers**

Although increasing commercial agricultural production has created opportunities for improving the livelihoods of local people, it has placed the Highlands in a more competitive environment in terms of accessibility to markets, capacity for commercial production and market organisation. The rapid liberation and intensification of agriculture leads to the increased need of farmers to have more access to inputs, information and the market (Van de Fliert et al., 2007). However, among rural areas of the country, the Northwest Highlands and the Central Highlands have the most limited access to markets due to their poor infrastructure and remoteness (Minot et al., 2006, p. 105). Within the Northwest Highlands, ethnic minorities have lower market access than majorities (Dang, 2010, p. 2). In research conducted by Centre for International Economics (2002), Henin (2002, p. 6), Tran (2006) and Van de Fliert et al. (2010b), there is a consensus that a weak market information system has also constrained local communities in the Highlands from accessing the production inputs and market information that are essential for them in formulating market-based agricultural production and trading strategies for increased income.

In the transitional process from self-subsistence and supply agriculture to commercial production, small agricultural producers in the Northwest Highlands are also challenged due to a lack of necessary market knowledge and communication skills for commodity production, processing and marketing (Tran et al., 2009). These have resulted in an insufficiency in local production and marketing, leading to uncontrolled changes in both input and output prices. Consequently, it has had negative effects

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\textsuperscript{5}Kinh are the ethnic majority of Vietnam.
mostly on the livelihoods of the poor with low competitiveness in input production, post-harvest processing and marketing and limited awareness of the economic and environmental impacts of their production activities (World Bank, 2009a, 2009b). It has therefore been suggested that transferring knowledge and building technical capacity may not be effective without improving market capacity for local people (Vu, 2005). A surplus of agricultural products in the transition process also requires farmers to find ways to sell their products through informal marketing channels and information networks among villagers (e.g. farmers, their relatives and neighbours) (Castella et al., 2005a, p. 179). However, these market channels are still weak, leading to low economic efficiency in agricultural production in the Highlands (Dao et al., 2006).

**Top-down agricultural extension**

Over the past two decades, the agricultural extension system in Vietnam has been transformed into a more diversified system. The purely formal supply of extension services has been complemented by an informal extension system, which is oriented to meet the needs of people. Public sector services are sometimes integrated with private extension services. Paid agricultural extension services are also now accepted by some farmers in some regions. However, agricultural extension services in the Northwest Highlands have been mainly provided by the government (Schad et al., 2011). Extension services for rural livelihood development are still weak in both the quantity and quality delivery (MARD, 2008; Minot et al., 2006). In the literature, the use of the top-down communication approach with poor feedback mechanisms is considered a significant weakness of agricultural development in Vietnam including the Northwest Highlands (Hoang et al., 2006; World Bank, 2003). Lack of transparency in public participation is another problem encountered in the government-based agricultural extension system (Schad et al., 2011, p. 93).

The local agricultural extension system in the Highlands plays a limited role in facilitating people’s access to markets or providing useful information on commodities (Nguyen et al., 2015). The private and voluntary sectors (i.e. private companies, traders, NGOs) are alternative sources of information, but their involvement in the local extension system is still very limited (Pham et al., 2010; World Bank, 2003). Many extension staff lack the necessary work experience, facilitation skills and knowledge that are needed for working with ethnic minority groups, leading to inefficient information and technology transfer (Dang et al., 2004, p. 30). The collaboration between development actors in the agricultural extension system is evaluated as weak (MARD, 2008; Nguyen, 2009). It is also believed that the better-off households tend to have more access to extension services and information (Clement & Amezaga, 2008, p. 273; Hoang et al., 2006, p. 523). Majority ethnic groups such as the Kinh are likely to benefit more from extension activities because the training materials of extension activities are normally written in the Vietnamese language (World Bank, 2003).
Moreover, although a large proportion of agricultural products in the Northwest Highlands is marketed, extension services in the Highlands are criticised for their overemphasis on agricultural production techniques and input distribution rather than on the marketing of agricultural products (Tran et al., 2009; Van de Fliert et al., 2007, p. 254). The lack of capacity of extension staff to carry out agricultural marketing and household economic analysis is also a hindering factor that slows down the process of agricultural commercialisation in the Highlands (MARD, 2008).

Since the late 1990s, bottom-up agricultural extension initiatives such as training visits, farmer field schools (FFS) and integrated agricultural programs (on topics such as integrated pest management, integrated crop management and sloping agricultural techniques), community-based management of resources, farmer-scientists and group-based learning approaches have been promoted in rural areas by development organisations and NGOs. These participatory approaches have made positive impacts on rural communities (MARD, 2008; Van de Fliert et al., 2007). However, to date, these innovative approaches have been done mainly on a small scale (Van de Fliert et al., 2007, p. 246). In addition, weak learning and sharing mechanisms among existing participatory extension approaches may inhibit long-term impacts for wider areas (Schad et al., 2011). As a home of many ethnic groups, agricultural extension also faces problems such as language barriers, the low education of local people and limited access to livelihood resources. Therefore, efforts to improve the impacts of agricultural intervention need to pay attention not only to strengthening rural livelihood assets but also to improving the communication methods that facilitate local development.

Environmental problems

In the transition from subsistence agricultural production to a market-oriented economy, environmental problems are also partly caused by market failures. A range of increasingly pressing environmental problems (e.g. deforestation, soil erosion and degradation and water pollution) has occurred in the Northwest Highlands due to poor natural resource management and weak socio-economic management mechanisms as well as low levels of awareness among local people. Environmental problems in the Highlands such as soil erosion and deforestation associated with the rapid development of cash crops like maize, tea, cassava and upland rice on vulnerable land have been the cause of foreseen environmental impacts (Clement & Amezaga, 2008; Müller et al., 2006). For example, unsustainable agricultural practices and deforestation on sloping lands have resulted in increasing soil erosion and low agricultural productivity (Clement & Amezaga, 2008, p. 274; Ha et al., 2010, p. 837). Rapid population growth has also caused a considerable impact on the land resources in the Highlands.

A case study research on the livelihoods of rural communities in three communes in the Northwest region indicated that there has been an overexploitation of land for intensive agricultural production,
especially for commercial maize production in recent decades due to increases in both population and emerging income needs (Norlund, 2005, p. 90). Friederichen and Neef (2010) assert that although maize production has made a significant contribution to the economic development of the Northwest Highlands, dependent farmers like the H’Mong people have suffered from emerging negative ecological impacts resulting from market forces in the region.

2.3.3. Impact assessment of agricultural research projects

Recognising the problems facing the Northwest Highlands, since the late 1990s, there has been a great deal of investment made by Vietnamese Government research institutes and international development agencies in the form of various socio-economic development policies and research initiatives. Most of these agricultural research projects have targeted economic development through increasing agricultural production and improving market engagement. Some explicit AR4D initiatives have been implemented by internationally-funded projects in the Northwest Highlands since the late 2000s. These AR4D projects have adopted participatory approaches with an aim to facilitate the better use of research outputs for development.

The Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI) is an example of a leading Vietnamese Government organisation carrying out agricultural research in the Northwest Highlands. In the last five years, the institute has carried out more than 140 agricultural research projects in Vietnam, most of which have been conducted in the Northwest Highlands. Other national research organisations and universities such as the Plant Protection Research Institute (PPRI), the National Institute of Animal Husbandry (NIAH), the National Maize Research Institute (NMRI), the Center for Agricultural System Research and Development (CASRAD), Vietnam University of Agriculture (VNUA), Thai Nguyen University (TNU), and Tay Bac University (TBU) have also conducted a large number of agricultural research projects in the Highlands. The major objectives of these agricultural research projects are the selection and development of high-yielding crops, mobilisation of the indigenous knowledge and experiences of minority ethnic communities on plant gene resources, plant protection and biodiversity conservation, agricultural value chain development, and market engagement for small agricultural producers (Nguyen et al., 2010a; Phan & Dang, 2010; Vu et al., 2010). Participatory techniques such as PRA tools were adopted for data collection in the implementation and evaluation processes of several of these agricultural research projects (Ha et al., 2010; Harrison, 2002).

Turning to an example of the internationally-funded development activities in the region, the Sustainable Land Use and Rural Development in Mountainous Region of South East Asia Program (the Upland Program) was initially implemented in 2000 by University of Hohenheim in collaboration with VNUA, TNU and NIAH. This multidisciplinary research program aims to make a scientific

Another example of an active international development agency in the region is ACIAR which, since late 2007, has focused its work on the Northwest and South Central Coast regions of Vietnam. Multidisciplinary teams in the Northwest Highlands have carried out AR4D projects funded by ACIAR. With the aim to improve market integration and sustain livelihoods for local communities, these AR4D initiatives in the Highlands have focused on three key areas: i) the production and marketing of local agricultural and forestry products (high-value temperate fruits, maize and vegetables), ii) the production and marketing of beef cattle, and iii) sustainable agroforestry management (ACIAR, 2009, p. 8; Van de Fliert, 2008). Unlike conventional agricultural research projects, some recent ACIAR-funded AR4D projects in the Northwest Highlands have modified their approaches to include participatory communication strategies for planning, experimentation, monitoring and evaluation through collaborative research mechanisms. The aim of these modified approaches is to develop the decision-making capacity for local people.

However, the impact assessment of these agricultural research projects including AR4D projects remains a weakness in regard to both the impact assessment objectives and methods. This study’s review of documentation on the projects conducted by active research institutions and development agencies such as NOMAFSI, VNUA, TBU and ACIAR in the Northwest Highlands and the results of the FGDs with farmers and in-depth interviews with agricultural researchers and extension staff led to the identification of five major weaknesses in existing impact assessment approaches in the region. First, most agricultural research initiatives only undertake an end-evaluation at a single point in time or they only implement a short-term impact assessment. Second, the impact assessment of these AR4D projects pays more attention to the objectives of researchers and donor agencies than to the interests of local communities. Third, despite the fact that most agricultural research projects claim to apply a participatory approach, top-down planning, implementation and monitoring and evaluation approaches are still dominant, especially in most government-funded agricultural research projects. These top-down approaches lead to low levels of empowerment of local communities and in most cases fail to capture what local communities perceive to be their needs. Fourth, there is a gap in researchers’ understanding of the diverse local cultures and languages. This gap sometimes leads to limited communication and unreliable impact assessment findings. Fifth, the indicators currently used for impact assessment are aimed at measuring the return on investment or cost-effectiveness for the donor organisation, rather than fostering the sustainability of the local community.
Compared to the government-funded projects, international donor-funded AR4D projects in the Northwest Highlands have had a stronger participatory orientation and a broader scope of impact considerations. However, there is still no clear strategy for assessing the long-term social, economic, human, physical and natural impacts on the sustainable livelihoods of local communities. The impact assessments of both domestic-funded and international-funded research projects are very weak in terms of sharing the impact assessment findings and obtaining feedback from the key stakeholders, especially local beneficiaries. Table 2.1 summarises the major dimensions of the impact assessments conducted by domestic-funded and international-funded research projects in the Highlands.

**Table 2.1: Comparison of impact assessment approaches in agricultural research projects in the Northwest Highlands**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Vietnamese Government-funded projects</th>
<th>International development agency-funded projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact assessment approaches and methods</td>
<td>o Top-down approach</td>
<td>o Top-down approach in most projects but bottom-up approach in some recent AR4D projects</td>
</tr>
<tr>
<td></td>
<td>o No impact assessment, or sometimes the impact assessment is conducted at the end of a project</td>
<td>o Impact assessment often implemented at the end of a project</td>
</tr>
<tr>
<td></td>
<td>o Use of mainly quantitative methods for data collection and analysis</td>
<td>o Use of both quantitative and qualitative methods for data collection and analysis</td>
</tr>
<tr>
<td>Impact assessment indicators</td>
<td>o Mainly short-term and economic-focused indicators (e.g. changes in production outputs and income)</td>
<td>o Mainly short-term and economic-focused indicators (e.g. changes in production outputs and income)</td>
</tr>
<tr>
<td></td>
<td>o Aimed at direct scientific outputs (technology development and publications) and project performance rather than local sustainability</td>
<td>o Aimed at direct scientific outputs (capacity building and publications) and cost-effectiveness for donors rather than local sustainability</td>
</tr>
<tr>
<td>Stakeholders’ participation in impact assessment processes</td>
<td>o Project implementers are evaluators who define impact assessment indicators</td>
<td>o External specialists or researchers are evaluators who define impact assessment indicators</td>
</tr>
<tr>
<td></td>
<td>o Local communities, extension staff and government staff are information givers</td>
<td>o Local communities, extension staff and government staff are information givers</td>
</tr>
<tr>
<td></td>
<td>o No participation of private sector (private companies and traders) or NGOs in impact assessment process</td>
<td>o Limited participation of private sector (private companies and traders) and NGOs in impact assessment process</td>
</tr>
<tr>
<td>Dissemination of impact assessment findings</td>
<td>o No mechanism for sharing impact findings with and getting feedback from local communities</td>
<td>o Limited or no mechanisms for sharing impact assessment findings with and getting feedback from local communities</td>
</tr>
<tr>
<td></td>
<td>o The sharing of impact assessment findings among research partners (research institution, development agencies and local governments) is very weak</td>
<td>o Efforts made to share impact assessment findings among research partners (research institutions, development agencies and local governments), mostly through publications and media products</td>
</tr>
</tbody>
</table>
In conclusion, a top-down approach with limited attention paid to the cultural diversity and complexity of the Northwest Highlands has been used in both Vietnamese Government-funded and international agency-funded agricultural projects. The past and present impact assessments of most agricultural research projects in the region have taken a short-term and economic focus. Efforts have been made to measure direct research outputs, report scientific findings and analyse cost-effectiveness in order to report to donors and funding agencies rather than targeting the sustainable livelihoods of local communities. In addition, existing impact assessment processes lack mechanisms for sharing the impact assessment results with and getting feedback from stakeholders, especially local communities. These limitations have led not only to unconvincing evidence in the impact assessment findings but also to the limited utilisation of the findings for local development and for the effective implementation of future agricultural research interventions.
Chapter 3
THEORIES AND PRACTICES RELATED TO IMPACT ASSESSMENT OF RESEARCH FOR DEVELOPMENT

3.1. Introduction

AR4D projects are increasingly implemented in poor regions in order to improve the socio-economic and political conditions for local communities (Krall et al., 2003; Marasas et al., 2001). AR4D is driven by a sustainable livelihoods approach which places people at the centre of development activities and emphasises the role of collaboration among the relevant stakeholders (e.g. farmers, researchers) in defining the research problems and developing the research questions (Hogh-Jensen et al., 2010). AR4D and technology development involve direct or indirect interactions with rural livelihoods by facilitating or hindering change in vulnerability contexts, livelihood asset bases and development policies, institutions and processes. There has been emerging concern about the need to develop an appropriate framework for assessing the impacts of agricultural research including AR4D projects in order to gain better understanding about the contribution of research interventions to poverty alleviation and to the formulation of strategic development programs and policies for less developed communities and regions (Adato & Meinzen-Dick, 2002; Krall et al., 2003; Marasas et al., 2001). Such a framework requires an integration of both theories and practice in order to make impact assessment useful for social change and development.

This chapter reviews the development theories and practices that are relevant to the impact assessment of AR4D projects. It starts with an overview of the basic concepts in research and development (R&D), R4D and AR4D. The definition of AR4D is discussed by looking into the different participation levels of key stakeholders and the communication processes used in AR4D projects. This is followed by a critical analysis of the concepts of livelihoods, sustainable livelihoods frameworks and the interactions among livelihood components. In addition, as sustainable livelihoods is a target of AR4D, assessing the impacts of AR4D means finding appropriate ways to measure change in sustainable livelihood. The concepts of the impact pathway and the theory of change (ToC) approach are discussed as complementary tools for obtaining critical information about how the impacts of AR4D have been achieved through an impact pathway which is influenced by various internal and external factors. The chapter ends with the analytical framework that explains how participatory impact assessment can be utilised to measure the impacts of AR4D through the lens of the sustainable livelihoods framework and guided by ToC analysis.
3.2. Research for development

3.2.1. From research and development to research for development: concepts and approaches

Research and learning is seen as an intertwined process in which knowing and learning about the truth coexist, leading to the concept that “research is about the power to define reality” and doing research is to carry out systematic investigation aiming to make some claims about the world (Laws et al., 2003). Among different research concepts, the terms “R&D” and “R4D” frequently appear in the literature on international development. However, there has been a gradual shift from a focus on R&D to the R4D model and from defined project outputs to a livelihoods focus. This shift is characterised by the change from the passive to more active roles played by local stakeholders in a research process and from a focus on increased production to the development of sustainable livelihoods for target groups.

The Organisation for Economic Cooperation and Development (OECD) and USAID tend to use the term “R&D” rather than “R4D”. According to them, R&D emphasises the creation of new knowledge to generate new knowledge stock and the use of this new knowledge to devise new applications. This definition includes the synthesis and analysis of previous research to the extent that it leads to new and creative outcomes (OECD, 2002; USAID, 2010). According to this definition, R&D includes three major types: i) basic research, ii) applied research, and iii) experimental development. Basic research could be in theoretical or experimental form with a focus on acquiring new knowledge from observable facts without using the knowledge. Applied research gains knowledge in order to determine ways to meet people’s needs. Experimental development is systematically implemented to achieve practical knowledge to improve existing production systems and services. R&D aims to develop, test and apply new knowledge for better outcomes, with researchers and scientists taking the lead roles in a research process and with the research mainly aiming to improve human conditions.

Compared to R&D, the recent concept of R4D has been developed with more attention paid to the role of local participants in research projects for the purpose of empowering the target communities. The R4D concept is rooted in the emphasis placed by Paulo Freire among others since the 1970s on the importance of the active participation of the poor in development (Hogh-Jensen et al., 2010). Recent R4D initiatives have shifted to a more interdisciplinary-oriented research, which enhances collaboration and partnership among stakeholders in a research process. In agricultural research, Chambers and colleagues have emphasised the need for farmers to be involved since the 1970s (in Hogh-Jensen et al., 2010). Van de Fliert and Braun (2002, p. 26) state that the early participation of farmers in a research project could result in the formation of a problem and opportunity tree with many ramifications other than the previously identified issues. Effective communication is also seen
as a key factor for the success of any R4D (Tiscenko & Fisher, 2009). Since the late 1990s, the concept of R4D has also been driven by the concept of sustainable livelihoods (Hogh-Jensen et al., 2010). According to Hawkins et al. (2009, p. 7), R4D helps to develop the capacity of beneficiaries to implement, manage and evaluate their own development processes.

The R4D research approach has attracted the attention of most of the international development agencies and donors such as ACIAR, the International Centre for Tropical Agriculture (CIAT), the UK Department for International Development (DFID) and the World Bank (Menter et al., 2004; Ochola et al., 2011). Depending on the different development contexts and research objectives, R4D approaches are referred to using different terms such as participatory research for development (Bessette, 2004; Hogh-Jensen et al., 2010), integrated research for development (IR4D) (Hawkins et al., 2009; Kaufmann, 2007) and R4D (Laws et al., 2003; Mytton, 2012). Although each type of R4D has its own development objectives, R4D projects share the common characteristics of an orientation towards participatory approaches and participatory communication towards people’s empowerment, a focus on long-term impacts and a focus on sustainable livelihoods development.

Scholars have attempted to classify R4D and clarify the differences between R&D and the R4D model. Menter and colleagues (2004) explain that researchers in R&D projects take the lead roles in controlling the production of technological innovations or technologies, and these innovations are developed by the research team before being transferred to users. By contrast, R4D is seen as active or integrated research that emphasises the interactivity and adaptability of new technologies or innovations in a complex ecosystem. Hogh-Jensen et al. (2010, p. 909) and Krall et al. (2003) point out the shift from focusing only on scientists’ findings in the R&D model to taking into account social organisations and the attitudes and behaviours of stakeholders in the R4D model. Despite various efforts to distinguish the concepts of R&D and R4D, these terms are used interchangeably in international development practices and the literature, leading to confusion in many cases. In the agricultural research field, researchers and development actors often make different interpretations of R&D and R4D projects, especially when agricultural research projects are implemented in the same socio-economic contexts.

3.2.2. Agricultural research for development

Basic understanding of AR4D

The definition of AR4D is sourced in various R4D concepts. This section discusses the concept of AR4D based on the recent dominant perspective of R4D for the empowerment and sustainable livelihoods of target communities. From this point of view, AR4D is seen as participatory research involving the use of both quantitative and qualitative methods (Laws et al., 2003). It follows the premise that research can facilitate development or improve the conditions in less-developed
countries and regions through the research process itself (Hogh-Jensen et al., 2010). AR4D is also considered to increase agricultural outputs and value, playing an important role in the reduction of poverty in many developing countries (Thirtle et al., 2003).

Agricultural research has recently moved from a linear model to a people-centred model. In the linear model, research themes and questions are defined and designed by researchers and not by local communities. In the people-centred model, the key stakeholders’ attitudes and interests are taken into consideration in decision-making. Definitions of AR4D often refer to the people-centred model. The sustainable livelihoods approach has been the most influential innovation in AR4D. Despite variations in AR4D approaches, there is an accepted view that the roles of farmers in an AR4D research process change from passive and consultative to collaborative and self-decision-making (Hawkins et al., 2009; Van de Fliert et al., 2010a). In AR4D, researchers and scientists loosen their roles in the research by empowering local stakeholders in the decision-making processes. This allows the target groups to make their own decisions towards the development of sustainable livelihoods.

R4D and AR4D projects are carried out in various stages or phases. According to Bessette (2004, p. 34), there are four main phases in a R4D cycle: i) diagnostics, ii) planning, iii) intervention or experimentation, and iv) assessment (Bessette, 2004, p. 34). Based on each phase, (Bessette, 2004) proposed participatory communication strategies to support the implementation of the R4D project such as building relationships with local communities, involving local communities, designing and using the appropriate communication tools, and documenting and sharing the results. Van de Fliert and colleagues (2010a) divided AR4D into seven phases: diagnostics, basic research, application, adaptation, development, implementation and evaluation. However, an AR4D project may not necessarily conduct all the phases; for example, it might inherit research outputs from other research. Promoting a farmer-based research approach, CIAT developed the Local Agricultural Research Team (CIAL) concept in a farmer-run research process comprising eight stages: motivation, election, diagnosis, planning, experimentation, evaluation, analysis and feedback (Ashby et al., 2000; Douthwaite et al., 2009).

Synthesising the dominant points of view about R4D phases and the level of involvement of the relevant stakeholders in AR4D processes, the following eight main phases in an AR4D project are identified: 1) interest and motivation, 2) diagnostic research, 3) basic research, 4) applied research, 5) adaptive research, 6) development, 7) implementation, and 8) assessment and feedback. The first research phase is aimed at raising research interest and building initial relationships among the stakeholders before carrying out the diagnostic research. The cultivation of interest and motivation for the research is important in AR4D because the projects are carried out in vulnerable regions where the poor have limited awareness of the potential value of AR4D and low motivation to participate in
development activities. Once the diagnostic research is carried out in the second phase of an AR4D project, the subsequent phases develop, test and adapt the agricultural technologies and innovations to the real local natural, social and cultural contexts before scaling-out to wider groups of communities and scaling-up from the grassroots level to policy-makers, development organisations and other development actors. Farmers themselves normally take the lead role in the implementation phase. In this phase, a new agricultural technology or innovation is applied on a large production scale. In the final phase, the AR4D project is assessed in order to measure the contribution of the project to people’s livelihoods and capacity and to inform future development policies and strategies.

As AR4D is a complex process in which technologies are continuously tested and adapted to the local socio-economic context, some research phases can be combined together or leaped over. Depending on the availability of research outputs from other research initiatives, the local socio-economic and environmental contexts and the capacity of the research organisations, all or several of the research phases could take place in AR4D projects. For example, the first and second phases could be combined into one phase if the general research problems or issues have been well defined in previous research initiatives. AR4D projects could also utilise available developed technologies and innovations by adapting and implementing them to local contexts. The passive or active participation of stakeholders in each stage could result in positive or negative outcomes and impacts of AR4D on the development of sustainable livelihoods.

**Major components of AR4D towards sustainable livelihoods**

Understanding the key characteristics of AR4D is vital for designing, implementing, monitoring and evaluating systems that enable agricultural research to achieve sustainable impacts. A review of the literature on research that fosters a people-centred model and implements participatory research processes for development, such as the works by Pretty (1995a), Adato and Meinzen-Dick (2002); Bessette (2004) and Van de Fliert et al. (2010a), identifies the key components of AR4D. These characteristics distinguish AR4D from conventional agricultural research projects in the context of developing countries. Table 3.1 presents a summary of the key components and characteristics of AR4D projects.

As described in Table 3.1, AR4D is collaborative and interdisciplinary-oriented agricultural research. AR4D projects place local communities at the centre and take sustainable livelihoods as the core of the development process. As deduced earlier, there are eight major phases in carrying out an AR4D project. Through these phases, agricultural technologies or innovations are developed, tested, adapted and implemented at a larger scale. The impact assessment of the AR4D project is the final phase that helps to measure the contribution of the project and to share and communicate the impacts among stakeholders for better future agricultural research. Impact assessment also captures feedback and
recommendations for facilitating change in local development policies and strategies, institutional environments, research organisations and development agencies.

Table 3.1: Key components and characteristics of AR4D projects

<table>
<thead>
<tr>
<th>Component</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESEARCH OBJECTIVES</td>
<td>• Acquisition of new knowledge to determine ways to meet needs</td>
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<td></td>
<td>• Adaptability of agricultural innovation in a complex ecosystem</td>
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<td></td>
<td>• Local empowerment</td>
</tr>
<tr>
<td></td>
<td>• Sustainable livelihoods focus</td>
</tr>
<tr>
<td>RESEARCH APPROACH</td>
<td>• Interdisciplinary-oriented towards blended method</td>
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<tr>
<td></td>
<td>• People-centred approach and empowerment</td>
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<tr>
<td></td>
<td>• Participatory process</td>
</tr>
<tr>
<td></td>
<td>• Sustainable livelihood focus</td>
</tr>
<tr>
<td>RESEARCH PHASES</td>
<td>• Interest and motivation for building research participation and partnership</td>
</tr>
<tr>
<td></td>
<td>• Diagnostic research to define research priorities of target stakeholders</td>
</tr>
<tr>
<td></td>
<td>• Basic research to acquire new knowledge from observable facts</td>
</tr>
<tr>
<td></td>
<td>• Applied research to gain practical knowledge to meet the needs of target stakeholders</td>
</tr>
<tr>
<td></td>
<td>• Adaptive research to test and adapt new technology or innovations to local context</td>
</tr>
<tr>
<td></td>
<td>• Development for scaling-up and scaling-out the application of new technology or innovation</td>
</tr>
<tr>
<td></td>
<td>• Implementation of a larger scale application of new technology or innovation</td>
</tr>
<tr>
<td></td>
<td>• Assessment and feedback for measuring and sharing impacts</td>
</tr>
<tr>
<td>COMMUNICATION STRATEGIES</td>
<td>• Participatory communication strategies for needs assessment, research planning and implementation</td>
</tr>
<tr>
<td></td>
<td>• Participatory monitoring and evaluation of research activities</td>
</tr>
<tr>
<td></td>
<td>• Participatory impact assessment</td>
</tr>
</tbody>
</table>

The participatory approach incorporating participatory communication strategies for needs assessment, research planning, implementation and monitoring and evaluation is utilised to enhance the active engagement of local people in AR4D projects and to empower those stakeholders to improve their own conditions. This leads to a change in their behaviours, which is needed in order to sustain the impacts. As a result, livelihood outcomes and impacts such as changes in human, social, economic, physical and natural assets could be achieved. The contribution of the participatory communication strategies underpinning AR4D towards social change and development in target communities is illustrated in Figure 3.1.
3.2.3. Stakeholder participation in AR4D

Basic concepts of participation

The concept of participation is applied in many ways with a wide practice coverage (Bessette, 2004). The term “participation” could be used interchangeably with other terms such as “participatory communication”, “popular communication” and “participatory development” (Brendlinger, 1992, p. 88). Generally, the different definitions of participation focus on the nature of the participation process itself or on the functions of the participation. Bordenave (1994) defines participation as a process in which a person can see himself or herself as both a unique individual and a member of a community at the same time, leading to the conclusion that participation is a basic human need or a human right. Participation also means the mobilisation of people in order to bring about equitable political and economic power-sharing for certain groups (Servaes, 2003). It implies the involvement of relevant stakeholders in the design and implementation of a development project (Tufte & Mefalopulos, 2009, p. 6). McAllister and Vernooy (1999) emphasise that “there is no right or wrong amount of participation”; rather, development efforts should pay attention to increasing the “quality”
of participation by giving people better control over the development process.

Participation and its functions are increasingly discussed in the literature on participatory communication. From the communications perspective, participation has two different meanings: participation as a ‘means’ and participation as an ‘end’ (Huesca, 2003). On one hand, participation as a means refers to increasing the effectiveness of an externally introduced program via the involvement of local people in the processes. On the other hand, participation as an end implies that participation is the goal in itself; that is, it aims to empower people by equipping them with the ability to change their own lives (Huesca, 2003; Pretty, 1995a; Van de Fliert, 2010b). In the domain of agricultural and rural development, Pretty (1995a, p. 1251) also defines two overlapping schools of thought and practice in relation to participation, with one placing emphasis on “participation as a means” to increase the involvement of people in agricultural development processes and the other placing a focus on “participation as a fundamental right” to have collective action, empowerment and institutional development.

Participation typologies draw the attention of researchers, development agencies and development practitioners who strive to understand how people can be involved in a development process and how different communication strategies can be used to efficiently mobilise local resources for sustainable development. Peruzzo (1996) classifies participation into three different types: non-participation, controlled participation, and power participation. In this classification, the first type is the passive participation of people. The second type is initiated due to pressure from the bottom and receives limited acceptance from the top. The third type is the most empowerment-focused, as collaborative management and self-management facilitate growth in individuals and communities. Among other views, the World Bank (1995) and Tufte and Mefalopulos (2009, p. 6) divide participation into four types: passive participation, consultation, collaboration, and empowerment.

Looking at how multiple stakeholders from different disciplines and backgrounds participate in research processes, Rosenfield (1992) and Austin et al. (2008) categorise R4D projects into multidisciplinary, interdisciplinary and transdisciplinary research. In this classification, multidisciplinary research is a non-integrative mixture of disciplines and members of different disciplines work independently but together towards the end results. It is mutual and cumulative but not interactive (Collin, 2009). Interdisciplinary research crosses the boundaries between academic disciplines. This crossing helps to mutually strengthen capacity and partnership among the different researchers or institutions joined in one project (Krall et al., 2003; Stokols, 2006, p. 75).

In contrast to multidisciplinary and interdisciplinary research, Hirsch Hadorn et al. (2008, p. 19) consider transdisciplinary research as holistic research that can “grasp the complexity of the problems” and understand the “diversity of scientific and societal views” to “link abstract and case
specific knowledge, and to constitute knowledge with a focus on problem-solving for what is perceived to be the common good” (Stokols, 2006). In this type of research, no stakeholder can stay in their comfort zone (Stokols, 2006). In transdisciplinary research, there is no boundary among different disciplines, leading to the blending of methods and assumptions into integrative conceptual models from different fields (Morgan et al., 2003; Van de Fliert et al., 2010c). The interdisciplinary and transdisciplinary agricultural research approaches have been adopted in recent AR4D initiatives. These approaches aim to mobilise resources and strengthen collaboration among research institutions and with local stakeholders in order to solve the multiple interrelated problems faced by the least developed communities and regions. Although there is no standard definition of multidisciplinary or transdisciplinary research, pulling different stakeholders out of their comfort zones to work together to deal with a common problem could lead to multiple outcomes and impacts on social change and development.

**Stakeholder participation in agricultural projects and programs**

There is an emerging need to engage local stakeholders in development activities including AR4D in order to address local issues in developing countries and regions. Research institutions and development actors are more aware of the benefits of shifting from a top-down approach to participatory-oriented research processes. Cornwall and Jewkes (1995) state that the participation of stakeholders or allocation of power to stakeholders in a research project helps to distinguish conventional and participatory processes. Laws et al. (2003) suggest that, in doing research, it is necessary to pay attention to the roles of local stakeholders (e.g. villagers, children and other disadvantaged groups of people) and external stakeholders (e.g. local government agencies, NGOs and community development practitioners). Leeuwis and Van de Ban (2004) argue that “maximum participation” could be achieved if decision-making power is handed over to all stakeholders. Hoffmann et al. (2007) acknowledge the innovative power of farmers in participatory research. They argue that farmers could play complementary roles not only in identifying research priorities but also in testing and evaluating new agricultural technologies. As described by Van de Fliert et al. (2010a) in their proposed AR4D framework, farmers should be involved in all phases of an AR4D except for the basic research.

In order to measure the participation of local stakeholders in agricultural research, various researchers have made efforts to clarify participation levels. Although there are variations in the definitions of participation levels, a common agreement is achieved about the need to shift the participation of local stakeholders from the passive level to the consultative, collaborative and self-empowerment level. Nilja and Ashby (1999, pp. 3–4) divide the participation of local farmers in a research process into five types: on-farm research participation, consultative research participation, collaborative research
participation, collegial research participation, and local decision-making research participation. In the first type, researchers take the exclusive roles in the decision-making process; in the second type, farmers are informed and give ideas but with limited influence on decision-making. The participation of people (in groups or as individuals) in the last three types of participation identified by Nilja and Ashby gradually improves, from having opportunities for two-way communication with researchers, to joint decision-making, to self-decisions-making.

Pretty (1995a, p. 1252) conducted a comprehensive analysis of how farmers improve their decision-making capacity by being involved in agricultural research processes. Pretty’s framework separates the participation of local people in development projects and programs into seven levels that move from passive participation to more active participation, as presented in Figure 3.2.

![Figure 3.2: Typologies of participation in agricultural development projects and programs](source: Adapted from Pretty (1995a))

An AR4D project is a non-linear development process. It is characterised by fluidity and complexity that require the participation and contribution of multiple stakeholders with interweaved roles at various levels along a pathway of change. This pathway is also influenced by various technical, socio-
economic, institutional and policy factors and conditions. The achievement of impacts in agricultural research interventions is therefore driven not only by the ways in which agricultural technologies are developed but also by the ways in which these technologies are tested, adapted to different social contexts and sustained by target communities and research partners. Other rival factors such as changes in infrastructure, climate conditions and overlapping development synergies in the same areas and risks could also affect the achievement of impacts in AR4D. Understanding these influential factors is important for the effective impact assessment of AR4D.

**Participatory communication processes for enhancing stakeholder participation in AR4D**

As different communication strategies could result in various levels of participation by the key stakeholders in each phase of AR4D, leading to different outcomes and impacts, so communication strategies could be seen as a core factor in this complex innovation process. The literature discusses how participatory processes and communication strategies have been designed to involve the key stakeholders in each phase of an AR4D project. Although the practice of AR4D and the communication approaches used to enhance the participation of stakeholders in each phase of a research project vary among development agencies and regions, there is a common perspective that the stakeholders’ levels of participation are linked to their functional empowerment in R4D processes. Based on the work by Van de Fliert et al. (2010a), Bessette (2004) and Pretty (1995a) on AR4D phases, the concept of participation and the communication strategies used to enhance the participation of stakeholders, the eight key phases of AR4D in the context of implementation in developing countries are summarised in Table 3.2.

These phases are non-linear because of the different roles of different stakeholders as well as their different controls over the research process. In the initial phases of a research project, researchers take a lead role while farmers passively participate. Farmers’ roles change from passive to the consultative, collaborative mode, to self-decision-making. In the development phase, local extension systems play a key role in supporting farmers to adopt and adapt agricultural innovations. Farmers become independent in the technology implementation process. Impact assessment is carried out by researchers in close collaboration with farmers, extension staff and other stakeholders. Although the final impact assessment is often in the hands of the researchers, the local farmers and extension staff play decisive roles in some assessment activities such as measuring and interpreting multiple livelihood outcomes which are better understood by these stakeholders.
Table 3.2: Stakeholder participation and communication strategies in AR4D projects

<table>
<thead>
<tr>
<th>Research phases</th>
<th>Communication strategies</th>
<th>Participation of</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Farmers</td>
</tr>
<tr>
<td>I. Interest and motivation</td>
<td>- Meeting with local stakeholders (local communities, authorities and extension staff) to explore research problems and research priorities</td>
<td>★★★★</td>
</tr>
<tr>
<td>II. Diagnostic research</td>
<td>- Developing relationship and trust</td>
<td>★★★★</td>
</tr>
<tr>
<td></td>
<td>- Understanding local setting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Refining research problems and research needs with local stakeholders</td>
<td></td>
</tr>
<tr>
<td>III. Basic research</td>
<td>- Not or limited participatory communication; decision are mainly made by researchers</td>
<td>-</td>
</tr>
<tr>
<td>IV. Applied research</td>
<td>- Participatory communication for gaining and testing agricultural technologies or innovations</td>
<td>★</td>
</tr>
<tr>
<td>V. Adaptive research</td>
<td>- Participatory communication</td>
<td>★★★★</td>
</tr>
<tr>
<td></td>
<td>- Participatory monitoring &amp; evaluation for testing and adapting agricultural technologies or innovations</td>
<td></td>
</tr>
<tr>
<td>VI. Development</td>
<td>- Participatory communication</td>
<td>★★★★</td>
</tr>
<tr>
<td></td>
<td>- Participatory monitoring &amp; evaluation plans and strategies for scaling-up and scaling-out agricultural technologies</td>
<td></td>
</tr>
<tr>
<td>VII. Implementation</td>
<td>- Capacity building for farmers</td>
<td>★★★★</td>
</tr>
<tr>
<td></td>
<td>- Farmers’ self-implementation, monitoring and evaluation</td>
<td></td>
</tr>
<tr>
<td>VIII. Assessment and feedback</td>
<td>- Participatory communication for empowerment</td>
<td>★★★★</td>
</tr>
<tr>
<td></td>
<td>- Participatory communication for sharing and sustaining impacts</td>
<td></td>
</tr>
</tbody>
</table>

Legend: - =None (or only receiving information); ★=Consultative; ★★=Collaborative; ★★★=Main decision-makers

Source: Adapted from Van de Fliert et al. (2010a), Bessette (2004) and Pretty (1995a)
Creating participation for sustainable agricultural development and social change not only requires researchers to be aware of the true meaning of participation but also to be aware of the specific socio-economic and political contexts in which the development processes are taking place. White (1994) points out that, without having a clear and full understanding of the strengths and weaknesses of participation, participatory communication strategies for community development may not be successful. Leeuwis and Van de Ban (2004) recommend that researchers pay adequate attention to the scarce resources (e.g. time, energy and other resources) of stakeholders because they often spend a lot of time and other resources to participate in the sessions without being compensated for the opportunity cost. A top-down approach in research activity implementation is also seen as one of the major obstacles hindering the improvement of the livelihoods of the poor in many research projects (Pachico et al., 2004, p. 144). The limited or formal participation of some stakeholder groups (e.g. local authorities and agricultural extension staff) in developing countries due to the influence or propulsion of local political power structures often result in low impacts on development. The recommendation is also made that researchers and farmers should establish strong and effective collaborative action in a research project: such collaboration can help to overcome communication problems and achieve remarkable agricultural innovations for development (Hoffmann et al., 2007, p. 358).

3.3. Sustainable livelihoods frameworks

3.3.1. Basic concepts of sustainable livelihoods

The concept of livelihoods has been discussed in agricultural and rural development literature in the last few decades. It is considered to be more tangible than the concept of development and provides easier ways to observe, describe, discuss and quantify the relevant factors (Tao & Wall, 2009, p. 142). Livelihoods can be simply understood as “adequate stocks and flows of foods and cash to meet basic need” (World Commission on Environment Development [WCED], 1987). However, the importance of human capabilities in achieving a livelihood is not taken into account in this basic definition. Livelihoods can also be interpreted as the ways in which a person earns a living (Chambers & Conway, 1991). In a broader meaning, a livelihood is seen as a combination of people’s capabilities and the activities required for securing the means of living such as food, income and assets (Chambers & Conway, 1991; Scoones, 1998).

Development practitioners began to pay attention to “sustainable livelihoods”, and definitions of sustainable livelihoods have been developed by reference to practices that have successfully dealt with poverty and empowerment issues in recent decades (Chambers & Conway, 1991). The
definitions of sustainable livelihoods vary among NGOs and development organisations. One of the early prominent approaches to sustainable livelihoods was expressed by the Advisory Panel of the World Commission on Environment and Development, which aimed to place “sustainability” and “security” as the central focus of the livelihoods concept:

A livelihood is defined as adequate stocks and flows of food and cash to meet basic needs. Security refers to secure ownership of, or access to, resources and income earning activities, including reserves and assets to offset risks, ease shocks and meeting agencies. Sustainable refers to the maintenance or enhancement of resource productivity on a long-term basis. A household may be enabled to gain sustainable livelihood security in many ways through ownership of land, livestock or trees, rights to grazing, fishing, hunting or gathering; through stable employment with adequate remuneration; or through varied repertories of activities. (WCED, 1987)

In this definition, population, resources, environment and development are seen as important inputs to sustainable livelihoods (Chambers, 1988, p. 10). It emphasises that the sustainable livelihood security of a household could be achieved by having proper ownership or access to resources (e.g. land, crops, livestock, and rights to grazing, fishing and hunting) on a long-term basis and by being adequately remunerated from stable employment (WCED, 1987). Despite its useful description of the causal relationship between livelihood factors and sustainable livelihoods, the interactions between livelihood factors at different levels are not considered in this definition. Chambers and Conway (1991) modified the WCED concept into a new sustainable livelihoods concept that considers both environmental and social sustainability. The comprehensive definition of sustainable livelihoods is provided by Chambers and Conway (1991, p. 6) as follows:

A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capacities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term.

In this definition, a sustainable livelihood is one that achieves both environmental sustainability and social sustainability. Environmental sustainability relates to the external impacts of the livelihood (pollution, global warming, and deforestation), and social sustainability relates to coping with external problems (shocks and stress). This concept of sustainable livelihood includes three interconnected sub-concepts, namely, people’s capability, equity and sustainability. Each one is linked to the others and is seen as both “an end” and a “means” of living (Chambers & Conway, 1991, p. 3). This definition also provides a wider view about the outcomes and impacts of sustainable
livelihoods in both scope (local, global) and scale (short and long-term).

Scoones and a team from the Institute of Development Studies (IDS) at University of Sussex agreed with the major components in the concept of sustainable livelihoods developed by Chambers and Conway; however, they asserted that the addition of outcome indicators is necessary (Scoones, 1998, p. 5). They also indicated that, although poverty and the environment are the key issues in sustainable development, the concept offers limited clarification about trade-offs and contradictions between these two issues (Scoones, 1998). As a result, drawing on the definition of sustainable livelihoods by Chambers and Conway (1991) and on other research about the relationship between livelihood assets and poverty reduction such as the work by Brundtland (1987) and Swift (1989), the IDS research team proposed a shortened but clear definition which focuses on rural development (Scoones, 1998):

A livelihood comprises the capabilities, assets (including both materials and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from the stresses and shocks and maintain or enhance its capacities and assets both now and in the future while not undermining the natural resource base.

The development of the concept of sustainable livelihoods has contributed to a significant change in development practice regarding the roles of ownership and access to livelihood resources and opportunities for sustainable development. The sustainable livelihoods approach has therefore drawn the attention of various development agencies and research organisations such as the IDS (Tao & Wall, 2009), DFID, Care International and UNDP (Brocklesby & Fisher, 2003). Sustainable livelihoods is also listed as the first of the five corporate development strategies in the FAO Strategic Framework for 2000–2015 (FAO, 1999).

In summary, there are various factors and processes that could either constraint or enhance the ability of people to achieve their sustainable livelihoods. The concept of sustainable livelihoods incorporates people’s capabilities and assets (both materials and social resources) and their activities for a means of living. A sustainable livelihood can recover from and cope with external problems (shocks and stress) and maintain and develop livelihood capital for the long-term basis. Although definitions of sustainable livelihood vary according to different scopes of research, the livelihoods and sustainable livelihoods concepts have changed practitioners’ perceptions about ways of living and enhanced the recognition of the importance of human capacity and vulnerability contexts in the development of sustainable livelihoods. Development projects including AR4D are complex processes that are implemented in changing social, political and institutional contexts and often have multiple influences on livelihood development rather than focusing only on technology development and innovation.
3.3.2. **Sustainable livelihoods frameworks**

To meet the need for an in-depth analysis and application of the sustainable livelihoods concept and sustainable livelihoods approaches into development practices, a number of sustainable livelihoods frameworks have been developed by various development agencies and NGOs such as DFID, IDS, UNDP, International Food Policy Research Institute and Oxfam (Adato & Meinzen-Dick, 2002; Hinshelwood, 2003). Each sustainable livelihoods framework has common and unique perspectives on livelihoods, poverty and development. They all focus on developing an analytical framework for understanding the complex and differentiated processes of livelihood pathways. Such a framework is essential for planning, implementing and assessing development interventions for the sustainable livelihoods of target communities. Among the existing theories and practices, the two most recent and prominent sustainable livelihoods frameworks were developed by the IDS and DFID.

**IDS sustainable rural livelihoods framework**

The IDS sustainable rural livelihoods framework anticipates that different socio-economic and political contexts and different combinations of livelihoods resources will have an influence on the combinations of livelihoods strategies, leading to different outcomes for sustainable livelihoods. These sustainable livelihoods outcomes are enhanced or constrained by institutional processes and organisational structures. The institutional processes (both formal and informal institutions and organisations) can be seen as an important factor that mediates the ability of people to carry out strategies to achieve livelihood outcomes. The IDS sustainable rural livelihoods framework starts with an analysis of the five major groups of sustainable livelihoods outcomes: i) the creation of working days, ii) poverty reduction, iii) wellbeing and capacity building, iv) livelihoods adaptation and resilience, and v) natural resource base sustainability. According to Scoones (1998), these sustainable livelihoods outcomes can be assessed at the individual, household, community, region and national levels. This framework is also built on the premise that when outcomes are well-defined, the outcome assessment indicators are better developed (Scoones, 1998). The IDS sustainable rural livelihoods framework is shown in Figure 3.3.

In the IDS framework, livelihoods resources are seen as both material and non-material inputs or capital including natural, economic, human and social capital. This capital may have direct or indirect impacts on livelihood outcomes. There is also room for other capital such as “political capital”, “symbolic capital” and “physical capital” (Scoones, 1998, p. 17). However, livelihoods capital is grouped based on scales of conditions as well as different points of view. In addition, the IDS framework emphasises three major livelihoods strategies: i) agricultural intensification (capital-lead) or extensification (policy and labour-led), ii) livelihoods diversification, and iii) migration. Scoones (1998, p. 9) argues that sustainable livelihoods from agriculture can be gained either by intensification.
(more outputs per input unit area or through increased capital investment and labour inputs) or extensification (more outputs due to using more inputs), or income diversification (off-farm activities and migration). Different combinations of livelihood strategies can lead to different livelihood outcomes.

**Figure 3.3: IDS sustainable rural livelihoods framework**

*Source: Scoones (1998, p. 4)*

In addition, the contextual analysis of conditions, trends and policy settings is performed by considering all the socio-economic and political conditions (e.g. policy, history, macro-economic conditions, terms of trade, climate, agro-ecology, demography and social differentiation) as necessary inputs for livelihoods (Scoones, 1998). There is also an emphasis on the ability of people to recover from and to cope with the vulnerability contexts such as trends, shocks and risks (Brocklesby & Fisher, 2003, p. 5). Finally, institutional processes and organisational structures, which are both formal and informal, are considered to be important factors in sustainable rural livelihoods. These institutional and organisational processes and structures may enhance or hinder the formation of livelihood strategies to achieve sustainable livelihoods outcomes (Scoones, 1998; Tao & Wall, 2009, p. 144).
DFID sustainable livelihoods framework

The DFID Sustainable Rural Livelihoods Advisory Committee developed a sustainable livelihoods framework based on the IDS sustainable rural livelihoods framework and other related literature. The DFID sustainable livelihood framework provides a holistic approach to understanding the factors that enable or constrain livelihood development. The framework facilitates change in thinking about poverty and livelihoods of the poor by looking at both the direct and indirect supports needed to improve sustainable livelihoods in a particular socio-economic and institutional context. It also helps to identify, design and assess new development activities for more effective intervention strategies for poverty reduction and social development. The DFID sustainable livelihoods framework is based on three roots: i) conceptual roots that draw from changing views about poverty over the past three decades, ii) practical roots that take into consideration the outcomes of development initiatives, and iii) organisational roots that consider how sustainable livelihoods approaches have been developed in the various initiatives of development agencies and NGOs (Ashley & Carney, 1999).

According to DFID (1999), its sustainable livelihoods approach enhances the strengths and minimises the negative impacts of integrated rural development programs. The framework aims to address the strategically important issues rather than all the aspects of livelihoods. It recognises the contribution of various livelihood resources to rural poverty reduction and addresses constraints not only at the household level but also at the macro and institutional level. It also helps to reduce dependency on a hostile macro-economic and institutional environment that may be dominated and heavily distorted by government (DFID, 1999). Although the DFID sustainable livelihoods framework does not mention the trade-offs that people face when they access different livelihoods resources in order to pursue different livelihood portfolios, this framework is recognised as an effective tool for organising and analysing ideas (Hinshelwood, 2003, p. 244). Figure 3.4 presents the DFID sustainable livelihoods framework.

The DFID framework illustrates how important components of livelihoods are linked to each other, identifies the core influences and processes of livelihoods and shows how the interactions of different components affect livelihoods (Adato & Meinzen-Dick, 2002; DFID, 1999). The five major components of the DFID sustainable livelihoods framework are vulnerability contexts, livelihoods assets, transformations of structures and processes, livelihoods strategies, and livelihood outcomes. The arrows in the figure denote the different dynamic relationships between the livelihoods components. Feedback mechanisms are likely to be set up between transforming structures and processes and the vulnerability contexts, and between livelihoods outcomes and assets and the vulnerability contexts (DFID, 1999).
Like the IDS sustainable rural livelihoods framework, the DFID sustainable livelihoods framework puts people in a particular context of vulnerability in which they have access to a wide range of livelihoods resources in the existing social, institutional and organisational environments. These environmental factors could shape or influence the combinations of livelihood strategies in pursuit of livelihood outcomes (DFID, 1999). On the other hand, the DFID sustainable livelihoods framework could help to understand the links between micro and macro factors. The sustainable livelihoods approach is also supposed to have strong links with participatory development, sector-wide approaches and integrated rural development. There is agreement in the literature that the livelihoods approach will not be effective without the participation of people who have good skills in social analysis and a strong commitment to poverty reduction (Adato & Meinzen-Dick, 2003; Nguyen et al., 2015).

Unlike the IDS sustainable rural livelihoods framework, the DFID sustainable livelihoods framework shapes livelihood assets into a five-capital pentagon comprising human, social, financial, physical and natural capital. When capital is grouped into a pentagon, any change of more than two dimensions of the pentagon will lead to a large variation of the rest of the pentagon. On the other hand, livelihood resources are interdependent in livelihood development. In some later research, other capital such as manufactured capital (Ekins et al., 2008), citizenship, enfranchisement, membership of political
parties (Adato & Meinzen-Dick, 2002) and information capital (Odero, 2006) is also conceptually discussed. However, these types of livelihoods capital are rooted in the same livelihoods resources. These types of livelihood capital could be classified into one of the five major capital groups mentioned above in the DFID framework’s five-capital pentagon.

As identified in the literature, a sustainable livelihoods approach is people-centred, responsive and participatory, targets poverty elimination on multiple levels, involves public and private partnerships, focuses on economic-institutional-social and environmental sustainability, and considers the dynamic nature of livelihoods (Ashley & Carney, 1999; Hinshelwood, 2003, p. 247). Therefore, the application of the sustainable livelihoods framework to assess the impacts of agricultural research can help people to change their thinking about poverty. In the sustainable livelihoods frameworks, poverty is not only measured by income, consumption and nutrition by reference to external standards but also by people’s accessibility to livelihoods resources (e.g. land, water and credit) in the pursuit of appropriate livelihood strategies to improve their lives. Poverty could also be taken into account by considering how people can adapt to vulnerability contexts (e.g. natural disasters, political rights, physical safety and social relationships) and how they can deal with risks and shocks in the future (Adato & Meinzen-Dick, 2002, p. 6).

**Utilisation of sustainable livelihoods frameworks for impact assessment of AR4D**

The adaption of the sustainable livelihoods frameworks for impact assessment offers a basis for developing a more suitable impact assessment framework for AR4D. The frameworks help to define appropriate indicators (outcomes or intermediate impacts, livelihood impacts and direct research outputs) of the changes that AR4D projects could make to the targeted regions and communities. The sustainable livelihood frameworks with specified capital groups (e.g. economic, human, social, natural and physical capital) could provide a direction towards the achievement of the expected impact assessment indicators. An in-depth understanding of the relationships between technologies, vulnerability contexts, household livelihood resources, intervening institutions and structures and livelihood strategies is also necessary for assessing both the short-term and long-term contributions of AR4D initiatives.

There have been various attempts to use a sustainable livelihoods framework for the impact assessment of agricultural research activities. According to Meinzen-Dick et al. (2003), a sustainable livelihoods framework is a good tool for analysing how an agricultural research intervention has affected people’s lives. It helps to assess the causal relationship between poverty and people’s access to livelihood resources and their diverse livelihood strategies. By using a sustainable livelihoods framework, both the direct changes (e.g. improved income, health, food) and indirect changes (e.g. assets, activities, the ability to cope with and recover from vulnerability contexts) that result from
agricultural research projects are assessed (Ashley & Hussein, 2000, p. 15). Parkinson and Ramirez (2007) state that the use of sustainable livelihood frameworks could help to identify the early and probable impacts of information and communication technology projects at the community level. Carpenter and McGillivray (2012) discuss the use of sustainable livelihoods frameworks to examine the ways in which agricultural research could have impacts on the livelihoods of the poor. They argue that the economic and non-economic impacts of agricultural research on poverty reduction could both be considered through a livelihoods lens.

Utilising a sustainable livelihoods framework as a lens for assessing the impacts of AR4D in the Northwest Highlands requires researchers to be aware of limitations in applying these frameworks. First, the notion of power, politics and empowerment is often missing from the categories of livelihoods (Adato & Meinzen-Dick, 2002; Ashley & Hussein, 2000). The sustainable livelihoods frameworks also do not incorporate historical factors, such as problems in previous development interventions that could influence the reception of the target groups to new interventions (Adato & Meinzen-Dick, 2002). This is particularly true in the context of poor communities and regions where various development activities are conducted at different times or at the same time. To ensure the effective impact assessment of AR4D, the top-down political systems and historical conditions that could influence the impact assessment process itself should be recognised.

In addition, farmers with the same livelihood assets may pursue different livelihood strategies because they are affected by different perceptions, geographic settings or levels of access to the market (Binder & Schöll, 2009). Without understanding fully the local cultural diversity and complexity, real impacts could not be measured. The sustainable livelihoods frameworks also place a focus on households and local complexity, leading to less attention paid to larger-scale and external policy or institutions (Allison & Horemans, 2006). Defining and quantifying the indicators for assessing impacts on livelihoods is also challenging, and research results are likely to be incomparable due to heavy reliance on participatory techniques and qualitative data (Ashley & Hussein, 2000). Finally, in some cases, the endowment of initial livelihood assets or capital (e.g. agricultural inputs, credit and livestock) for technology adoption sometimes can help to accumulate livelihood assets that affect the combinations of livelihood strategies of farmers in research areas. Failing to separate these investments could result in weak evidence of the assessment indicators of AR4D on local livelihood development and social change.
3.4. Impact pathway and theory of change

3.4.1. Impact pathway

Basic concepts

The concept of the impact pathway is believed to be rooted in the logical framework model for planning and evaluation developed by the US Department of Defence in the late 1960s (Douthwaite et al., 2007; Horton et al., 1993). Since then, the logical framework has been modified and utilised in international development by agencies such as the UK Overseas Development Administration, IFAD and UNDP (Uribe & Horton, 1993). The logical framework was considered to be a good way to make the linear links between key components of development projects and programs, that is, to link inputs and activities to outputs, outcomes and impacts (Springer-Heinze et al., 2003). However, the logical model focuses on visualising a logical causal chain of events while the impact pathway model looks at both causality and complexity in a chain with a non-linear nature.

According to the Consultative Group on International Agricultural Research (CGIAR) Independent Science and Partnership Council (ISPC) (2012), the impact pathway model unpacks the link between outcomes and impacts and provides more details about a pathway in which each activity could contribute to impacts. The impact pathway concept has been continuously developed and adapted in the evaluation of agricultural research projects. In agricultural development practice, the frequently used terms for the impact pathway model or framework include impact pathway analysis (Krewitt et al., 1998; Springer-Heinze et al., 2003), impact flow diagram (Guijt, 1998) and participatory impact pathway analysis (PIPA) (Douthwaite et al., 2007).

The impact pathway model has become an important tool for tracing a complex pathway in which given outputs could bring about given outcomes and impacts including unexpected consequences. Springer-Heinze et al. (2003) describe impact pathway analysis as a logic-based evaluation tool to improve impact assessment methodologies for agricultural research projects. This impact pathway framework divides agricultural research into four stages: research activities, outputs, outcomes, and impacts. It then identifies the connecting processes between the stages. It also visualises research stages and helps to identify the internal and external factors that could influence the ability of agricultural research to achieve impacts (Springer-Heinze et al., 2003).

Impact pathway in the evaluation of agricultural research

Douthwaite et al. (2007) developed the PIPA approach to strengthen the impacts of multiple R4D projects that were implemented by CGIAR and various research institutes, national extension networks and community-based organisations in the Challenge Program on Water and Food in nine river basins in the world. The PIPA design provides an in-depth analysis of how the outcomes and
eventual impacts of R4D projects are linked, with the initial hypotheses of the inputs and outputs formed by combining a logic model and network maps. By making this combination, a simple causal chain in the form of the impact pathway is added with a more detailed explanation about causative change and using network maps to identify the horizontal or vertical ways (scaling-up and scaling-out) to achieve the outcomes and eventual impacts at different levels. Scaling-up is aimed at achieving vertical institutional expansion to foster an enabling environment for innovations, while scaling-out pushes the wider adoption of agricultural innovations from individual farmers to larger communities. However, one weakness of the PIPA approach is that the method was designed mainly by the impact evaluators, managers and staff of the Challenge Program on Water and Food projects. The beneficiaries participated only in the impact evaluation process.

ACIAR developed guidelines for assessing the impacts of its research activities, in which pathway analysis is identified as a key direction for tracing the full impacts of agricultural research projects (Davis et al., 2008). These guidelines aim to provide a comprehensive guide for assessing the impacts of a completed agricultural research project through two major impact assessment approaches: adoption studies, and full impact assessment. In the impact assessment of the ACIAR investment in rodent control activities in Vietnam and Cambodia, impact pathway analysis was adopted to design the data collection strategy and assess the impacts of the rodent control projects by gaining a clear understanding of the environmental contexts and focusing on the key components of change. In this pathway analysis, research outcomes are considered to be the external use or adoption of research outputs by key stakeholders such as research and extension organisations, NGOs, development agencies and farmers, leading to practical change and impact achievement (Palis et al., 2013).

In addition, according to Templeton (2009), although capacity building is key component of most R4D initiatives, limited attention has been paid to assessing the economic returns of capacity building impacts. Templeton proposed the use of “capacity building-to-impact pathway analysis” to map the pathway from capacity building to impacts. This helps to measure impacts such as the number of technology adoption farmers, changes in consumption, social wellbeing and environmental conditions. In later research, Templeton also used the impact pathway to analyse how research by the International Rice Research Institute on pesticide use and farmer health contributed to changes in pesticide policy in the Philippines and estimated the economic impacts of this change (Templeton & Jamora, 2010). However, it was recognised that although links between capacity building and outcomes and impacts can be identified, quantification of the level of attribution is difficult because capacity-building activities are often carried out together with or as part of research activities (Templeton, 2009).
The concepts and practices related to the impact pathway or pathway to change vary among practitioners in the agricultural research field; however, an impact pathway framework often focuses on describing and analysing how the application of direct research outputs of a research project could lead to outcomes, wider adoption and long-term impacts. Based on the analytical framework for impact assessment of agricultural research developed by Templeton (2005), the impact pathway analysis for strengthening impacts of agricultural research in the work by Springer-Heinze et al. (2003) and other concepts related to impact pathways in the literature, the key components of the impact pathway framework are described in Figure 3.5.

Figure 3.5: Impact pathway analysis framework for agricultural research
Source: Adapted from Templeton (2005) and Springer-Heinze et al. (2003)

As described in the above figure, agricultural research is a continuum but not necessary a linear process. Project outputs are transferred to the next users and end users in order to achieve the ultimate impacts. This long pathway to change is influenced by multiple internal and external factors. Ultimate impacts could be achieved through a long pathway from innovation development to adoption and development at a larger scale. By adopting an impact pathway framework or analysis, the ultimate use of agricultural research projects is looked at and measured by both the researchers and the key stakeholders. However, there are always overlapping areas between the components such as between outputs and outcomes and between outcomes and impacts. The outcomes (e.g. scientific outputs and
changes in development policies, institutional environments and people’s capacity) could sometimes be seen as the intermediate impacts of agricultural research projects because they can contribute greatly to the development of livelihoods in the target communities and region over both a short-term and long-term period. In addition, agricultural research is often a complex process. The outcomes are not only generated by an agricultural research project meeting its initial objectives but also by a participatory research process itself that could be utilised for future agricultural research intervention (McAllister & Vernooy, 1999, p. 45).

Furthermore, an impact pathway analysis helps to analyse how impacts can be achieved but it does not present a linear relationship between outputs, outcomes and impacts because no or limited impact is generated by agricultural research unless the outputs or agricultural technologies are adopted by farmers who have sufficient livelihood assets in supporting institutional environments. Finally, due to pressures on time and budgets, agricultural research projects often carry out an end-evaluation only a short time after the project completion; therefore, when applying the impact pathway approach for impact assessment there could be an overemphasis on the direct outputs and outcomes of the research rather than on the long-term livelihood impacts.

3.4.2. Theory of change

Basic concepts

The ToC has been conceptualised and attracted interest since the late 1990s when efforts were made by development actors to evaluate complex community initiatives. Various terms are used to refer to ToC, such as program theory, roadmap, causal pathway, blueprint for evaluation (Douthwaite et al., 2013), theory-driven evaluation (Chen, 1990) and theory of action (Schorr, 1997). Although these terms are different, they all relate to approaches that deal with the causality and complexity of development projects and programs. Moreover, in some cases, these terms are used interchangeably for different projects with different research focuses.

Like the impact pathway framework, ToC is also seen as a program theory-based approach that was developed from the logical framework or logic model since the 1960s. Rogers (2008, p. 34) argues that a simple logical model could not help to gain different stakeholders’ views about how change is designed and achieved. However, there has been a move from simple and linear explanations in the simple logical model to a non-linear or more complex focus in the ToC approach. Most international development agencies and NGOs such as DFID, CGIAR, Danida (Denmark’s development cooperation), IDS and the Asia Foundation have adopted ToC to develop a more integrative approach for scoping, designing, implementing, monitoring and evaluating their development activities (Vogel, 2012, p. 11). ACIAR also recently paid attention to the implications of the ToC approach in its agricultural research projects and programs (Stern & Mayne, 2013). However, there has been no clear
mechanism established to use ToC as a complementary tool for the effective impact assessment of the ACIAR funded agricultural research projects.

Because of the wide adoption of ToC in development activities as well as in agricultural research projects, various attempts have been made to define and clarify the ToC concept. Reisman et al. (2007) simply describe ToC as a visual diagram that represents the linkages or logical connections among development activities or strategies, outcomes and goals. Douthwaite et al. (2013) state that ToC can help to articulate how causal assumptions are linked to the designed outcomes. As described by James (2011), the ToC is an ongoing process that reflects how change happens and what influences this change to occur in particular organisations, groups of people or contexts. James (2011) identifies the key benefits of using ToC as the development of common understanding, better clarification and improved effectiveness and program focus, a framework for monitoring and evaluation, enhanced partnership among partners, organisational development, facilitation of communication and people’s empowerment, pointing out that these benefits could inevitably overlap. The Treasury Board of Canada Secretariat (2012) refers to ToC as a theory-based approach to evaluation that helps evaluators to uncover the black box of change by having better understanding of the causal links between the outputs and outcomes of an intervention. It is also emphasised that by using ToC for evaluation, the assumed causal chain of results is tested by checking each link and the assumptions about change.

Based on common views in the literature about ToC concepts and its applications in development practice, the ToC framework can be presented as shown in Figure 3.6.

**Figure 3.6: Theory of change approach**

*Source: Adapted from Mayne (2012), Vogel (2012) and Stern and Mayne (2013)*
As described in this figure, the key components of ToC are: i) a visual causal chain about interventions or processes leading to change, ii) assumptions about how change happens and the possible risks to achieving change, and iii) rival factors that could influence the observed results or changes. Each component could enable or prevent the process of change in a given context and at multiple levels. Impacts of AR4D projects in the Northwest Highlands region, for example, cannot be fully measured if there is a failure to understand the actual or potential influence of the region’s critical conditions and rival factors on impact achievement.

It is useful to consider how the ToC approach is different from the impact pathway model. Although these two concepts are sometimes used interchangeably, Rogers (2008) emphasises that the views of different stakeholders about desirable outcomes are represented in ToC rather than in the impact pathway or the simple logic model. Rogers explains that, although both the impact pathway and ToC approaches address the causality and complexity in the relationships between outcomes and impacts of development interventions, ToC makes more explicit explanations about change by questioning the causality and by taking into account the risks and uncertainty that could influence the expected outcomes and impacts. Taking a similar view, Stern and Mayne (2013) refer to ToC as a mature impact pathway. Based on a review of the use of ToC in international development, Vogel (2012) concludes that making explicit assumptions about change could enhance the ability of development initiatives to innovate and adapt to dynamic conditions.

**Utilisation of ToC in the evaluation of agricultural research**

In the evaluation field, ToC is adopted in both ex-ante and post-ante evaluation of development projects and programs. Barnett and Gregorowski (2013) describe ToC as “the cornerstone of theory-based approaches to evaluation”. According to Stern and Mayne (2013), the use of ToC could provide a good design for data collection that gains comprehensive causal explanations about a development program. In a similar point of view, Leeuw and Vaessen (2009) suggest that understanding ToC is a primary step in achieving explanations for observable impacts. Stein and Valters (2012) state that ToC can be used in agricultural research for strategic planning, description, monitoring and evaluation, and learning purposes.

In efforts to develop a sustainable livelihoods-based framework to assess the impacts of Australia’s international agricultural research, Carpenter and McGillivray (2012, p. 29) recommend the adoption of ToC to identify the intended poverty reduction impacts. Participants of a recent FAO email conference on approaches and methodologies also expressed the view that the ToC and impact pathway approach should be adopted for ex-post impact assessment of agricultural research projects (Ruane, 2014). However, suggestions were made on developing a ToC in parallel with a project design and implementation process using the different perspectives of key stakeholders and
beneficiaries to make it both an adaptive project management tool and a key element design for evaluation (Stern & Mayne, 2013).

Like the impact pathway approach, the theoretical concepts and practices of ToC vary among individuals and development organisations. However, increasing efforts have been made by development actors to use ToC as a theory-based approach to map a causal sequence or change from the intervention activities to the expected change and to identify critical assumptions and conditions in the reflection about how and why change occurs or could potentially occur because of development interventions. Therefore, ToC could be considered an ideal tool not only for designing but also for implementing, monitoring and evaluating AR4D projects.

3.5. Participatory impact assessment

3.5.1. Conventional versus participatory impact assessment

Conventional impact assessment

Impact assessment or impact evaluation has been used in development planning since the 1950s. Both terms are used interchangeably in development practices and theories. The aim of impact assessment is to measure change that occurs due to the interventions of a project or a program in order to provide important inputs for decision-makers in approving or adjusting development projects (Khandker et al., 2010; Mayoux & Chambers, 2005). It also provides lessons learned to enhance future programs (Krall et al., 2003). Impact assessment could also be understood as an analysis of both the intended and unintended changes made by a project or program during and after its implementation; these changes could be measured by both quantitative and qualitative impact indicators (Ashley & Carney, 1999; Davis et al., 2008). The attribution of change to a development project or program could be measured by assessing the relative importance of a project’s factors and non-factors or by comparing project and non-project populations (Catley et al., 2008; Khandker et al., 2010).

The ex-post impact assessment and ex-ante impact assessment are identified as the two main impact assessment approaches to agricultural research projects (Douthwaite et al., 2007; Marasas et al., 2001). The ex-post impact assessment is conducted after a project’s interventions in order to identify the impacts during or after implementation and provide information for more effective interventions in the future. The ex-post impact assessment is preferred by most international research and development agencies such as CGIAR, ACIAR and CIRAD. In contrast, the ex-ante impact assessment is often carried out at a planning stage or while a research process is underway in order to estimate the expected outputs, outcomes, intended benefits and future impacts of projects. Various NGOs and international development agencies such as ACIAR (Davis et al., 2008), UNDP (2009)
and CGIAR (Tran et al., 2013) adopted ex-ante impact assessment as part of proposal assessment or of a whole impact assessment processes. Both ex-post and ex-ante impact assessment are conventionally carried out by agricultural research projects with an overwhelming focus on economic returns to meet the requirements of funding agencies or decision-makers (Ruane, 2014).

Conventional impact assessment methods tend to focus more on the economic dimension of poverty (Mayoux & Chambers, 2005) or economic variables (e.g. increased production, cash, income and job generation) and internal management issues (Ashley & Hussein, 2000). Following a review of the impact assessment procedures of national research systems in three countries (Kenya, Madagascar and Uganda), Springer-Heinze et al. (2003) found that the use of a methodology with an economic focus and limited attention to processes of change was one of the key constraints in the impact assessment approaches taken in these research systems. The impact indicators used in conventional impact assessment methods are mainly defined by outsiders or professionals at the start of a project (Ashley & Hussein, 2000). Owen (2006) points out that conventional evaluations of impacts are often implemented at the end of a project or when the project is at a settled phase in order to measure expected and unexpected outcomes, justify the cost–benefit and provide guidance for future implementation. Quantitative-based approaches and methods are preferred in most conventional impact assessments.

A number of communication issues remain problematic in the impact assessments of agricultural research projects, especially in developing countries. The top-down or one-way communication approach is practised by the majority of government programs and development agencies. Many agricultural research projects are implemented in least-developed regions where ethnic minority communities live, but the impact assessment of these agricultural research projects is conducted in national or majority languages. Participatory and visual techniques are not properly adopted (Nguyen et al., 2013). In addition, the single quantitative-based approach with well-structured questionnaires and closed questions is likely to help the evaluators get the expected information and results rather than help them understand how outcomes and impacts are generated and how they contribute to local development. These problems sometimes lead to misunderstandings or weak evidence about outcomes and impacts.

Although many efforts have been made recently to use participatory processes to increase the participation of local people (as the key stakeholders and beneficiaries) in the impact assessment processes in agricultural research, many participatory processes still serve as the “fashionable frill” or “political slogan” rather than serving the learning and empowerment of local people. Such participatory communication activities focus on making participation a means to inform people and have them give answers to impact assessment questions rather than as an end that empowers people
to define the impacts of the agricultural research initiatives and to make their own decisions on how to utilise the impact findings for their own development.

Local and international development agencies and NGOs have tended to use conventional impact assessment approaches in their research projects. As an independent impact assessment group for CGIAR, the Standing Panel on Impact Assessment (SPIA) has conducted substantial quantifiable assessments to meet the escalating demands of donors since the 1990s. Most of the impact assessment work conducted by SPIA has concentrated on measuring direct quantitative impacts through ex-post impact assessment (Renkow & Byerlee, 2010). According to Douthwaite et al. (2003), in the CGIAR system, economic evaluation methods are dominant with little consideration of complexity. In addition, both ex-ante and ex-post impact assessment are seen independent research that are separated from monitoring and evaluation schemes, leading to weak evidence upon which to assess plausible impacts (Douthwaite et al., 2007).

By 2013, ACIAR had conducted 82 impact assessments of its agricultural research projects (ACIAR, 2013). Most of the impact assessment work conducted under the ACIAR Impact Assessment Series over the past decade focused on return on investment by measuring impacts and adoption in order to meet funding requirements (Davis et al., 2008; Gordon & Chadwick, 2007). In the guideline developed by ACIAR in 2008 for assessing the impacts of agricultural research, cost–benefit analysis is recommended and monetarily quantifiable indicators are preferred (Davis et al., 2008). The quantitative approach is the main assessment approach taken in most ACIAR impact assessments, such as those published by Martin (2008), Beattie et al. (2010) and Palis et al. (2013).

However, recommendations are made in the literature to change from a top-down approach to a bottom-up approach and from defined project outputs to a livelihoods focus (Ashley & Carney, 1999; Catley et al., 2008). Other suggestions include moving from short-term economic gains to broader livelihoods issues (human and social issues and economic and environmental sustainability) (Ashley & Hussein, 2000; Marasas et al., 2001; Van de Fliert, 2010b). Krall and colleagues (2003) argue that impact assessments should consider the complex and indirect relationships between agricultural technology or innovations and sustainable development.

**Participatory impact assessment**

Participatory impact assessment (PIA), which is seen as an extension of PRA, was initially practised in South Asia and East Africa by international development agencies and NGOs (Robinson, 2002). Chambers (1994b) believes that the application of PRA since 1990 marks a shift from a top-down approach to a bottom-up approach and from a blueprint process to a learning process. Unlike conventional top-down impact assessment approaches, PIA aims to measure the real impacts created by a development project or program rather than accounting for aspects of its implementation such
as inputs and service delivery, structure construction and trainings (Catley et al., 2008). PIA does not merely focus on accountability purposes but also on how to adapt and develop innovations to a large scale with wider impacts. In the PIA approach, impact indicators are designed and assessed by and with local people. Estrella and Gaventa (1998) suggest that local resources such as skills, knowledge and methods are needed in PIA processes.

According to Holland (2013, p. 15), PIA not only empowers local communities but also generates information and statistical data on the extent to which change can be attributed to development activities. Cromwell et al. (2013, p. 165) believe that understanding local needs and capacity is a core component of assessment for long-term sustainability. They discern the following five key features of PIA: identifying interested stakeholders; establishing stakeholders’ expectations; identifying priority evaluation criteria and defining impact assessment indicators; agreeing on methods with stakeholders; and collecting and analysing data in collaboration with stakeholders.

In international development practice, a number of researchers have adopted, modified and used key PRA tools for PIA such as participatory mapping and modelling, transect walks, seasonal calendars, daily and activity profiles, historical profile and trend analysis, matrix scoring, Venn diagrams, flow diagrams on systems and impacts, semi-structured interviews, direct observations, FGDs and key informant interviews (Cramb & Purcell, 2001; Pretty, 1995a, p. 1255). These tools have also been flexibly employed in combination with conventional statistical methods to measure the impacts of development projects and programs on people’s lives (Catley, 1999, p. 33; Chambers, 1994a; Cornwall et al., 1993; Robinson, 2002). According to Chambers (1994a), the use of these participatory methods and tools has spread in the four major sectors: natural resource management, agriculture, poverty and social programs, and health and food security.

ActionAid used the social mapping method for a large-scale participatory survey of the utilisation of services in over 130 villages in Nepal in 1992 (Chambers, 2007). In a study to assess the impacts of a commercial destocking strategy on pastoralists in a drought-affected region in South Ethiopia in 2006, proportional piling and matrix scoring methods were used to determine the different sources of income and expenditure and the contribution of different food and non-food relief interventions to local communities (Abebe & Catley, 2013). The pair-wise ranking method was adopted to assess the quantitative indicators of agricultural sustainability in Malawi in the Malawi Starter Pack Evaluation Program 1999–2000 (Cromwell et al., 2013).

As discussed in Chapter 2, in Vietnam, PRA methods and techniques have also been adopted and promoted since the early 1990s by various development agencies, local governments and NGOs such as Oxfam, Plan International, World Vision, Child Fund Australia and ActionAid (Tran et al., 2008). PRA tools and techniques have been continuously modified and adapted for socio-economic
planning, implementation, monitoring and evaluation processes at local levels (village, commune and districts) (CACERP, 2004; Poulsen et al., 2008). In assessing the impacts of the CIAT Forage for Smallholders Project in the Central Highlands of Vietnam in 2003, the wealth ranking and matrix scoring method was adopted for assessing changes in livelihood assets such as the human, natural, financial and physical assets of local communities (Cramb et al., 2003).

Like any development approach, the PIA processes vary among development agencies and NGOs in terms of both the impact assessment focuses and approaches. The PIA approach is referred to by different terms such as participatory monitoring and evaluation (PM&E) and participatory assessment of development (PADeV). Depending on the purpose and scope of the evaluation, PIA could be considered as an impact assessment process itself or as the result of a monitoring and evaluation process (Goyder et al., 1998; Krall et al., 2003). Others see PM&E as part of PIA (Cramb & Purcell, 2001; Estrella & Gaventa, 1998).

The literature also indicates an emphasis on using the PIA approach in impact assessment for sustainability (Gottschick, 2008) and pro-poor impact assessment (Mayoux & Chambers, 2005). In promoting a bottom-up approach to impact assessment, Dietz et al. (2013) developed the PADev guidebook. This guidebook aims to help researchers get the data and information needed for ex-post assessment of AR4D by looking carefully at the context of the research processes, ensuring the active involvement of key stakeholders in the evaluation processes, and using the livelihoods framework for relevant stakeholders to identify relevant changes over a long period. However, if monitoring and evaluation focuses more on measuring ongoing development activities and their performance compared to initial objectives, impact assessment aims at measuring how change is actually or potentially achieved due to development intervention activities. The term “participatory” refers to the participation of local stakeholders in the development processes.

Despite the differences in practical approaches, there is a consensus that, in comparison with conventional impact assessment, participatory methods are not only more cost-effective in getting reliable information and knowledge in a rapid way but also are better in attaining cross-checks of impact results (Bruges & Smith, 2008; Pretty, 1995a). Some common steps are carried out in PIA initiatives (Catley et al., 2009; Guijt, 1998): i) defining the impact assessment objectives, research questions and resources, ii) identifying the impact assessment indicators, iii) deciding the impact assessment methods, iv) assessing the attribution or contribution of a project, and v) triangulating the results and feedback and verifying the results with the community. Understanding these steps is crucial for developing appropriate impact assessment frameworks for development interventions.
3.5.2. Towards an appropriate impact assessment approach to AR4D

Assessing the impacts of agricultural research is a difficult task because of the diverse effects that a project may have (Meinzen-Dick et al., 2003). The views on the impact assessment of agricultural research projects including AR4D are different among the key stakeholders depending on their objectives and the scope of the assessment. Most impact assessment works try to examine outcomes after a project has been implemented, while some also predict the impacts before the program intervention takes place through ex-ante evaluation using simulation or economic models (Peterson & Horton, 1993). Following a conventional impact assessment approach to agricultural projects, past and current impact assessment efforts focus mainly on assessing project performance, the adoption levels and economic gains, which are compared to a set of indicators established before the project, rather than on a broad range of livelihood sustainability (Ashley & Hussein, 2000; Mayoux & Chambers, 2005, p. 273).

However, there has recently been a shift in worldwide impact assessment theories and practice. Increasing attention has been paid to developing a more comprehensive impact assessment approach for AR4D. Impact assessment initiatives have recently shifted their focus to measuring the contribution of AR4D to the improvement of livelihoods of people in the developing world (Adato & Meinzen-Dick, 2002; Ashley & Carney, 1999). According to Krall et al. (2003), the impact assessment of AR4D aims to enhance development impacts on the livelihoods of poor people, getting return on investment information, drawing lessons for better future investment and sharing impact results with the public in order to raise awareness. Recent AR4D initiatives have adopted participatory approaches in design, implementation and monitoring and evaluation. There has also been an emerging concern about ensuring the active participation of key stakeholders in the impact assessment of agricultural research activities (Adato & Meinzen-Dick, 2002; Goyder et al., 1998; Guijt, 1998). Therefore, multiple livelihood impacts such as changes in human capacity and social networks and partnerships are taken into account rather than only economic gains.

Driven by change in participatory processes and the livelihoods perspective, various researchers such as Ashley and Hussein (2000), Cramb and Purcell (2001), Adato and Meinzen-Dick (2002), Krall et al. (2003) and Catley et al. (2009) have discussed the adoption of participatory processes and the sustainable livelihoods approach for assessing impacts of AR4D. Cramb et al. (2003, p. 258) indicate that participatory rural livelihood analysis is a suitable framework for impact evaluation. Moreover, it is pointed out that both the conventional economic approach and the sustainable livelihoods focus approach could be incorporated in the sustainable livelihoods framework (Meinzen-Dick et al., 2003). Participatory approaches dominated by PRA techniques are seen as the suite of methods for sustainable livelihoods-based impact assessment (Ashley & Hussein, 2000; Catley et al., 2009). The
use of both qualitative and quantitative methods in impact assessment is recommended in order to improve both the quantification and explanation of the impact indicators (Adato & Meinzen-Dick, 2003; Carpenter & McGillivray, 2012). The Task Force on Impact Assessment and Evaluation for the European Initiative for Agricultural Research for Development places a strong emphasis on participatory impact evaluation by integrating impact assessment into AR4D in order to have better internal learning processes and change as well as paying adequate attention to the complexity and non-linear nature of agricultural innovations (Krall et al., 2003). The SPIA strengthening impact assessment strategies for CGIAR research projects in 2013–2015 are aimed at developing and testing innovative methods for assessing the full impacts of agricultural research and development initiatives, institutionalising the diffusion data collection for larger-scale evaluation and improving communication among stakeholders by strengthening local capacity and collaborations to increase the standards of impact assessment (CGIAR, 2013).

Recent change in impact assessment strategies has also been implemented by leading research organisations. CGIAR has made a move from measuring ex-post impact to assessing the contribution of agricultural research to local and global development and both qualitative and quantitative approaches have been employed to measure the full impacts of agricultural research (Carpenter & McGillivray, 2012). The FAO has also recently paid more attention to how to carry out the ex-post impact assessment of agricultural research projects by looking at both economic and various non-economic impacts and from the national to local level (Ruane, 2014). Other initiatives in the impact assessment of ACIAR AR4D projects have placed importance on considering the non-economic and social impacts which drive the adoption of new technologies (Pearce, 2010, p. 8). The most recent impact assessment strategy of ACIAR sets out three major types of assessment for completed projects (ACIAR, 2013): i) economic-focused evaluation, ii) adoption studies, and iii) impact pathway analysis. The purpose of the impact assessment is therefore not only to measure return on investment indicators but also to assess impacts on the livelihoods of target beneficiaries and fully understand a pathway in which agricultural interventional actions have plausible links to impacts (ACIAR, 2013).

For example, Palis et al. (2013) applied mixed methods in combination with the application of the impact pathway approach for the assessment of ACIAR’s research project on rodent control in Vietnam, Lao PDR and Cambodia. This aimed to measure a wide range of outcomes and impacts of this project, such as economic impacts (e.g., reduced rice losses, improved production and income), and other environmental and social impacts (e.g., reduced impacts of harmful rodenticides to the environment, cohesive interactions among sectors and increased food security). In another study, Stern and Mayne (2013) reported the use of ToC for impact evaluation of natural resource management interventions, involving several initiatives such as the CGIAR Research Program on Aquatic Agricultural Systems, the CGIAR Challenge Program on Water and Food’s Ganges Basin
Development Challenge, and the CSIRO–AusAID African Food Security Initiative. They indicated that the application of ToC can help to explain the occurrence of results in all impact assessment.

3.6. Application of relevant theories and practices for this study

As discussed in the previous parts of the thesis, the Northwest Highlands are characterized by diversity relating to culture and ethnicity, on the one hand, and variable degrees of connectedness to markets, on the other. The highlands are in the transition from subsistence to commercial agriculture. Agricultural research has played an important role to the long-term development of the region. Like any other development endeavour, agricultural research for development needs appropriate impact assessment. Past and current impact assessment approaches remain weak due to their short-term and economical focus, top-down communication, and invalid evidence of impact due to the limited attention paid to overlapped research synergies in the same areas and donors over focused cost-effective analysis.

Recent studies have shown that impact assessment of AR4D should not only focus on having the proof of impact at reasonable cost for learning, steering and accountability but also exploring the plausible link between observed impacts and research investment. Understanding relationships between technologies and vulnerability contexts and resource of households, intervening institutions, and livelihood strategies is also very important to measures the outcomes and impact attributed by a research project. Therefore, having an appropriate impact assessment approach that can help to understand the contribution of agricultural research for development but also to formulate policies for sustainable development of the highlands is very necessary.

From the above discussion about the major social economic characteristics of the Northwest Highlands, and development theories and practices that are relevant to the impact assessment of AR4D projects, an argument can be made for the need to develop a holistic impact assessment framework for AR4D for development of the highlands. First, understanding different types of agricultural research can help to design appropriate impact assessment strategies in which impact indicators are defined in a way that impacts are designed to be achieved. Second, the sustainable livelihoods framework can be used as a lens for identifying multiple livelihood impacts that provides a better understanding of the complexities involved in social change and development. Third, using the ToC change concept helps to understand the plausible links between research outputs and impacts. Finally, participatory techniques with participatory process and communication strategies enhance the participation of target stakeholders in impact assessment processes towards the sustainability of impacts of AR4D to development.
Chapter 4
RESEARCH METHODOLOGY

4.1. Introduction

This chapter describes the research paradigm and methodology applied in this study. The chapter starts with the description of the research design, in which the major social research paradigms are discussed to explain the choice of an appropriate research inquiry for this study. The research plan including the major steps in carrying out this study is also discussed in this part. The next section focuses on describing the site and participant selection for the study. This is followed by a discussion about the data collection and analysis methods. The validity and reliability of the findings and the ethical considerations in the study, are discussed in the final part of the chapter.

As stated in the first chapter, the overall objective of the study was to develop a holistic framework for assessing the impacts of AR4D projects underpinned by participatory communication strategies. This new impact assessment framework was tested and validated in agricultural research projects that had been implemented in the Northwest Highlands. The proposed holistic impact assessment framework can be utilised to assess the impacts of other AR4D initiatives in areas and regions with similar socio-economic and natural conditions to those in the Northwest Highlands. The results of this pilot impact assessment will also help to understand the contribution of AR4D and inform future development policies and R4D strategies in the Highlands. To achieve this overall objective, a participatory research paradigm was selected. The qualitative approach based methods and tools such as semi-structured and in-depth interviews, FGDs and the observation method were employed in combination with documentary research.

The study was conducted at four communes in two districts of Son La province that were the implementation sites of three agricultural research projects (two international-funded projects and one Vietnamese Government-funded project). These agricultural research projects shared a common focus on improving farming systems on sloping lands for better socio-economic and environmental development of the Northwest and other upland regions of Vietnam. The majority of the primary research participants were farmers from a range of ethnic minority groups such as Dao, Thai, Sinh Mua and Kinh. The secondary stakeholders included local commune and district extension staff and village leaders and project managers and researchers from research institutions, universities and development agencies who were involved in agricultural research projects, funded by both the Vietnamese Government and international development agencies in the Northwest Highlands.
4.2. Research design

4.2.1. Research paradigm

The selection of an appropriate research paradigm is important in order for a study to achieve the research objectives. A research paradigm is similar to a research approach, research tradition or scientific paradigm. The term “paradigm” was first used in science by Thomas Kuhn to imply a basic orientation to theory and research (Neuman, 2006). Definitions of research paradigms vary among scholars in different disciplinary fields. There are various views about research approaches or paradigms. Patton (1990, p. 37) defines a paradigm as “a worldview, a general perspective, a way of breaking down the complexity of the real world”. According to Guba and Lincoln (1994, p. 107), a paradigm is a “a set of basic beliefs (or metaphysics) that deals with ultimate or first principles”. A paradigm can be simply synthesised as a general organising framework of theory and research that enables researchers to make basic assumptions and identify the key research issues and relevant research types and methods to achieve the research objectives (Neuman, 2006, p. 81).

Based on the basic definitions of research paradigms and practical research work, research paradigms or approaches are classified into different types or categories. According to Laws et al. (2003), there are two major research approaches: the traditional (or positivist) approach, and the social constructionist approach including social constructionism, phenomenology, critical theory, grounded theory and postmodernism. As discussed by Laws et al. (2003, p. 27), the traditional or positivist approach is based on the premise that a reality exists independently from the minds of researchers, leading to the conclusion that researchers should focus on describing and analysing reality. In contrast, the social constructionist paradigm maintains that the reality is constructed and the researcher’s perspectives are crucial in defining it. The constructionist paradigm emphasises the power dynamics around research in which the objective truth about reality is believed to be influenced by the researcher’s own values, belief and interests. The positivist approach is seen to have a quantitative focus while the constructionist approach is considered to deal with more qualitative data.

The concepts of research paradigms, inquiries or approaches have changed over time to adapt to different social, economic, political, cultural and natural settings. Guba and Lincoln (1994) distinguish different research paradigms by setting three major questions: 1) the ontological question for understanding the nature of reality; 2) the epistemological question for knowing how researchers find about reality; and 3) the methodological question to define how researchers go about finding evidence for what they believe. By raising these questions, they identified the four most popular research paradigms in research: positivism, post-positivism, critical theory and constructivism. In the positivism paradigm, truth or reality exists independent from the researcher’s perception. In post-positivism, like positivism it is believed that reality existed independent from researchers’ views
although it can be known as imperfectly and probabilistically. Critical theories aims to facilitate transformation while constructivist aims to generate concepts on general consensus (Guba & Lincoln, 1994). The key characteristics of these five research paradigms are summarised in Table 4.1.

Table 4.1: Key characteristics of research paradigms

<table>
<thead>
<tr>
<th></th>
<th>Positivism</th>
<th>Post-positivism</th>
<th>Critical theory</th>
<th>Constructivism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ontology</strong></td>
<td>Naïve realism</td>
<td>Critical realism</td>
<td>Historical realism</td>
<td>Relativism</td>
</tr>
<tr>
<td><strong>Epistemology</strong></td>
<td>Dualist and objectivist</td>
<td>Modified; dualist and objectivist</td>
<td>Transactional and subjectivist</td>
<td>Transactional and subjectivist</td>
</tr>
<tr>
<td></td>
<td>Findings true</td>
<td>Findings probably true</td>
<td>Value-mediated findings</td>
<td>Created findings</td>
</tr>
<tr>
<td><strong>Methodology</strong></td>
<td>Experimental and manipulative</td>
<td>Modified experimental and manipulative; Critical multiplism</td>
<td>Dialogic and transformative</td>
<td>Hermeneutic and dialectical</td>
</tr>
<tr>
<td></td>
<td>Verification of hypotheses</td>
<td>Falsification of hypotheses</td>
<td>May include qualitative methods</td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted from Guba and Lincoln (1994) and Lincoln et al. (2011)

In a similar approach, Porta and Keating (2008) divide research paradigms into four major paradigms: positivist, post-positivist, interpretivist and humanistic. The interpretivist paradigm aims at understanding the subjective knowledge. In contrast, the humanistic paradigm believes that no subjective knowledge is possible (Porta & Keating, 2008, p. 23). Creswell (2007) also discusses the four major similar paradigms or worldviews that inform qualitative research: positivism, social constructivism, advocacy, and pragmatism.

As described in Table 4.1, the positivists assume that reality independently exists and that it is driven by immutable law and mechanisms (Guba & Lincoln, 1994). The post-positivist approach has a similar philosophy about the existence of reality: reality exists, but this reality is imperfect and probabilistic (Guba & Lincoln, 1994). In critical theory, reality is shaped and virtually affected by multiple social, economic, political, cultural, ethnic and gender factors and historical contexts over time. Constructivists hold the deterministic view that reality or knowledge is constructed through interactions among researchers and local communities.
Different methodologies and approaches are proposed to gain knowledge and understanding in line with different research paradigms. According to Guba and Lincoln (1994), the experimental and manipulative methodology is used to verify or falsify hypotheses and questions that are probable facts or laws. This experimental and manipulative methodology is modified by post-positivists with an emphasis on “critical multiplism”, the use of grounded theory, the estimation of natural settings and the utilisation of qualitative techniques to falsify rather than verify probable facts or laws. The dialogic and transformative methodology refers to the creation of dialogue between researchers and the subjects of their inquiry in order to facilitate personal and social transformation. The constructivists use the hermeneutic and dialectical methodology to gain knowledge based on individual or collective reconstruction (Guba & Lincoln, 1994).

The present study apply constructivist epistemology with the use of used qualitative methods involving all stakeholders as respondents. These methods were applied to understand participatory processes in the case project. The study was conducted with primary stakeholders (e.g. farmers, extension staff) in a culturally diverse region characterised by high ethnicity, limited education levels, low economic conditions and language barriers. It also involved researchers in multidisciplinary fields crossing various research institutions and from the local to central level. Therefore, it was necessary for the selected research methodology to deal with complexity and diversity not only in relation to the local social, economic and cultural conditions and contexts but also in relation to the target respondents and communities. Qualitative methods and techniques such as FGDs, in-depth interviews and semi-structured interviews were selected and carried out in participatory oriented ways for the purposes of this study. By applying the researcher’s prior experience in participatory monitoring and evaluation of rural and agricultural development projects, and modifying the qualitative methods and techniques for data collection and analysis to adapt to local conditions, it was expected that the adaptive and participatory oriented approach could facilitate an effective research process and achieve the research objectives.

4.2.2. Research design

This study was conducted through five major stages. The first two stages mainly involved documentary research, while the third stage focused on primary data collection and analysis. The last two stages of the research involved the thesis writing and finalisation. A summary of these five stages is illustrated in Figure 4.2.
Figure 4.1: Major stages of the research
In the first stage, the research problems were defined and the research methodology was developed based on a review and analysis of the relevant literature. The first round of fieldwork was conducted in this stage through informal meetings and discussions with researchers from institutions such as NOMAFSI, CIRAD, VNUA and TBU who were actively involved in agricultural research projects in the Northwest Highlands. These activities helped to establish and strengthen relationships with these research institutions and gathered secondary data for the research. The research sites and target participants were also selected during this round of fieldwork. The second stage focused on refining the theory and practice related to the research and developing the research methodology for the study. The data collection methods were developed and pre-tested in the field during the second round of fieldwork in this stage.

The primary data collection and analysis activities were carried in the third phase of the study. These activities were not only aimed at gathering primary data and information for the study but also at testing and adapting the proposed impact assessment framework in order to identify the most effective methodologies for the holistic impact assessment of AR4D projects. Pre-testing of the data collection methods was conducted in order to work together with the key stakeholders, especially local farmers, to finalise the research methodology and create suitable impact assessment indicators for the study. This also helped to build trust and partnerships with the local communities and research participants. A revision of the literature review and the writing of the thesis were performed in the fourth stage. The fifth stage concentrated on finalising the research findings.

4.3. Site and participant selection

4.3.1. Research locations

The study was carried out in two districts of Son La province (Moc Chau and Yen Chau districts) and covered the implementation sites of three agricultural research projects: the ACIAR Northwest Project\(^6\), the CIRAD ADAM Project\(^7\) and the NOMAFSI Project\(^8\). The first project was funded by ACIAR, the second project was mainly funded by the French Agency for Development (AFD) with technical support from CIRAD, and the third project was funded by the Vietnamese Government. All three selected research projects involved farmers in developing and adapting new agricultural technologies for sustainable farming systems in the Northwest Highlands. Compared to the CIRAD

\(^6\) The full name of the project was “Improved market engagement for sustainable upland production systems in the Northwest Highlands of Vietnam”.

\(^7\) The full name of the project was “Support for agro-ecology extension in mountainous areas of Vietnam” (in French: “Appui au Développement de l’Agro-écologie en zone de montagne du Vietnam”, hence the abbreviation “ADAM”).

\(^8\) The full name of the project was “Integrated measures for sustainable maize production on sloping lands of the northern mountainous regions of Vietnam”.

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The ADAM Project and the NOMAFSI Project, the ACIAR Northwest Project adopted a more participatory approach with various participatory processes and communication strategies from the project design, to the implementation, monitoring and evaluation of research activities. Detailed information about the objectives and activities of these research projects is presented in later chapters.

The three selected research projects were conducted in several provinces of the Northwest Highlands with different scopes of activities, and all the projects conducted activities in Son La province. In Son La, the ACIAR Northwest Project and the CIRAD ADAM Project were both conducted in Moc Chau and Mai Son districts and the NOMAFSI Project was implemented only in Yen Chau district. The project districts are home to different ethnic groups such as Thai, Dao and Kinh. These districts also represent the common diverse social and cultural characteristics of the province as well as the Northwest Highlands. It was decided to select these similar social contexts as the research sites for the present study in order to achieve a comprehensive understanding about how different agricultural research projects with different research approaches could produce different outputs, outcomes and impacts, especially livelihood impacts. In these districts, several research projects including AR4D projects had also been conducted by Vietnamese Government research organisations and international development agencies.

In Moc Chau district, the study was conducted at Pieng Sang and Suoi Khem villages in Phieng Luong commune, La Nga village in Muong Sang commune (the ACIAR Northwest Project) and Tong Han village in Chieng Hac commune (the CIRAD ADAM Project). In Yen Chau district, the study was conducted in Chum village in Chieng Dong commune (the NOMAFSI Project). In this study, more villages in the coverage of the ACIAR Northwest Project were selected because this project was designed and implemented aiming at achieving the immediate use of research outputs for development purposes, generated better social, human, economic and environmental outcomes and impacts to highland communities than the other two projects. This helped to validate the impact assessment framework proposed by this study. The ACIAR Northwest Project was different from the other two projects in regards to its design and objectives, phases and activity implementation, and monitoring and evaluation that will be discussed in more details later in Chapter 6. A map of the research locations is presented in Figure 4.3.
4.3.2. Research participants

To ensure the reliability of data, the study sought the participation of a sufficient number of farmers, local agricultural extension staff, leaders of local villages and communes, and agricultural researchers who were involved in agricultural research projects implemented at the research areas. Because this study had limited time for fieldwork and three selected agricultural research projects involved a limited number of farmers as farmer researchers in research village (e.g. three to five farmers in each research village of the ACIAR Northwest project, three to five farmers in the NOMAFSI project and 28 farmers in the ADAM project), this study focused on interviewing with a small number of farmers while FGDs were conducted with a larger number of measure outcomes and impacts of research interventions. The purposive sampling method was employed to select appropriate participants. The research participants were selected from a set of criteria including participation or non-participation in selected research projects in the local areas, an understanding about the agricultural research initiatives implemented at local villages and communes, and active involvement in local socio-economic development and decision-making processes in their communities. Non-participants of the selected research projects in the research areas were also involved in the study to measure a wider level of outcomes and impacts of these research interventions to local communities.

In addition, although fieldwork activities were conducted in villages with similar socio-economic contexts, this study put a more focus on the ACIAR Northwest Project which present the basic
characteristics of AR4D as defined in Chapter 3. This aims to make better comparison about the contribution of different selected research projects and to validate the proposed impact assessment framework. More research participants were selected in the ACIAR Northwest villages because compared to other two projects, this project focused on strengthening capacity for local development institutions to implement the outreach strategies and build capacity of communities to implement innovations.

This study intended to capture the experiences and perceptions of all stakeholder groups in each of the case projects. As they were different in nature and involved different stakeholder groups in different ways, the number of project and non-project participants that were interviewed in the study consequently varied across the three research cases. A larger number of farmers from the research area of the ACIAR Northwest than the other two projects was involved in this study because this Northwest project applied a wide range of activities with various participatory communication strategies, implying the active involvement of 2-5 so called farmer researchers and outreach to larger community in each project site. In contrast the other two projects only used farmers to take care of the experimental plots. Another difference in farmer involvement was found in the implementation of outreach activities beyond the research sites, in that only the ACIAR Northwest project had carried out extension activities in non-project areas, while the other two projects had not.

As the majority of farmers in the research sites belonged to poor ethnic minority groups, economic conditions and ethnicity were not considered as categories for the selection of participants. The sampling procedure followed the composition of project participants in the respective communities, which was based on findings by the projects’ research teams that both men and women in the project communities were actively involved in farming activities. Therefore, both men and women were invited to attend the participatory research sessions of the research. The semi-structured interviews were carried out with 29 farmers of which 31 percent were women. With regards to the FGDs, the ratio of men and women participating varied among groups but there was a presence of women in most FGDs. The gender of FGD participants can be found in Appendix 7.

Particular attention was given during FGDs to eliminating the domination of a few voices, which can occur in research due to the biased selection of “elite participants”\textsuperscript{9} from local communities during the data collection and analysis process. In order to have appropriate participants composition for group discussions, the researcher consulted with local community leaders and local extension staff during the selection of research participants for FGDs.

Because the activities of all three projects were mainly carried out with farmers and the study was

\textsuperscript{9} In this context, elite participants would be farmers who have advantages in terms of livelihood resources and opportunities compared to others in their community.
carried out in a short period after these projects ‘completion, private sector actors such as local traders, agricultural product processors and input supply enterprises were not involved in the main primary data collection process but their roles were considered by reviewing the available secondary research documents. The major selection criteria for the key groups of primary research participants are described in Table 4.2.

Table 4.2: Summary of participant selection criteria

<table>
<thead>
<tr>
<th>Target participants</th>
<th>Selection criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers</td>
<td>• From selected agricultural research projects’ areas</td>
</tr>
<tr>
<td></td>
<td>• Active participation or non-participation in selected research projects</td>
</tr>
<tr>
<td></td>
<td>• Both men and women, poor or non-poor farmers</td>
</tr>
<tr>
<td>Local leaders</td>
<td>• From three selected research projects’ research and extension areas</td>
</tr>
<tr>
<td></td>
<td>• At village or commune levels</td>
</tr>
<tr>
<td></td>
<td>• Active participation in one of three selected research projects</td>
</tr>
<tr>
<td></td>
<td>• Both men and women</td>
</tr>
<tr>
<td>Extension staff</td>
<td>• Active participation in one of three selected research projects</td>
</tr>
<tr>
<td></td>
<td>• Having at least three years’ work experience in agricultural extension service</td>
</tr>
<tr>
<td></td>
<td>• From local district extension stations or provincial extension centres</td>
</tr>
<tr>
<td></td>
<td>• Both men and women</td>
</tr>
<tr>
<td>Agricultural researchers</td>
<td>• From research institutes and universities participating in or involved in agricultural research in the Northwest Highlands</td>
</tr>
<tr>
<td></td>
<td>• Active participation in three selected research projects</td>
</tr>
<tr>
<td></td>
<td>• Having at least three years’ work experience</td>
</tr>
<tr>
<td></td>
<td>• From multidisciplinary areas and multiple research organisations</td>
</tr>
<tr>
<td></td>
<td>• Both men and women</td>
</tr>
</tbody>
</table>

For the in-depth interviews with agricultural extension staff, the study focused on interviewing extension staff at communal and district levels who were directly involved in the research activities of the three selected projects in their local communes and villages. As all the extension officers in the research communes were males, gender was not considered for the selection of this group. Extension staff at provincial level from the Son La Provincial Centre of Agricultural Extension were not interviewed in the main data collection process as they had already been consulted during the study’s research methodology development process. District extension staff were actively involved in the research processes of the three projects while also belonging to the provincial extension network in the province.

Agricultural researchers from multidisciplinary fields in a number of research institutes were
interviewed in order to gain their critical views about the contribution of agricultural research including AR4D initiatives as well as their views about the role of the participatory processes underpinning some agricultural research initiatives in the development of the Highlands region. Among the researchers who were interviewed for this study, several field researchers from NOMAFSI had been involved in more than one of the case projects. This helped to get their views about how different projects with different approaches could lead to different outcomes and impacts. The summary of the study’s data collection activities, sites and participants is presented in Table 4.3 and the coded list of research participants is attached in Appendix 7.

Table 4.3: Summary of data collection activities, sites and participants

<table>
<thead>
<tr>
<th>Project</th>
<th>Locations</th>
<th>FGDs</th>
<th>Semi-structured interviews with farmers</th>
<th>In-depth interviews with</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACIAR Northwest Project</td>
<td>Moc Chau:</td>
<td>5 groups, 18 participants</td>
<td>16</td>
<td>7 4 4</td>
<td>- Visits to households and fields</td>
</tr>
<tr>
<td></td>
<td>- Phienh Luong</td>
<td>15</td>
<td></td>
<td></td>
<td>- Observations during FGDs with farmers, semi-structured interviews with farmers, and in-depth interviews with key informants</td>
</tr>
<tr>
<td></td>
<td>- Muong Sang</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIRAD ADAM Project</td>
<td>Moc Chau:</td>
<td>2 groups, 9 participants</td>
<td>9</td>
<td>5 2 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Chieng Hac</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOMAFSI Project</td>
<td>Yen Chau:</td>
<td>1 group, 5 participants</td>
<td>4</td>
<td>3 2 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Chieng Dong</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2 districts 4 communes</td>
<td>8 FGDs with 32 participants</td>
<td>29</td>
<td>15 8 6</td>
<td></td>
</tr>
<tr>
<td>- Percentage of men</td>
<td>-</td>
<td>50</td>
<td>69 73 75 67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Percentage of women</td>
<td>-</td>
<td>50</td>
<td>31 27 25 33</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.4. Data collection methods

4.4.1. Data collection strategy

This study employed a participatory approach and applied mainly qualitative data collection techniques to gather both qualitative and quantitative data. The secondary data was mainly gathered through documentary research. The primary data was gathered through various participatory data
collection activities including FGDs with farmers, in-depth interviews with key informants such as local leaders, extension staff and agricultural researchers, observations, and semi-structured interviews with individual farmers. Three field trips to Son La were carried out in February 2012, December 2012 and September 2013 to develop the research methodology and establish relationships with the target participants. The main primary data collection activities were conducted with research participants during the fourth field trip from 25 July to 14 September 2014. The major research activities with farmers and local key informants were carried out at the three projects’ areas but some in-depth interviews with agricultural researchers were held at research institutions located in Hanoi. The overall data collection strategy of the study is shown in the diagram in Figure 4.3.

**Figure 4.3: Data collection strategy**

4.4.2. *Documentary research*

The study of secondary data is important for any research. A study may depend entirely on secondary data sources or may use secondary data as one source of information together with information collected by other primary data methods such as interviews and observation (Laws et al., 2003; Punch, 2005, p. 190). The documentary research method involves the use of secondary data from various sources such as documents and statistics to support views or arguments (Bailey, 1994; Scott, 2006).
According to Laws et al. (2003), secondary sources of data and information can be published or unpublished and can be historical or contemporary. The triangulation of data and information can be achieved if secondary data is used in conjunction with other types of data (Punch, 2005).

This study conducted documentary research for three major reasons. First, books, journals, working papers and other publications provided a rich source of discussion and critical analyses on the concepts, theories and practices related to the study’s research topics. Through the documentary research, an understanding was gained of the relevant concepts, theories, frameworks and practices related to the impact assessment of agricultural research projects, such as R4D, participatory processes and participatory communication, PIA, the sustainable livelihoods frameworks and ToC. This understanding was necessary in order to adopt and integrate these theories and practices for the development of a holistic framework for the impact assessment of AR4D projects.

Second, secondary data such as government documents, development policies and reports on agricultural research projects including AR4D initiatives and development programs carried out throughout Vietnam by national and international research institutes and development agencies was useful to gain an understanding of the socio-economic and cultural setting. This data also provided an overview of the communication strategies used in past and current agricultural research projects in the Northwest Highlands and a basic assessment of how these communication strategies generated impacts on local livelihoods and the formulation of appropriate development policies and strategies.

Third, the documentation belonging to agricultural research projects including recent AR4D initiatives implemented in the Northwest Highlands by national research institutes (e.g. NOMAFSI, CASRAD, PPRI, VNUA and TBU) and international development agencies (e.g. ACIAR, CIRAD) provided diverse and rich information, statistics and evidence about the agricultural research activities and communication strategies used in these projects, especially the three selected projects. The outputs, initial outcomes and impacts of AR4D initiatives in the specific context of the Highlands were also attained from these documents. These impact indicators were utilised as the inputs or benchmark indicators to carry out the pilot impact assessment of the three selected agricultural research projects.

4.4.3. Observation

Observation involves a researcher paying attention, watching and listening in the physical setting of human interactions in the research area (Neuman, 2006, p. 397; Punch, 2005). This method has been practised for many years in social sciences and is classified into structured and unstructured approaches (Punch, 2005, p. 185). The structured approach is based on pre-developed observation
schedules with pre-determined categories and classifications, while the unstructured approach makes natural and open observations. Observation can also be divided into systematic observation or direct observation, and non-participant or participant observation (Bouma & Ling, 2004; Laws et al., 2003; McNeill & Chapman, 2005).

In comparison with other data collection methods such as interviews, observation can involve high numbers of participants but requires a high degree of personal involvement on the part of the researcher (Worsley, 1970). The major advantages of the observation technique are a rapid and cost-effective way to better understand the socio-economic and cultural contexts in the research area (Bui & Nguyen, 2006; Laws et al., 2003). Patton (1987, p. 73) states that, in the evaluation of a program, observational fieldwork helps evaluators to understand better the context in which the program was implemented and enables them to capture the participants’ awareness and ability to share information. According to Laws et al. (2003, p. 304), information may not be captured through interviews and FGDs if participants are not willing to speak; therefore, observation is an alternative solution. In addition, taking into account the limitations of observation methods, Laws et al. (2003) point out that a lack of observational skills could lead to an overemphasis on people’s behaviours rather than their motivations and to the over-simplification or distortion of the meaning of a situation.

Although classifications vary among authors, observation can be used by a structured or unstructured observation approach. More or less structured observation can be employed by looking on kinds of information to be collected in close relationship with what are other research activities to be conducted. Each observation technique has its own advantages and disadvantages depending on the objectives and scale of the research, having some structure in observation can help to answer a broader questions of interests. The use of a systematic or structured approach is recommended in the literature (Laws et al., 2003). Observation can be performed through visits to households and communities and other ethnographical data collection activities.

This study used direct or systematic observation. Observational data was collected through field immersion and the conduct of research activities with the local farmers, extension staff and leaders in two districts of Son La province. Before the fieldwork was conducted, the researcher developed a guide on what information could be gathered, understanding local socio-economic settings and planning suitable dates and time for conducting the observation. The direct observation facilitated the researcher to understand local social complexity by observing research participants and their interactions in local social and natural settings and helping the researcher to undertake an analysis of the situation.

In addition, the researcher’s experience in working with ethnic minority communities in the Northwest Highlands for several years facilitated the observation of real life among the participants.
and of changes in the socio-economic and cultural conditions of local communities including the local livelihoods asset base. In order to reduce bias, all observational data was carefully triangulated with findings from other data collection techniques such as semi-structured interview, FGDs and in-depth interviews. Observation also helped to assess the observable impacts of the agricultural research development projects in local communities. As observational data can be objective or subjective information, a field observation form was designed for note-taking during the field research activities. Any unclear information gained from the observation was clarified with the research participants during the data collection activities. Photographs were also taken during the field observation to gather evidence and for the triangulation of the research findings. The English translation of the note-taking form for observations is attached in Appendix 1

4.4.4. Interviews

Interviewing is one of the key data collection tools in both quantitative and qualitative research. Punch (2005) defines an interview as an interchange process in which the interviewer tries to obtain information, opinions and responses from an individual or groups. Patton (1990) states that the interview method can be implemented with homogenous or cross-cultural groups. Various authors have divided the interview method into three forms: structured, unstructured, and semi-structured (Fontana & Frey, 1994; Laws et al., 2003; Minichiello, 1990).

The structured interview is the most formal interview type, in which the questions are designed and posed to the interviewees in a standard way. In contrast, the unstructured interview is carried out in a more informal conservational way by using open-ended and non-standardised questions. Using the unstructured interview or informal conventional interview could help interviewers to deal with individual differences and situation change but often involve spending a great deal of time to get systematic information (Patton, 1987, p. 187). The semi-structured interview can be seen as a mixture or combination of structured and unstructured interview methods. The semi-structured interview uses both closed and open-ended questions, and the questions are asked in flexible ways.

The in-depth interview is seen as an unstructured form of interview. This is a useful qualitative data collection technique that is used for conducting intensive interviews with participants to explore their personal opinions or perspectives and experiences about a program or situation (Boyce & Neale, 2006). In-depth interviews are conducted face-to-face between one interviewer and one participant using mostly open-ended questions (Mack et al., 2005; Patton, 1990). Before carrying out an in-depth interview, a researcher prepares a list of topics or issues of interest (Bouma & Ling, 2004). The words used by the interviewees to convey their feelings, thoughts and perceptions form the main data collected in in-depth interviews (Patton, 1990), some other data collected by in-depth interviews can be analysed with quantitative techniques (Carpenter & McGillivray, 2012).
In the present study, in order to gather rich information from different target stakeholders, semi-structured interviews were conducted with individual farmers and in-depth interviews were conducted with groups of key informants such as local agricultural extension staff and leaders and agricultural researchers from various research institutes who were involved in the three selected projects. These interviews were carried out in a participatory way at the most convenient place for the participants. With the permission of the participants, the interviews were recorded in order to get the full information and to validate the research findings. The semi-structured and in-depth interview methods are discussed in the following paragraphs.

**Semi-structured interviews with farmers**

Semi-structured interviews allow the researcher to ask the same questions to all participants in flexible ways. It is a focused, conversational and two-way communication process between people who ask questions and people who answer those questions (Hancock, 1998). As the semi-structured interview is a mixture of structured and unstructured interview methods, it helps to gain both quantitative and qualitative data (Massey, 1987, p. 1505). The open-ended questions encourage interviewees to share their opinions and enable interviewers to probe with further questions based on the responses they receive (Dearnley, 2005, p. 22). Open-ended questions also enable the interviewers and interviewees to have wide-ranging discussions around some topics. According to Chambers (1994a, p. 959), although a semi-structured interview could be guided by a mental or written checklist, it is opened-ended and follows the unexpected communication flow. Chambers adds that both participatory visual and verbal methods could be employed in semi-structured interviews.

In agricultural research projects, conducting semi-structured interviews with farmers is an effective way to collect information about household livelihoods as well as household economies, farming systems, attitudes and perceptions. The results from semi-structured interviews can supplement other data collection methods (Laforest & Bouchard, 2009). The semi-structured interview is often adopted as a participatory technique for interviewing and creating dialogue with farmers (Pretty, 1995a). It could be flexibly combined with other PRA techniques to collect data from farm households about the impacts of agricultural extension intervention on household livelihoods (Petheram et al., 1998, p. 43). According to Abebe and Catley (2013, p. 151), the use of semi-structured interviews in the impact assessment of agricultural research could also help to cross-check information and probe responses.

This study conducted face-to-face semi-structured interviews with 29 individual farmers, of whom 18 farmers had participated directly in the three selected agricultural research projects in Moc Chau and Yen Chau districts. The other 11 selected farmers had not been involved in the research activities of these three projects but they lived in these projects’ research and extension locations. The non-project farmers could or could not gain benefit from these three selected research projects. Although
a majority of the research participants belonged to ethnic minority groups, they all could speak the Vietnamese national language.

A set of semi-structured interview questions was pre-tested with local farmers in Moc Chau district in the second round of fieldwork in the study in order to ensure the use of appropriate questions that could be answered by farmers and to ensure effective time management. For example, the semi-structured interview questions were revised by using short and more simple Vietnamese language because the majority of the people in the research communities belonged to ethnic minorities, such as Dao (in Phieng Luong commune), Sinh Mun (in Chieng Hac commune) and Thai (in Chieng Dong communes), who have their own native languages, although most speak sufficient Vietnamese. In addition, some questions that appeared to be sensitive, such as the information on marriage age, household poverty classification and other family issues, were removed from the semi-structured interview guide. Expected impact assessment indicators were also revised by getting the results from semi-structured interviews with local farmers in this pre-tested process. After pre-testing with several local farmers in Moc Chau, the main content of the semi-structured questions were revised and focused on: i) basic information about the interviewees and their farm households (e.g. age, ethnicity, education attainment); ii) basic housing resources and assets (income and savings, housing and hygiene conditions); iii) farm production and marketing; and iv) access to agricultural extension services and participation in agricultural research projects. The questions also included triggers for a broad discussion on how the design, implementation and monitoring and evaluation activities had been conducted by the agricultural research projects in the project areas. These questions helped to gain an understanding of the extent to which an agricultural research project underpinned by participatory processes contributed to the development of sustainable livelihoods for local farm households and communities. Figure 4.5 shows photographs of semi-structured interviews being conducted with farmers in Moc Chau district in July 2014.

Figure 4.4: Semi-structured interviews with farmers in Moc Chau district in July 2014
The semi-structured interviews with individual farmers were held at local farm households or on the farmers’ fields with the interview questions posed in understandable Vietnamese language. Both closed-ended and open-ended questions were used for these interviews. Qualitative and quantitative information was achieved from the interviews. Each semi-structured interview took around one and a half hours. The results of the individual semi-structured interviews were then analysed and incorporated with the results gathered from other forms of data collection in order to answer the research questions. The semi-structured interview guideline is attached in Appendix 2.

In-depth interviews with key informants

In-depth interviews are often carried out with key informants (or community experts) who are seen as experts who have first-hand knowledge about a community, its residents and the issues or problems that researchers are trying to investigate. These people could share knowledge and provide different perspectives on a single issue or on several issues (Mack et al., 2005; UNDP, 2009). According to Marshall and Rossman (2006), by using the in-depth interview method, a researcher could unfold participants’ views in such a way that the issues are raised by the interviewers but the responses are framed and structured by the interviewees.

The in-depth interview is a semi-structured exchange between an interviewer and an interviewee (Carpenter & McGillivray, 2012, p. 35; Mack et al., 2005, p. 116). An in-depth interview is less standardised than other methods because it requires well-trained interviewers, intensive use of labour and high travel costs and time commitments (Goodman, 2001). However, the in-depth interview method is widely used for research because of its provision of valuable information, especially when supplementing, triangulating and validating data collected by other data collection methods (Boyce & Neale, 2006, p. 4; Carpenter & McGillivray, 2012).

This study conducted in-depth interviews with three main groups of key informants: i) local agricultural extension staff (at commune and district levels), ii) local community leaders (at village and commune levels), and iii) agricultural researchers from research institutes and universities (senior and junior researchers). The local key informant groups had been involved actively in local socio-economic development activities and agricultural research projects, especially in the ACIAR Northwest Project, the CIRAD ADAM Project and the NOMAFSI Project. They also knew about the socio-economic conditions and historical development processes in their communities. The interviewed researchers were active field researchers and project coordinators of the three selected research projects.

In-depth interviews were conducted with individual informants. Most of the in-depth interviews took about two hours and were held at the most convenient places for the target participants. A record sheet was used for taking notes of the key content of the interviews. In addition, all the interviews
were recorded in order to capture the full conversations between the researcher and interviewees. This was useful for getting additional information during the subsequent data processing steps. The key issues explored in the in-depth interviews with the key informants were set out in guides for the interviews with the different groups of key informants (see Appendix 3, 4 and 5 for the in-depth interview guidelines). Each in-depth interview type for a particular key informant group dealt with specific issues raised in the research questions as summarised in Table 4.4.

<table>
<thead>
<tr>
<th>In-depth interview</th>
<th>Research question focus</th>
<th>Key issues to explore in research questions (RQs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-depth interviews with local leaders</td>
<td>RQ1 RQ2</td>
<td>RQ1: What frameworks and approaches have been applied to assess the impacts of AR4D projects in the Northwest Highlands over the past decade, and what are their strengths and weaknesses in terms of informing agricultural development policies?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RQ2: How, if at all, do these frameworks and approaches explain the contribution of participatory processes towards sustainable impacts?</td>
</tr>
<tr>
<td>In-depth interviews with local extension staff</td>
<td>RQ1 RQ2 RQ3 RQ4</td>
<td>RQ3: What methods and key indicators can be identified to assess the impacts of AR4D from a comprehensive livelihoods perspective in a region at variable stages of agricultural development and social change?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RQ4: What strategies can be formulated to utilise impact assessment findings towards influencing development policy, decision-making and practices for the Northwest Highlands?</td>
</tr>
<tr>
<td>In-depth interviews with agricultural researchers</td>
<td>RQ1 RQ3 RQ4 RQ5</td>
<td>RQ5: What are the potential uses of a new impact assessment framework for the various stakeholder groups engaged in AR4D in the Northwest Highlands?</td>
</tr>
</tbody>
</table>

4.4.5. Focus group discussions

The focus group interview method has been used since the 1930s and 1940s to deal with the limitations of traditional researcher-directed interviews (Krueger, 1994). FGDs help researchers to get in-depth information about people’s opinions. The FGD is seen as a rapid assessment, semi-structured data gathering method, in which groups of participants are purposively chosen to discuss focus issues and problems (Kumar & States, 1987). Bouma and Ling (2004, p. 180) point out that the strengths of in-depth interviews and observation are combined in the FGD context. One focus group generally consists of six to twelve participants (Laws et al., 2003; McNeill & Chapman, 2005, p. 65) or four to twelve participants (Marshall & Rossman, 2006). These participants are engaged in discussion around focus issues.
The FGD method is an easy and fast way to get information from groups of participants (Morgan, 1997) and minimise evaluation cost (Sharts-Hopko, 2001). Both qualitative and quantitative analysis can be done by conducting FGDs. Krueger and Casey (2000) argue that FGDs can be used for decision-making before, during and after implementation of a policy. An FGD opens more opportunities for all group members to participate in the evaluation activity by discussing, giving feedback on a program and providing recommendations (Bui & Nguyen, 2006). Holland (2013, p. 3) states that FGDs help to generate participatory statistical analysis. From an impact assessment perspective, Meinzen-Dick et al. (2003) propose that the sustainable livelihoods framework could be used in FGDs to analyse the impacts of agricultural research in terms of the rate, patterns and determinants of agricultural research outputs. However, researchers should be aware of the potential for conflicts in FGDs among group members who have opposite ideas; this requires the involvement of facilitators who are good at handling such problems (Krueger & Casey, 2000, p. 36; Laws et al., 2003). Despite some limitations, FGDs are widely used due to their low cost, socially-oriented characteristics, flexibility, high face validity, potentially speedy results and capacity to manage large size qualitative research (Krueger & Casey, 2000). The FGD method has been widely used in rural development research in Vietnam such as works by Van de Fliert et al. (2010b), CIAT (Cramb et al., 2003), Plan International (Poulsen et al., 2008) and Oxfam (Nguyen et al., 2009).

In this study, eight FGDs were conducted with farmers to collect data and information in the selected agricultural research projects’ locations in two districts of Son La province. Each group consisted of three to five farmers. Most of the farmers in the projects’ areas belonged to ethnic minority groups such as Dao and Thai people with low economic conditions; therefore, ethnicity and economic aspects were excluded from the group selection process. However, in the selection of participants for the FGDs attention was paid to the farmers’ levels of engagement in the agricultural research initiatives carried out in their villages and communes. Out of the eight FGDs, five FGDs consisted only of farmer researchers who had benefited directly from the three selected research projects. The remaining FGDs included non-project farmers who had not participated in the three projects’ research activities but who could benefit from the implementation of these projects in their villages. This helped to gain insights and findings in both comparable and reflective ways. A guide was developed for the FGDs in order to identify the issues to be explored and to ensure a clear focus on the relevant research questions. Figure 4.6 shows photographs of FGDs conducted in Moc Chau district in July 2014.
Figure 4.5: FGDs in Moc Chau district in July 2014

In the FGDs, several participatory and visual tools such as Venn diagrams, rankings, radar of participation and seasonal calendars were employed for data collection and analysis. The radar technique was used to assess the level of participation or engagement of farmers in the research projects’ planning, monitoring and evaluation processes. The Venn diagram helped to assess changes in social organisation in local communities as well as the contribution of the research interventions to strengthening these social networks (e.g. relationship between local community and local government, agricultural extension system and other social organisations). The seasonal calendar was adopted to assess the initial impacts of the projects through positive changes in production patterns, incomes and crop diversification in the local communities.

These participatory and visual techniques were modified in order to adapt them to the local social, cultural and educational contexts and the typical characteristics of ethnic minority communities in sub-regions of the Northwest Highlands. The FGDs with farmers were conducted at local locations that were convenient for the people participating (e.g. at village meeting places, farm households or on fields) and at times that were suitable for the villagers by paying careful attention to local customs, spiritual events as well as production seasonality. FGD sessions were also conducted before other data collection methods with participants who were involved in the projects’ research and extension activities. Like the in-depth interviews with key informants, all the FGDs with farmers were recorded for later data transcription and analysis. The FGD guide is attached in Appendix 6.
4.5. Data analysis

As a generic term, “analysis” often refers to a bundle of three mutually exclusive categories: description, analysis, and interpretation (Wolcott, 1994). Quantitative data and qualitative data are often analysed by different processes (Laws et al., 2003). Therefore, establishing clear data analysis strategies for different types of gathered data and information is important for research. In this study, data analysis aimed to achieve more qualitative indicators due to the selection of the participatory research paradigm with more qualitative data collection techniques.

In this study, qualitative data with rich descriptions was mainly gathered through observation, in-depth interviews with key informants and FGDs with farmers, while some quantitative data (e.g. basic information about interviewed households, economic indicators and statistics) was generated by the semi-structured interviews with individual farmers and from secondary data sources. Photographs and notes in summary form (verbal or salient themes) were taken during the field observations, in-depth interviews, FGD sessions and semi-structured interviews, which helped to gain an understanding about the local socio-economic contexts.

This study used thematic analysis in combination with descriptive statistics as a key data analysis approach. Thematic analysis is a descriptive qualitative approach to data analysis. Braun and Clarke (2006) describe the thematic data analysis approach as a way of pinpointing, examining and recording patterns or themes in the gathered data. They recommend thematic analysis as a useful and flexible method for any qualitative research. MacQueen et al. (2012) describe thematic data analysis as one of the most common forms of analysis in qualitative data with an emphasis on the qualitative data generated from in-depth interviews, focus groups and field observations. In terms of the distinction between content analysis and thematic analysis, Vaismoradi et al. (2013) argue that these methods could be used interchangeably; however, while both thematic analysis and content analysis are aimed at describing and interpreting data, thematic analysis focuses more on qualifying data and content analysis concentrates on quantifying data.

There are certain phases in the analytic process of qualitative research. Marshall and Rossman (2006, p. 156) suggest seven phases in an analytical process whereby: 1) the gathered data is organised; 2) the researcher becomes immersed in the data; 3–5) categories and themes are generated; coded and interpreted; 6) alternative understandings are sought; and 7) the understandings are presented. Braun and Clarke (2006, p. 87) similarly identify six major phases in conducting thematic analysis, as illustrated in Figure 4.7.
When conducting thematic analysis, a researcher pays attention to the context and integration of the manifest and latent content; while in the conduct of content analysis, a researcher pays attention to the frequency of occurrence and the division of the manifest and latent content (Vaismoradi et al., 2013, p. 399). Thematic analysis not only focuses on counting phrases or words in a text but also on identifying the implicit and explicit ideas in the gathered data (Braun & Clarke, 2006). This data analysis approach fitted the participatory research paradigm of this study. In this study, the data collected from the observations, in-depth interviews with key informants and FGDs was collected, reviewed, coded and analysed according to the generated categories and themes with careful attention paid to the local social and cultural context and the integration of the manifest and latent content.

In addition, for the data collected from the semi-structured interviews with farmers, both the quantitative and qualitative data was cleaned or carefully checked, coded by themes or patterns, and analysed with the assistance of the latest SPSS software. The findings were presented in raw data (direct quotes), interpretive form, and descriptive statistics (e.g. cross-tabulation, frequency, pictures, and graphs). Pearson’s Chi-square ($\chi^2$) test was employed to improve the claims of the research findings. The aim of Pearson’s Chi-square ($\chi^2$) test is to test the independence between two nominal variables (e.g. participation or non-participation in the agricultural research projects and the application or non-application of sustainable agricultural techniques and gross farm income).
helped to measure the goodness of the measured indicators. In this study, data triangulation was also carried out to increase the validity of the findings by comparing the different themes and interpretations generated by the different data collection techniques in order to find the similarities and differences.

4.6. Overcoming challenges in the study

Through the process of applying the holistic impact assessment framework to three research projects in the context of the Northwest Highlands, some challenges were experienced in terms of identifying, measuring and communicating impacts to the target stakeholders. Identifying these challenges helps to obtain impact indicators that take into consideration the measures necessary to deal with challenges in a research process. Because the selected three projects were implemented in complex social and farming systems in which impacts were perceived differently by researchers and local stakeholders such as farmers, extension staff and local authorities, it was not easy to develop applicable impact assessment methodologies and identify appropriate impact indicators. In this study, the impact assessment methodology and impact indicators were developed and then tested with local farmers, researchers and local extension staff during the methodology development stage, leading to impact assessment methodologies that are adaptive to local contexts.

Assessing the impacts of AR4D projects in a socially diverse region such as the Northwest Highlands was also challenged by various factors such as constraints in time and resources, gaps in language and the understanding of local stakeholders about impacts. An impact assessment cannot be successful without establishing good partnerships with local leaders and farmers before, during and after a research process. To overcome this problem, the study maximised the use of visual techniques and open discussion with farmers. The researcher spent whole days with the local communities during the data collection activities. Discussions on the impacts of AR4D were conducted with local farmers in both group meetings and semi-structured interviews with individual farmers but also in conversations with local people on their farms and during meals. Direct observations were made on both the changes in farms and in the behaviours of local community members. The researcher also tried to isolate local village leaders in FGDs to avoid their dominant voices in discussions. In addition, because local extension staff were busy in the crop seasons, this study conducted in-depth interviews in the evening with two extension staff in Moc Chau district at their homes, which helped to get valuable information.

Researchers and development workers should always be aware that no standard set of techniques could be applied in all contexts due to differences in the culture, capacities and interests of local
people. Besides conducting semi-structured interviews with farmers and in-depth interviews with key informants, this study made flexible use of visual techniques such as the crop seasonal calendar, and radar of participation to enhance the active participation of stakeholders in the impact assessment process. The FGDs and interviews were audio-recorded with the permission of the participants. These recordings helped not only to gather rich information but also to verify unclear information accessed from written or drawn materials. In this study, audio recording was used for getting supplementary information during FGD data transcribing and analysis. Daily reflections and summaries of the research findings were conducted by the researcher.

In addition, in order to avoid bias from my personal experience with local communities, any difference in the findings from different source of data was consulted with local stakeholders. Impact assessment findings were shared back to local communities to get feedback and verify research findings. This study was challenged by having limited time and resources to hold workshops to share impacts with local stakeholders. In making efforts to overcome this problem, the initial research findings were reported back to farmers at the end of each FGD session in order to get their feedback. Interviews and discussions were repeated with several key farmers, researchers and local extension staff at different times. This helped not only to design the appropriate methodology for data collection but also to validate the findings on the impacts of these projects. However, it could be more useful to conduct local-level workshops to communicate the impacts with various stakeholders. This can help not only to validate impact assessment findings but also to improve the understanding of local shareholders about impacts. Additionally, it facilitated the better use of impact findings by local extension personnel in making effective extension strategies and by farmers for scaling-out the application of successful technologies.

4.7. Validity, reliability and ethical considerations

Validity and reliability

Validity and reliability concepts should be considered throughout the entire research process from designing a study, analysing the results and judging the study’s quality (Patton, 1990). These concepts are important in both quantitative and qualitative research (Golafshani, 2003). According to Neuman (2006), validity and reliability are central concerns which help to achieve the truthfulness, credibility and believability of research findings. Validity refers to how accurately a data collection method can measure what it is intended to measure, and reliability refers to extent to which gathered data is consistent or dependable (Golafshani, 2003; Lee, 2004; Neuman, 2006).

Researchers classify validity into internal and external forms. Internal validity refers to how well the
research findings match reality, and external validity refers to the generalisation of the research findings in other settings (Merriam, 1998; Punch, 2005, p. 30). Statistical validity is another form of validity when statistical tests or procedures are used (Neuman, 2006, p. 217). Many attempts have been made to classify the measurements of validity and reliability. According to various researchers, there are four major types of measurement validity (face, content, criterion, and construct validity) and three major types of measurement reliability (overtime stability, representative reliability over groups, and equivalence reliability) (Neuman, 2006; Punch, 2005).

The literature discusses how to improve the validity and reliability of research results. Careful preparation of the research process is believed to increase reliability and validity (Lee, 2004). In addition, various researchers discuss the importance of triangulation by using various data collection methods (both qualitative and quantitative methods) in enhancing the validity and reliability of the collected data (Golafshani, 2003; Patton, 1990). In order to enhance the validity and reliability of the results of this study, various techniques were used. As the study aimed to use both good quantitative and qualitative indicators, careful attention was paid to the preparation of the research process, triangulation of data and statistical techniques (Punch, 2005, p. 117). Catley et al. (2008) identify triangulation as a crucial stage in the assessment of research findings whereby different sources of primary and secondary information are triangulated in order to cross-check the results, as illustrated in Figure 4.8.

![Triangulation of information](image)

**Figure 4.7: Triangulation of information**

*Source: Catley et al. (2008, p. 58)*

In this study, three particular steps were taken to improve the validity and reliability of the research results. First, the collection of data in the study followed a well-prepared procedure. The data
collection activities in the field were flexibly organised in order to adapt to local conditions including the participant’s availability of time to participate in the study, crop seasons and the participants’ work commitments. The basic procedure included the following sequential steps: (1) defining the research objectives and research scope; (2) choosing the research paradigm and research methodology and developing the data collection methods; (3) conducting documentary research (throughout the entire research process); (4) testing and finalising the data collection tools and methods in the field; and (5) conducting the formal data collection in the field (semi-structured interviews, FGDs and in-depth interviews). After each data collection activity, the results were summarised and shared with the participants to enhance their understanding about the contribution of AR4D projects to their communities to get their feedback to improve the accuracy of the research findings.

Second, triangulation in this study was performed by the combination and comparison of the data gathered by different data collection methods. The study used various data collection techniques such as semi-structured interviews, in-depth interviews, FGDs and structured observations. The collected data was triangulated during the research process. This helped not only to increase the validity and reliability of the research findings but also contributed to capacity building for all the stakeholders involved in the research by acquiring having better justification skills. Third and finally, for the quantitative impact indicators (e.g. production cost and income, percentage of output sold), a statistical technique like the Pearson’s Chi-square ($\chi^2$) statistical test was employed to test the reliability of the results and to compare the differences between the farmer groups.

**Ethical considerations**

Ethical considerations are important issues in research because of potential problems related to privacy, voluntary participation, information exploitation and misuse of survey information (Neuman, 2006, p. 313). Punch (2005), Mauthner (2002) and Neuman (2006) emphasise that researchers should pay attention and be sensitive to ethical issues before (conceptualisation and design) and during the research process (data gathering, data analysis, and reporting). Research ethics help to protect and minimise harm to participants (Bouma & Ling, 2004; Hay & Israel, 2006; Laws et al., 2003, p. 233). It is also argued that participants have the right to know about the purpose and methodology of a research study and the right to agree or refuse to participate (McNeill & Chapman, 2005, p. 12).

This study involved different groups of participants, namely, farmers, researchers, extension workers, local government staff and leaders. It was therefore necessary to apply for ethical clearance and confirm that the study would protect the rights and privacy of the participants. The ethical clearance process was carried out according to the School of Communication and Arts and University of Queensland policies. During this study, the participants were advised that they were free to decide
whether or not to be involved and that any information they provided would be considered strictly confidential. Consent documents were sent to the target participants before involving them in data collection activities. The names of the participants were not disclosed for any purpose (see Appendix 8).

The information gathered during the semi-structured interviews with individual farmers and from the in-depth interviews with key informants was processed confidentially and known only by the researcher except with the permission of research participants. The results from the surveys were used in aggregated form rather than as individual data, and feedback from the FGDs was also synthesised in aggregated form. None of the information gathered in the study has been given to any third party. The final thesis does not contain information that can be traced back to any individual stakeholders.

The impact assessment of AR4D projects is an important concern for research institutions, national and international development agencies and local communities. The weaknesses in both the objectives and methodologies of past and present impact assessment strategies clearly demonstrate the need for a holistic impact assessment framework. Although several attempts have been made to develop appropriate frameworks for assessing the impacts of AR4D projects, few serve to explain how participatory processes help an AR4D project to not only achieve its objectives but also to empower people to develop sustainable livelihoods. The next chapter describes the holistic framework for impact assessment of AR4D projects proposed in this study. The framework was constructed by raising key research questions about why the impacts of AR4D should be identified with stakeholders, measured and communicated to target stakeholders and how these processes can occur. To answer these key questions, different theories and practices related to the impact assessment of AR4D projects were utilised. The chapter focuses on critical discussions about the main reasons for carrying out an assessment of AR4D impacts, the key users of impact assessment findings, the types of impacts, the methodology for data collection and analysis, and the communication of the impact assessment findings to stakeholders. The chapter also provides a brief analysis on how ToC can be used as a complementary tool for the impact assessment of AR4D in order to address the issues of causality and complexity of agricultural research.
Chapter 5
A HOLISTIC FRAMEWORK FOR THE IMPACT ASSESSMENT OF AGRICULTURAL RESEARCH FOR DEVELOPMENT

5.1. Introduction

Because AR4D is a complex and non-linear process, the assessment of the impacts of AR4D projects requires a holistic framework that can deal with these complexities and causality issues. In addition, researchers and practitioners increasingly agree on the need to incorporate farmers as the end-users of the AR4D impact assessment findings, especially in developing country contexts. It is accepted in the agricultural research literature that if local stakeholders have a clear understanding about the contribution of a research project to their development, they can better adopt the innovations and sustain the impacts for local development and social change.

Although there is no standard methodology or approach for assessing the impacts of AR4D projects across communities and regions, clearly defining the objectives and principles of the impact assessment can help to design appropriate methods for measuring and communicating the impact assessment findings. A holistic impact assessment framework of AR4D projects must address three major issues, namely, complexity and causality in the field of agricultural research, a sustainable livelihoods focus, and empowerment of local people. Based on the relevant theories and practices related to the AR4D impact assessment, the sustainable livelihoods frameworks, ToC and PIA, and on an understanding of the socio-economic and natural conditions of the Northwest Highlands, the holistic framework for assessing the impacts of AR4D was informed by asking the following six guiding questions for framework design:

1) Why should the impact assessment of AR4D projects be carried out?
2) Who are the relevant users of impact assessment findings?
3) What types of impacts of AR4D projects should be assessed?
4) What methods and resources should be used to measure the impacts of AR4D projects?
5) How should the impact assessment findings of AR4D projects be communicated to stakeholders in order to enhance the sustainability of the impacts?
6) Why and how should ToC be adopted for assessing the impacts of AR4D projects?
5.2. A holistic impact assessment framework for AR4D

5.2.1. Why should the impact assessment of AR4D projects be carried out?

Although the assessment of AR4D impacts could play an important role in the development of the Northwest Highlands, scholars have made few attempts to assess existing impact assessment approaches in AR4D projects in the region. Local government agencies, development agencies and research institutes have limited understandings about the contribution of impact assessment findings to development. Therefore, this study’s analysis of current impact assessment strategies and the testing of alternative impact assessment approaches—in the course of developing a holistic impact assessment framework for AR4D in the Highlands—represents a significant step forward. An appropriate impact assessment framework will help to increase the understanding of AR4D projects that use participatory processes in the Northwest Highlands. It will also contribute to the formulation of suitable development strategies for the Highlands in the longer term. The proposed impact assessment framework can also be utilised in other regions with similar levels of socio-economic disadvantage and cultural diversity so that the impacts of projects can be maximised towards the goal of sustainable development. In the framework, the following key objectives of AR4D impact assessment are identified:

- To fully assess the contribution of AR4D to local development, especially to the sustainable livelihoods of local communities;
- To learn how different participatory processes could help to develop, adapt and sustain agricultural innovations in specific local contexts;
- To utilise impact assessment findings to influence development policy and research for development strategies for the Northwest Highlands and other regions with similar socio-economic and natural conditions.

5.2.2. Who are the relevant users of impact assessment findings?

AR4D aims to achieve long-term development through the establishment of complex socio-economic and farming systems. Because different development stakeholders have different roles in different phases of an agricultural research project, they have different interests in the expected impacts of the project (Lilja et al., 2001). Identification of the relevant users of impact assessment findings will help to better utilise the findings for the goal of sustainable development. In a 2014 FAO email conference on the ex-post impact assessment of agricultural research, researchers agreed that the two main objectives of the assessment of agricultural research impact are accountability and learning (Ruane, 2014). Accountability refers to the effective analysis of the resources used for agricultural research,
and learning means drawing lessons for more effective implementation of current and future research projects.

The conventional impact assessment approach often pays attention to accountability for donors but ignores the fact that farmers are important end-users of the impact assessment findings. If the farmers do not fully understand the impacts of the new technology, they will have no incentives to scale-out this technology to sustain the identified impacts. From a sustainable livelihoods perspective, the proposed holistic impact assessment framework identifies five key user groups of impact assessment findings: farmers as the end-users; agricultural extension staff; researchers; policy-makers; and private sector actors such as traders and companies. These can be further categorised into two main groups of users of impact assessment findings: local users (local farmers, extension staff, traders, and local policy-makers) and external users (agricultural researchers from national and international institutions, universities, international development agencies and high-level policy-makers). Depending on the objectives of the particular AR4D project, each user group has certain roles in the utilisation of the impact assessment findings for the scale-out of the research outputs.

**Farmers as end-users**

Because the ultimate goal of AR4D initiatives is to create impacts on the livelihoods of target communities and not simply the production of a new technology per se, farmers should be considered as end-users of impact assessment findings. Efforts to place farmers’ demands as the first objective of impact assessment have been growing. Impact assessment findings can be utilised by farmers as key inputs for their individual, household, community and regional development. It is argued that if farmers understand how the application of innovations has improved their livelihoods and what factors constrain their livelihoods development, they are able to make more effective decisions in accessing livelihood resources, markets and extension services to pursue an appropriate combination of livelihood strategies to improve their lives.

Farmers also learn about and share impacts with other farmers, local extension staff and outside researchers, leading to better collaboration and understanding among stakeholders about the contribution of agricultural innovations. Because many farmers in the Northwest Highlands are poor and have limited education, learning about impacts and following other farmers in the application of new technologies can be a quick way to reduce poverty and support the social development of local communities. Finally, because farmers are the main decision-makers in the development and implementation phases of AR4D, understanding fully about the impacts of research interventions can help farmers to share the agricultural innovations with other villagers, thus sustaining the impacts.
Local agricultural extension staff

The review of the literature on the concept of AR4D and ToC in Chapter 3 showed that agricultural research efforts produce limited outcomes and impacts if the developed technologies or innovations are not transferred to wider groups. An AR4D project may have good direct research outputs but may have poor outcomes and impacts due to a poor agricultural extension system. In addition, unlike conventional top-down research projects, recent AR4D initiatives implemented in the Northwest Highlands often involved local agricultural extension staff in their research processes through various activities such as capacity development training, field trials and monitoring and evaluation. Local extension actors played a vital role in the extension or outreach strategies of these research projects.

The level of technology adoption is influenced by the support from local extension actors as well as local extension programs. Therefore, local staff should also be seen as key users of impact assessment findings. By having a full understanding of the AR4D impacts and the contribution of the participatory processes to local development, this stakeholder group can not only learn about the contribution of the developed technologies in the local context but can also give valuable advice to local authorities on developing extension programs that are more effective for the target communities. Different research projects adopt different research processes and communication strategies, leading to different levels of outcomes and impacts on local socio-economic development; therefore, learning about the impacts associated with these differences can help local extension actors to choose the most effective approach for their future research and extension activities in the region.

Local authorities and policy-makers

Local leaders and other policy-makers can also be seen as relevant users of impact assessment findings. The positive or negative impacts of AR4D could influence the formulation of policies and strategies for the development of target communities and regions. For example, local government agencies can use the research results to make either short-term or long-term development policies, agricultural extension programs and market development strategies. In addition, these stakeholders play important roles by working with local extension services, and local people’s organisations such as farmers’ association, women’s association and farmers’ production and business groups to participate in technical training and providing financial support to farmers adopting new production technologies at a wider scale. The impact assessment findings of AR4D projects can also help local governments to gain the lessons learned about the successes and failures of existing research initiatives. This can enable them to have more effective collaboration with research institutes in implementing future research activities at local villages. It has been observed that in most top-down political systems, without the enabling environments for the adoption and development of agricultural
technologies and innovations, AR4D could fail to achieve long-term impacts (Van de Fliert et al., 2010a) and the Northwest Highlands is not an exceptional case.

**Researchers from research institutions and funding agencies**

Researchers, research institutions and international funding and development agencies need to know what their AR4D efforts and investments have achieved compared to their initial objectives. The impact assessment results help these stakeholders discharge their accountability to donors and improve the decision-making processes of research organisations. As AR4D is seen as a learning process, agricultural researchers from research institutions could benefit from impact assessment findings. The impact assessment findings are also useful for research institutions to not only learn about how the capacity of individual researchers has been strengthened through their involvement in an AR4D intervention but also for conducting future effective research interventions in target areas.

Each AR4D project has its own communication strategies to achieve its objectives. Understanding how the different participatory processes and communication strategies used in the design, implementation and monitoring and evaluation of AR4D projects could contribute to the achievement of sustainable impacts can help research organisations to strengthen their research capacity as well as their communication mechanism for development. As a result, more effective decisions could be made for the funding, design and implementation of future interventions. By learning from both the successes and failures of the research approaches and methods applied by AR4D projects, the research capacity of individual researchers, especially novice researchers, will be strengthened.

**Private sector actors**

In the context of the market-oriented agricultural development of the Northwest Highlands, private sector actors such as input suppliers, collectors, food processors, wholesalers and retailers of local agricultural products could be considered another group of target users of impact assessment findings. Together with farmers, these private sector groups could be direct or indirect beneficiaries of agricultural research activities. For example, by participating in research activities and learning about impact assessment findings, these private sector actors can improve their understanding of different aspects of the local production systems and markets (e.g. the value chains of local agricultural products such as maize, plums and other temperate fruits) in which they are involved. As the Northwest Highlands is in a rapid transition to a market economy, current AR4D initiatives not only aim to improve production but also to enhance the market engagement of local people. Therefore, impact assessment results are also important for private sector groups. This helps to strengthen linkages among market actors, including local farmers and with local governments, research organisations and NGOs. Impact assessment findings can also be utilised by private sector actors to develop more effective market investment strategies.
5.2.3. *What types of impact indicators of AR4D projects should be assessed?*

**Utilising the sustainable livelihoods framework as a lens for impact analysis**

It has been argued that the impact assessment of AR4D projects should not only focus on obtaining proof of impact as an economic return on investment, but also on exploring the plausible links between the observed multiple impacts and the research investment (Krall et al., 2003, p. 333). The sustainable livelihoods framework provides the parameters for a comprehensive conceptual analysis of what and how impacts can be achieved by AR4D. The application of a sustainable livelihoods framework can also help define and unravel the assessment of impacts that occur in the complex realities of individuals, households and communities, and at regional and national levels (Scoones, 1998).

Several scholars have identified that the analysis of AR4D processes and impacts is compatible with the principles of the sustainable livelihoods framework because of the mutual interactions between AR4D and livelihood assets, development policies and institutions, and the shared context in which livelihood strategies are combined for better outcomes and impacts (Adato & Meinzen-Dick, 2002; Carpenter & McGillivray, 2012). The sustainable livelihoods framework provides the parameters for a comprehensive conceptual analysis of how AR4D projects achieve impacts and what impacts they achieve. In this study, the sustainable livelihoods framework is utilised as a lens to identify four key groups of impact assessment indicators for AR4D projects: direct research outputs, livelihood impacts, institutional impacts, and impacts in the vulnerability context.

Analysing how the sustainable livelihoods framework could be adapted for the assessment of the impacts of agricultural research and technologies, Adato and Meinzen-Dick (2002) indicate that agricultural technology development is suitable for dealing with the complexity of livelihood strategies if the full livelihoods picture is understood. They explain the main ways in which agricultural research can fit in a sustainable livelihoods framework: by increasing or decreasing vulnerability contexts; by making links with livelihood assets; and by being a part of the policies, institutions and processes which enable an environment to change. The indicators of these major groups of interactions may not be the same among different regions and communities. However, being guided by them will help to identify the appropriate impact indicators for AR4D in a particular social context.

In this study, the DFID (1999) sustainable livelihoods framework was utilised as a lens to identify three main groups of impacts of AR4D projects: i) livelihood impacts or changes in the livelihood asset base, ii) institutional impacts or changes in policies, institutions and processes, and iii) impacts or changes in the vulnerability context. These impact groups are strongly linked to direct research outputs. These interactions are illustrated in the diagram in Figure 5.1.
As described above in Figure 5.1, AR4D could affect people’s livelihoods directly and indirectly by generating institutional or long-term livelihood impacts in three main ways:

i) By making changes in the livelihood asset base such as human capital (e.g. knowledge and skill, health), social capital (e.g. trust, membership, informal safety net and communication), economic capital (e.g. income, saving and credit opportunities), physical capital (e.g. roads, transportation, sanitation, healthcare systems) and natural capital (e.g. soil fertility, water conservation and biodiversity).

ii) By interacting with policies, institutions and processes such as formal and informal institutions (e.g. development policies, culture, organisational capacity) and development strategies that affect people’s access to livelihood assets, their vulnerability context and their choice of strategies to achieve livelihood outcomes and impacts.

iii) By influencing the vulnerability context such as i) shocks (e.g. changes in human or animal health, natural disasters, and sudden economic changes), ii) trends in migration, livelihood
resource use, and other indicators such as prices, governance and technologies, and iii) seasonality in production, price, employment and health.

Impacts from AR4D projects are more likely to be achieved if the direct research outputs can be immediately adopted and sustained by target communities and supporting stakeholders. On the other hand, measuring the direct research outputs is also important to understand how impacts are generated by an AR4D intervention. Research institutions, funding agencies and local development institutions are all interested in achieving applicable direct research outputs for development. Utilising a sustainable livelihoods framework to set the parameters for assessing the impacts of AR4D initiatives in the Northwest Highlands of Vietnam is relevant as it helps to identify and measure both the actual and potential short-term and long-term impacts.

For the above mentioned reasons, the proposed holistic impact framework incorporates four major groups of impact assessment indicators: i) direct research outputs, ii) livelihood impacts, iii) institutional impacts, and iv) impacts in the vulnerability context.

**Direct research outputs**

The direct research outputs of AR4D could be new or improved plant varieties or agricultural technologies, farmer innovation, a set of recommendations, and the publications achieved by a project (Marasas et al., 2001). Because a pathway to move from research outputs to outcomes and impacts is often affected by multiple internal and external factors (e.g. livelihood assets base, vulnerability context, and institutional environments), assessing the direct outputs of AR4D not only helps to analyse the effectiveness of AR4D but also to understand how livelihood outcomes and impacts could be achieved. Funding agencies, research institutions and local governments also need to know the research outputs that have resulted from an intervention so that they can make better decisions. The direct outputs of AR4D include a trained workforce in local development institutions that is capable of delivering outreach activities and outreach material to support these activities, and new technologies. The attainment of academic qualifications such as masters or doctoral degrees by staff and students from research partner organisations involved in research activities of an AR4D research project can be sometimes seen as an important short-term impact of research interventions. Measuring the direct research outputs of AR4D can be done during or immediately after the project completion.

In many cases, the direct research outputs could be immediately applied by research institutions, local extension agents and target communities, leading to better outcomes and impacts. For example, direct research products such as the documentation of technical processes, communication strategies for the participation of stakeholders in AR4D as well as reports on accountability to donors could be immediately communicated with and used by interested stakeholders. Other publications such as journal articles, research theses, visual posters, videos and photo stories related to the agricultural
innovations could also be utilised by local extension systems to be shared and applied in target communities or with other communities in the region with similar social and natural contexts. In addition, the direct products of AR4D help to enhance future research activities and policy development for target areas. An innovative research process itself is also a direct product of AR4D. Using these direct research outputs could help to achieve both actual and potential impacts for future research initiatives as well as for the socio-economic development of target areas.

For poor and remote regions like the Northwest Highlands, the immediate use of direct research outputs could be a socially and financially effective way to deal with poverty and unsustainable management of natural resources. Sustainable production techniques such as minimum tillage, mulching and intercropping maize-based systems on sloping lands and appropriate fertilizer control can be directly adopted by local farmers and other government extension programs, leading to improved livelihoods for local communities and reduced environmental problems even over a short period.

Livelihood impacts

AR4D can affect people’s livelihoods by making changes in the livelihoods asset base such as changes in human capital (awareness, knowledge and skills), social capital (community organisations, social relationships and other social networks), economic capital (improved yields, income, labour savings, savings and other financial flows), physical capital (new farm equipment, infrastructure and market and information systems) and natural capital (soil fertility, soil erosion reduction, forest protection, water conservation and bio-diversification). For example, the new production technologies generated by AR4D can be applied by farmers to increase crop and livestock productivity and farm income. This improved economic capital is important for the support of poor households that usually do not have enough resources to apply new production technologies and for the provision of a wider choice of livelihood strategies such as crop diversification, long-term investment and better access to markets for farmers to achieve livelihood objectives. A strengthened relationship between farmers and extension officers could provide farmers with better access to extension services, leading to more productive farms and enhanced economic efficiency.

Through the lens of the sustainable livelihoods framework, five key groups of AR4D impacts on livelihoods are identified. These groups of livelihood impacts are described in Table 5.1.
Table 5.1: Key groups of AR4D impacts on livelihoods

<table>
<thead>
<tr>
<th>Livelihood impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human capital (H)</td>
<td>Formal and informal education, skills, knowledge, health, household labour</td>
</tr>
<tr>
<td></td>
<td>power and conservation of indigenous knowledge</td>
</tr>
<tr>
<td>Social capital (S)</td>
<td>Involvement in social networks and organisations (farmer groups, agricultural</td>
</tr>
<tr>
<td></td>
<td>cooperatives), communication systems, access to market information</td>
</tr>
<tr>
<td>Economic capital (E)</td>
<td>Farm income and saving, sources of credit (formal and informal) and other</td>
</tr>
<tr>
<td></td>
<td>financial inflows</td>
</tr>
<tr>
<td>Physical capital (P)</td>
<td>Ownership of farming equipment, post-harvest processing facilities, irrigation</td>
</tr>
<tr>
<td></td>
<td>and roads, communication means, and other household physical assets</td>
</tr>
<tr>
<td>Natural capital (N)</td>
<td>Soil erosion protection, land fertility, water conservation, forest protection</td>
</tr>
<tr>
<td></td>
<td>and biodiversity</td>
</tr>
</tbody>
</table>

Source: Adapted from Adato and Meinzen-Dick (2002); Carpenter and McGillivray (2012); and DFID (1999)

These five groups of livelihood impacts should be assessed by appropriate approaches and methods. For example, the assessment of economic capital impacts may require quantitative-oriented methods while the impacts on other types of capital such as human, social and natural capital could be measured with qualitative methods. The combination of qualitative and quantitative approaches could be a suitable choice in order to fully understand the impacts. In addition, because all the types of livelihood capital are interrelated, a change in one or more than one capital could lead to change in the rest. Measuring changes in livelihood capital should therefore look at both short-term and long-term multiple impacts. Attention should also be paid to differences in perceptions about livelihood impacts among individuals and between groups of stakeholders in order to gain a deeper understanding about the contributions of a research intervention to local livelihoods. Finally, because AR4D is a non-linear process, explicit assumptions about risks, shocks and rival factors in the impact pathway should be taken into account when carrying out an impact assessment. Depending on the development purposes, livelihood impacts could be measured at the individual, community or regional level.

A research for development process, especially a participatory research process, which aims to make research outcomes that are adaptable to farmers’ conditions could also help to strengthen human and social capital. Through involvement in an effective research process, local people not only gain new knowledge and skills but also improve their status in their local community through strengthening their social networks and relationships. Natural capital such as soil fertility, soil erosion protection and water and biodiversity conservation could certainly be improved if adaptable and sustainable agricultural technologies are applied by farmers. Because livelihood assets are interdependent in the
development context, any change in more than two assets or groups of capital could also lead to a large variation in the other assets. Therefore, different combinations of livelihood assets and new agricultural technologies could influence people’s choices of livelihood strategies in the existing institutional environment to achieve livelihood outcomes (e.g. improved income and savings, more employment, better access to extension services and markets) and eventually livelihood impacts. Moreover, if an AR4D project is well designed, it could generate more outcomes and impacts on people’s livelihoods. In contrast, a poorly designed project can result in negative or limited outcomes and impacts to farmers’ livelihoods.

Institutional impacts

AR4D can deliver institutional impacts that influence the enabling environments and support change. Marasas et al. (2001) classify institutional impacts as “intermediate impacts” and define them as changes within research and development institutions and in the enabling environment that facilitate the transfer and adoption of direct research outputs by target communities into a large scale. Adato and Meinzen-Dick (2002) state that both formal and informal institutions and organisations can support a change in livelihoods through their influence on access to livelihood resources, choice of livelihood strategies and vulnerability contexts. Institutional impacts have a strong link with human, physical and financial dimensions because these impacts enhance human capacity through education and training activities; this enhanced human capacity, in turn, facilitates the efficient use of resources in farm production and business, leading to better economic value (Marasas et al., 2001).

AR4D can result in positive changes in the research capacity of research organisations because agricultural research is often conducted in and adapted to local complex farming systems. This adaptive research process helps research institutions to strengthen their research capacity and their ability to formulate and implement appropriate research intervention strategies in other similar farming contexts. As discussed by Marasas et al. (2001) and Alene et al. (2007), AR4D could result in more effective organisational approaches and research collaboration strategies for researchers and other development actors.

Improved research capacity due to the implementation of a research project can be utilised for subsequent projects and be a means to significant impacts (Templeton, 2009). AR4D could also have an influence on the formulation of both short-term and long-term development policies and legislative support from local government agencies for the development of local communities and regions. As discussed by Douthwaite et al. (2007), agricultural innovation could be scaled-up from local organisations to higher-level organisations and institutions (e.g. policy-makers and development organisations) and scaled-out from farmer to farmer and from community to community; therefore,
understanding institutional impacts could help to form appropriate strategies to establish enabling environments for change.

In culturally diverse and poor regions like the Northwest Highlands, a change in institutional structures and processes is vital for supporting social change and development. In recent years there has been a move to more interdisciplinary research approaches involving various research organisations with different disciplines in AR4D projects in the Highlands. The different communication strategies used by AR4D could also immediately affect enabling environments for developing and adopting new agricultural technologies through improving collaboration between research organisations and local stakeholders and among the local stakeholders themselves in a research process. Partnership and collaboration among research institutions and with local stakeholders in the Highlands could be strengthened by AR4D. This helps to increase future collaboration among stakeholders towards more effective research for development.

Impacts in the vulnerability context

AR4D and technology development can increase or decrease a vulnerability context by making changes in livelihood resources such as changes in the availability of adaptable production techniques, crop diversification and resistance to disease, seasonal prices and people’s access to input and output markets. These changes could affect how people choose different types of livelihood strategies to achieve livelihood outcomes and eventually have livelihood impacts in the long term. The risks and shocks associated with income, health and market transactions could be affected by research interventions. As the Northwest Highlands is characterised by social and cultural diversity, a harsh natural setting and a high rate of poverty, learning about changes in vulnerability contexts is important for forming appropriate strategies to facilitate the development of the region. Impacts or changes in the vulnerability context could be seen as the intermediate impacts of AR4D projects if developed technologies are immediately accepted by target communities leading to observed improvement in local livelihoods.

As stated above, this study utilised the sustainable livelihoods framework as a lens to identify the four key groups of impact assessment indicators for AR4D projects: direct research outputs, livelihood impacts, institutional impacts, and impacts in the vulnerability context. Depending on the research objectives, the specific social context of the research locations, and the length of time between a project’s completion and its assessment, the impact assessment set out in the framework proposed in the present study could focus more on either the short-term or long-term impacts. The diagram in Figure 5.2 shows the interactions among direct research outputs, livelihood impacts, institutional impacts and impacts in the vulnerability context as the four key groups of impact assessment indicators in the holistic approach to impact assessment of AR4D.
Figure 5.2: Four key groups of impact assessment indicators in the holistic impact assessment approach to AR4D projects

Source: Adapted from DFID (1999), Adato and Meinzen-Dick (2002) and Anandajayasekeram et al. (2007)

Utilising the sustainable livelihoods framework as a lens for assessing the impacts of AR4D in the Northwest Highlands requires researchers to be aware of limitations such as the existence of top-down approaches, lack of understanding of local social complexity, and the application of inappropriate research methods. In such a culturally diverse and remote region, careful attention should be paid to fully understanding the existing top-down political and agricultural research systems. Because of the high diversity in socio-economic and geographic settings, different levels of knowledge and skills and unequal levels of access to markets in the Highlands, farmers with the same basic livelihood assets may pursue different livelihood strategies. With an incomplete understanding of the local cultural diversity and complexity, the real impacts of AR4D cannot be assessed. In addition, most of the AR4D initiatives in the Highlands to date have been implemented on a small scale, yet a narrow focus on households and local complexity could result in less attention being paid to larger scale and external policy decisions or development institutions. Finally, although participatory methods help to actively engage local people in impact assessment, a heavy reliance
on participatory techniques and qualitative data can lead to weak evidence of quantitative indicators such as net farm income and savings, credit flow and soil and vegetation improvement.

5.2.4. What methods and resources should be used to measure the impacts of AR4D projects?

A holistic impact assessment framework is one that aims to both fully measure the impacts of an AR4D project and empower local stakeholders in the impact assessment processes. The usefulness of the sustainable livelihoods framework in identifying the key groups of AR4D impacts was discussed above. The question discussed in this section requires an analysis of how the PIA approach and participatory methods could be adopted to measure the key groups of impact indicators in AR4D projects. Because a core objective of AR4D projects is to impact on local livelihoods through the active participation of relevant stakeholders and communities in the research design, implementation, monitoring and evaluation, the impact assessment needs to consider not only different impact indicators but also how different communication approaches or strategies could contribute to the achievement of impacts. In addition, the impact assessment in itself should be seen as a research process in which the key stakeholders learn and share in order to gain a deep understanding of the contribution of an intervention through a pathway of change and to utilise the impact assessment findings for local sustainable development.

The PIA approach, with a wide range of participatory data collection methods and tools such as FGDs, visual data collection techniques, in-depth interviews, direct observation and semi-structured interviews, is an effective way to collect qualitative and quantitative data about the impacts of AR4D projects. Because of limited education levels and poor economic conditions, language barriers and high levels of cultural and natural diversity in the Northwest Highlands, the adoption of the PIA approach with various participatory and visual techniques can engage the most disadvantaged groups in the impact assessment of AR4D and in local livelihood development processes. Using participatory techniques and tools for data collection not only helps to rapidly obtain reliable information and knowledge but also to empower local stakeholders in the impact assessment processes. The collaboration among stakeholders (e.g. farmers, extension staff and researchers) is also strengthened.

The PIA approach also provides opportunities to obtain feedback and share findings on impacts among stakeholders at different levels. Because of limited education and economic conditions, language barriers and high levels of cultural and natural diversity in the Northwest Highlands, the adoption of the PIA approach with various visual techniques can engage the most disadvantaged groups in the impact assessment of AR4D and in local livelihood development processes. In addition, both qualitative and quantitative research methods could be complementarily used in PIA in order to
take advantage of the strengths of each method (Bamberger et al., 2010). Leeuw and Vaessen (2009) point out the benefit of using mixed methods in order to gain greater validity in the impact findings through better triangulation of the findings from various methods. The recommended methods and tools for understanding and measuring each key group of indicators in the proposed holistic impact assessment framework are summarised in Table 5.2 and the results of testing this impact assessment framework will be presented in Chapter 7.

As discussed in Chapter 3, the PIA approach has many advantages over conventional top-down impact assessment approaches. However, scholars raise three concerns about the use of participatory methods that need to be considered. Firstly, project evaluators might co-opt “participation” and “participatory” as merely fashionable terms and not implement them adequately. A rapid and uncritical adoption of participatory methods will result in weak evidence if the assessment process has not maintained a clear focus on sustaining the impacts of the project (Pretty, 1995b; Robinson, 2002). Such weak communication practices do not enhance the engagement of local people in impact assessment processes nor facilitate these people’s utilisation of the impact assessment findings in order to achieve livelihood impacts. Secondly, participatory processes are often time-consuming. An insufficient allocation of time and human resources to the participatory sessions leads to weak commitment among the stakeholders to the assessment processes (Robinson, 2002). Thirdly, the outcomes of participatory evaluation are driven by group dynamics, which can create a distorted view of reality for unaware evaluators (Campbell, 2001).
Table 5.2: Key groups of indicators and key methods and tools in the impact assessment of AR4D in the Northwest Highlands

<table>
<thead>
<tr>
<th>KEY GROUPS OF INDICATORS</th>
<th>KEY METHODS &amp; TOOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Direct research outputs</td>
<td></td>
</tr>
<tr>
<td>- Technology development</td>
<td>Achievement of scientific products compared to expected outputs: <em>improved agricultural technology and innovative research processes</em></td>
</tr>
<tr>
<td>- Capacity building</td>
<td>Changes in capacity of research organisations: <em>publications, training, and attainment of academic degrees</em></td>
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<tr>
<td></td>
<td>▶ Documentary research</td>
</tr>
<tr>
<td></td>
<td>▶ In-depth interviews with key researchers from research institutions and with local agricultural extension staff</td>
</tr>
<tr>
<td></td>
<td>▶ Observation</td>
</tr>
<tr>
<td></td>
<td>▶ Documentary research</td>
</tr>
<tr>
<td></td>
<td>▶ In-depth interviews with researchers and local agricultural extension staff</td>
</tr>
<tr>
<td>II. Livelihood impacts</td>
<td></td>
</tr>
<tr>
<td>- Livelihoods capital:</td>
<td>Positive changes in livelihood capital:</td>
</tr>
<tr>
<td></td>
<td>- Human (knowledge and skill, health)</td>
</tr>
<tr>
<td></td>
<td>- Social (trust, membership, informal safety net, communication)</td>
</tr>
<tr>
<td></td>
<td>- Economic (income and savings, credit)</td>
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<td></td>
<td>- Physical (roads, transportation, sanitation, healthcare)</td>
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<tr>
<td></td>
<td>- Natural (soil protection, biodiversity)</td>
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<td></td>
<td>▶ Observation</td>
</tr>
<tr>
<td></td>
<td>▶ Documentary research</td>
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<tr>
<td></td>
<td>▶ In-depth interviews with key informants (local leaders, extension staff and agricultural researchers)</td>
</tr>
<tr>
<td></td>
<td>▶ FGDs with farmers using visual participatory tools (Venn diagram, ranking, radar diagram, ten-seed techniques)</td>
</tr>
<tr>
<td></td>
<td>▶ Semi-structured interviews with farmers</td>
</tr>
<tr>
<td>III. Institutional impacts</td>
<td></td>
</tr>
<tr>
<td>- Policies, institutions and processes</td>
<td>Changes in policies, institutions and processes (formal and informal): <em>development policies and development strategies, culture, scaling-up opportunities, research organisational capacity, research collaboration, and research for development strategies</em></td>
</tr>
<tr>
<td></td>
<td>▶ Observation</td>
</tr>
<tr>
<td></td>
<td>▶ Documentary research</td>
</tr>
<tr>
<td></td>
<td>▶ In-depth interviews with key informants (local leaders, extension staff and researchers)</td>
</tr>
<tr>
<td></td>
<td>▶ FGDs with farmers using visual participatory tools (Venn diagram, seasonal calendar, resource mapping)</td>
</tr>
<tr>
<td></td>
<td>▶ Semi-structured interviews with farmers</td>
</tr>
<tr>
<td>IV. Impacts in the vulnerability context</td>
<td></td>
</tr>
<tr>
<td>- Vulnerability context:</td>
<td>Changes in:</td>
</tr>
<tr>
<td></td>
<td>- Shocks (human or animal health, natural disasters, and sudden economic changes)</td>
</tr>
<tr>
<td></td>
<td>- Trends (migration, resource use, and other indicators such as prices, governance and technologies)</td>
</tr>
<tr>
<td></td>
<td>- Seasonality (production, price, employment and health)</td>
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<tr>
<td></td>
<td>▶ Observation</td>
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<td></td>
<td>▶ Documentary research</td>
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<td></td>
<td>▶ In-depth interviews with key informants (local leaders, extension staff and researchers)</td>
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<td></td>
<td>▶ FGDs with farmers using visual participatory tools (seasonal calendar, resource mapping)</td>
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<tr>
<td></td>
<td>▶ Semi-structured interviews with farmers</td>
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</tbody>
</table>
5.2.5. **How should the impact assessment findings of AR4D projects be communicated to stakeholders in order to enhance the sustainability of the impacts?**

Sharing the impact assessment findings helps the key stakeholders to understand the contribution made by AR4D to the development of target communities and regions. In the design of appropriate communication strategies for communicating the findings on AR4D impacts in such a diverse setting as the Northwest Highlands, project implementers should pay careful attention to how and for what purposes the findings can be utilised for development. As discussed above in Section 5.2.2, there are two main groups of users of impact assessment findings: local users (such as local farmers, extension staff, traders, and local policy-makers) and external users (such as agricultural research institutions, universities, international development agencies and high-level policy-makers). Appropriate strategies are required to communicate the impact assessment findings to each of these stakeholder groups.

For the local stakeholders and beneficiaries, the project’s evaluation facilitators can communicate the impact assessment findings immediately or soon after the completion of the assessment process. The project can communicate the findings in the impact assessment process itself and in the impact sharing process. Evaluation facilitators should base their communication of the findings with local stakeholders and beneficiaries on the particular social context and the available time and financial resources. The communication of findings can take place in the field or other places that are most convenient for the participation of different stakeholders. Facilitators should use simple and understandable language when disseminating impact assessment findings, due to the different levels of education and skills of local stakeholders.

For the research institutions, donors and policy-makers, after sharing the findings and getting feedback from the key stakeholders and beneficiaries, the project can produce conventional written reports and publications to be shared with research partner organisations. The dissemination of visual products such as videos, photo stories and posters in international conferences, university seminars and agricultural extension trainings can be an effective way to sustain the impacts. The promotion of research products and innovations through websites and electronic forums such as email conferences also helps to share the impact assessment findings with a wide audience at low cost.

5.2.6. **Why and how should ToC be adopted for assessing the impacts of AR4D projects?**

As discussed in Chapter 3, although ToC provides explicit explanations about change by questioning the causality and making assumptions about the external factors that could influence the expected outcomes and impacts, the impact pathway approach also helps to address causality and the complexity of change. In addition, the terms “impact pathway” and “ToC” are sometimes used
interchangeably. AR4D initiatives in diverse regions like the Northwest Highlands are driven by many internal and external factors, making it critical to understand the assumptions, risks, unintended effects and explanatory factors that could influence the ability of an AR4D project to achieve multiple impacts. For this reason, the integration of the ToC as a complementary tool in the impact assessment of AR4D in the Northwest Highlands was considered in the development of the holistic impact assessment framework.

ToC should be included in a holistic framework for assessing the impacts of AR4D projects in complex regions such as the Northwest Highlands for three main reasons. First, impact assessment should pay attention not only to measuring direct and short-term outcomes and impacts (e.g. improved crop yield, farm income and farm household savings) but also to measuring the ultimate contributions and non-linear factors (internal and external) that could enhance or hinder impact achievement (e.g. changes in the natural environment, market and local institutional systems). Because of the complexity of aspects relating not only to the AR4D project itself but also to the local communities and region, measuring the impacts of AR4D interventions should pay careful attention to complex and dynamic local farming systems. The theory-based approach such as ToC and the impact pathway could be used as a complementary tool for tracing the outcomes and impacts and making clear explanations about how change has occurred.

Second, if AR4D projects are not designed in ways that could deliver impacts, it is hard to identify or measure their long-term, social, human, economic and environmental impacts. Assessing the impacts of an AR4D project should therefore look carefully at a pathway of change in order to learn about by whom, with whom and for whom a research project was designed, implemented and monitored and evaluated. Because different AR4D initiatives use different research processes and communication strategies, understanding these differences and their influences on impacts also provides good suggestions for developing appropriate agricultural interventions in the future.

Third, as participatory agricultural research processes often take a long-term to generate impacts, some impacts are not observable over a short-term period. Therefore, the identification and quantification of impacts requires evaluators to trace a complex process of change from potential impacts. In addition, as stakeholders in complex regions are likely to require more time to adapt new agricultural technologies or innovations, the impact assessment should include the prediction of the potential future impacts. Mapping changes is essential for describing the complex process of agricultural research interventions in which research outputs lead to outcomes and eventually lead to impacts over a period of time following a project’s completion.
The application of ToC for the impact assessment of AR4D in the Northwest Highlands can be developed from existing ToC theories and practices. A comprehensive ToC analysis comprises key principles from mapping out the causal chain to understanding contexts, exploring assumptions and hypotheses and uncovering evidence. White (2009) recommends the combination of qualitative and quantitative approaches in a single evaluation, pointing out the need to use rigorous factual analysis to complement the counterfactual analysis of impact evidence. Based on a review of the literature on ToC and impact pathway concepts, the key principles in using ToC for the impact assessment of AR4D are represented diagrammatically in Figure 5.3.

![Figure 5.3: Key principles in using ToC approach to AR4D impact evaluation](image)

*Source: Adapted from White (2009) and Vogel (2012)*

It is important to note the challenges in using ToC for impact assessment. Although ToC concepts are useful for tracing impacts, a weak explanation about impacts can result from the impact assessment process due to gaps in culture and language, gaps in perceptions between the researchers and stakeholders, conflicts of interest among stakeholders and the influence of top-down politics and power in the research setting. A focus on higher-level impacts could also overlook some important intermediate impacts in the short-term. As mapping the pathways to change is based on assumptions, a limited understanding about the local context (e.g. culture, infrastructure, access to market and
natural resources) often leads to poor impact assessment findings. Finally, ToC is only useful for tracing impacts if it is designed and assessed in line with the perspectives of relevant stakeholders and beneficiaries, as the impact assessment framework presented in this thesis attempts to do.

5.2.7. The holistic impact assessment framework for AR4D projects

In conclusion, the application of a holistic impact assessment framework for AR4D is achievable by mixing different data collection and analysis methods and by integrating more than one conceptual framework. Answering the six questions posed above in the development of the proposed holistic impact assessment framework highlights five common steps in the process of utilising and integrating development theories and practices into a holistic impact assessment framework for AR4D. The first step is designing the AR4D project based on the identification of its possible impacts. Depending on the specific social context of the research site and the expected length of time between the completion of the project and its evaluation, the project can set out to focus on short-term or long-term impacts. The second step is identifying the key groups of impact indicators.

The third and fourth steps are selecting the appropriate assessment strategies and the specific methodologies and techniques for data collection and analysis in order to measure the relevant impact assessment indicators. The fifth and last step is conducting participatory workshops or meetings with local communities to share the impact assessment findings and get feedback from local stakeholders to help verify the findings and facilitate the use of the research outputs on a large scale. The impact assessment findings can also be reported to funding and implementation agencies and can be shared among research partners and development agencies through publications, media and other electronic means for better implementation and assessment of future AR4D interventions.

Figure 5.4 presents the proposed holistic impact assessment framework for AR4D.
Figure 5.4: Holistic impact assessment framework for AR4D
The application of a comprehensive impact assessment framework such as the one outlined in this study can be expected to face a number of challenges. Firstly, the holistic framework may not work well if the project teams lack good facilitation skills or lack a deep understanding of the local culture and an appreciation of the complexity of the research context. Secondly, because social, human, economic and environmental impacts are more likely to be achieved if AR4D projects are designed to deliver measurable impacts, the impact pathway and the causal links between outputs and impacts should be well integrated into the impact assessment process. Thirdly, even an impact evaluation that adopts a holistic framework may be insufficient to measure the full contribution of an AR4D project to local changes. For example, the effective application of participatory approaches in the Northwest Highlands is hampered by the dominance of conventional research approaches and top-down political power structures. Fourthly, no standard set of participatory communication techniques can fit different communities and locations. The types and expected levels of stakeholder participation in the impact assessment process will depend on the relevant users of the assessment findings for the particular project. In each case, evaluators should consider carefully the appropriate time allocation and suitable locations for each participatory activity. The effective sharing of impact assessment findings among the different groups of relevant stakeholders and at different levels is necessary to help sustain the identified impacts.

The results of testing and validating the proposed impact assessment framework is discussed in Chapter 6, Chapter 7 and Chapter 8. In Chapter 6, component 1 of the framework is discussed with the provision of information about the three agricultural research projects in the context of the Northwest Highlands selected for the validation of the proposed holistic impact assessment framework. This aims not only at helping to understand the design, research approach and activities, and monitoring and evaluation schemes of these research projects in the Northwest region but also identify the level at which the projects can be considered genuine AR4D projects. This chapter is closely linked to Chapter 7 in which the research findings from applying the framework are analysed. Chapter 8 presents major conclusions drawn from developing and validating the holistic impact assessment framework for AR4D projects in Northwest Highlands.
Chapter 6
THE ANALYSIS OF THREE SELECTED AGRICULTURAL RESEARCH PROJECTS IN THE NORTHWEST HIGHLANDS

6.1. Introduction

As described in Chapter 4, three agricultural research projects that had been implemented in the Northwest Highlands were selected in this study for the application of the proposed holistic approach to impact assessment. The three selected projects were:

**Project 1:** “Improved market engagement for sustainable upland production systems in the Northwest Highlands of Vietnam”, funded by ACIAR; referred to in this study as the ACIAR Northwest Project.

**Project 2:** “Support for agro-ecology extension in the mountainous areas of Vietnam”, funded by the AFD with technical assistance from CIRAD; referred to in this study as the CIRAD ADAM Project.

**Project 3:** “Integrated measures for sustainable maize development on sloping lands of the northern mountainous regions of Vietnam”, funded by the Vietnamese Government; referred to in this study as the NOMAFSI Project.

All three projects were implemented in Son La province, which is the largest province of the Northwest Highlands and fairly representative of the characteristics of the region. The ACIAR Northwest Project and the NOMAFSI Project were completed in 2013, while the CIRAD ADAM Project finished in 2014. NOMAFSI was the key implementing organisation of each of these research projects. Table 6.1 provides an overview of the key characteristics of the three case projects.

This chapter focuses on the discussion about types of agricultural research projects which was discussed on the first component of the proposed holistic impact assessment framework for AR4D. For the purpose of testing and validating the holistic impact assessment framework for AR4D projects, this study focused only on the research activities conducted by these three projects in Moc Chau and Yen Chau districts of Son La province. In these locations, the projects had attempted to develop appropriate techniques for sustainable maize-based farming systems on sloping lands and to improve farmers’ engagement with markets. Different communication approaches were used by the three research projects.
Table 6.1: Overview of the three case projects

<table>
<thead>
<tr>
<th></th>
<th>ACIAR Northwest Project</th>
<th>CIRAD ADAM Project</th>
<th>NOMAFSI Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timeline</strong></td>
<td>June 2009 to May 2013</td>
<td>November 2008 to</td>
<td>January 2011 to</td>
</tr>
<tr>
<td></td>
<td>Extension to September</td>
<td>December 2012</td>
<td>December 2013</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>Extension to 2014</td>
<td></td>
</tr>
<tr>
<td><strong>Locations</strong></td>
<td>Son La province: Moc</td>
<td>Son La province:</td>
<td>Son La province:</td>
</tr>
<tr>
<td></td>
<td>Chau and Mai Son</td>
<td>Moc Chau and Mai</td>
<td>Yen Chau district</td>
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<tr>
<td></td>
<td>districts</td>
<td>Son districts</td>
<td></td>
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<td></td>
<td>Lai Chau province: Sin</td>
<td>Yen Bai province:</td>
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<td></td>
<td>Ho and Tam Duong</td>
<td>Van Chan district</td>
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<td></td>
<td>districts</td>
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<td></td>
<td>Phu Tho province: Thanh</td>
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<td></td>
<td>Ba district</td>
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<tr>
<td><strong>Budgets</strong></td>
<td>2,362,179 AUD (2,095,890</td>
<td>1,323,000 EUR (1,821</td>
<td>1,800,000,000 VND</td>
</tr>
<tr>
<td></td>
<td>USD)</td>
<td>490 USD)</td>
<td>(84,758.8 USD)</td>
</tr>
<tr>
<td><strong>Key funding agencies</strong></td>
<td>ACIAR</td>
<td>AFD</td>
<td>The Vietnamese</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Government</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>Leading: University of</td>
<td>Leading: NOMAFSI</td>
<td>Leading: NOMAFSI</td>
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<tr>
<td>organisations</td>
<td>Queensland and NOMAFSI</td>
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<tr>
<td></td>
<td>Collaborative: PPRI,</td>
<td>Collaborative: CIRAD</td>
<td>Collaborative: NMRI and</td>
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<td></td>
<td>CASRAD, VNUA and TBU and CIAT</td>
<td></td>
<td>the Soil and Fertilisers</td>
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<td></td>
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<td></td>
<td>Research Institute</td>
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<tr>
<td><strong>Key local partners</strong></td>
<td>Provincial and district</td>
<td>Local provincial</td>
<td>Local provincial</td>
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<td>DARD</td>
<td>and district DARD</td>
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<td>Provincial centres and</td>
<td>District stations</td>
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<td>agricultural extension</td>
<td>extension</td>
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</tr>
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</table>

Source: Van de Fliert (2008), NOMAFSI (2007b), CIRAD and NOMAFSI (2008), Le (2010a) and documentation from the three projects

Based on the review of three project’s documents, in-depth interviews with researchers and local extension staff involved in these projects, and semi-structured interviews with famers in the three project areas, this chapter provides an overview of the research locations and communities and of the implementation of the three agricultural research projects. The chapter starts with a benchmark description of the communities where the projects operated. The next section describes and analyses the basic features of the three case projects. It focuses on key aspects including: i) project objectives;

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10 Using exchange rates on 31 Dec 2013 from www.oanda.com: 1 USD=1.12 AUD; 1 USD=0.763 EUR; 1 USD=20,980 VND.
phases and mechanisms for activity implementation, and iii) project monitoring and evaluation. This discussion includes a comparative analysis of how the agricultural research projects were designed, carried out, and monitored and evaluated. The chapter closes with a discussion about which project functioned as an AR4D project towards the goal of developing sustainable livelihoods in local communities. This information is very crucial for the first step of the application of the holistic impact assessment framework for AR4D, especially in the context of the Northwest Highlands.

6.2. Overview of project research communities

6.2.1. General information

As stated in Chapter 4, this study was conducted in five villages in four communes in Moc Chau and Yen Chau districts in Son La province. This section provides an overview of the specific socio-economic and natural contexts in which the research activities of the three projects were implemented. This not only helps to understand the local context but also provides information about the internal and external factors that could have influenced the achievement of outcomes and impacts in the three projects.

Moc Chau is seen as the gateway district of Son La province, located on National Highway No. 6 and 120 km from Son La town to the east. The district has an average height of about 1,050 m above sea level. Moc Chau district shares its borders with Thanh Hoa province and Lao PDR in the west, with Hoa Binh province in the east, Da River and Phu Yen district in the north, and Yen Chau district in the west and northwest. The current boundaries of the district were formed when Moc Chau was divided into two districts (Moc Chau and Van Ho districts) in 2013. Moc Chau district has 13 communes and two towns, with the total natural area of 1,081.66 km² and a total population of 106,345 people. The climate in Moc Chau is typical of the Northwest Highlands. The district is characterised by higher humidity (about 85 percent) and colder weather compared to the lowland regions of Vietnam. Its average temperature is 24–28°C and the average annual rainfall is around 1,650 mm. There are five major ethnic groups living in the district, namely, Thai, Kinh, Muong, H’Mong and Dao. The migration of Kinh people from the lowlands has continued since the 1950s (Son La News, 2014).

Yen Chau district is also located on National Highway No. 6 and is 64 km from Son La town to the southeast. The district shares its borders with Bac Yen district in the north, Mai Son district in the west and Moc Chau district in the east. It shares a 47 km border with Hua Phan province of Lao PDR in the south. Yen Chau district has 14 communes and one town in a total natural area of 843 km². The total population of the district is about 73,000 people, of whom about 70% are ethnic minority groups.
such as Thai, Kinh, H’Mong, Sinh Mun and Kho Mu. Thai (Black Thai) account for more than 55% of the district population, followed by the H’Mong and the Kinh. Yen Chau has a tropical monsoon climate with a high annual average rainfall divided into two typical sub-regions: the low region along National Highway No.6 with a dry and hot climate affected by the southwest monsoon and the high region with a temperate climate and high humidity (Son La News, 2014). A map of Moc Chau and Yen Chau districts is presented in Figure 6.1.

![Maps of Moc Chau and Yen Chau districts](http://investinvietnam.vn/report/parent-region/91/95/Son-La.aspx)

Figure 6.1: Maps of Moc Chau and Yen Chau districts


Together with secondary data collection and FGDs with farmers, this study conducted 29 semi-structured interviews with individual farmers in four communes. In this semi-structured interview sample, about two-thirds of the farmers had been involved in the research and extension activities of the three selected projects. Nearly all the farmers who participated in the semi-structured interviews belonged to an ethnic minority group, such as Dao (41%), Sinh Mun (20.7%) and Thai (34.5%). The results of the semi-structured interviews with farmers indicated that, on average, a household consisted of 4 to 5 persons. Agricultural production, especially maize production, was a major source of income for most local farmers. In terms of education, most of the interviewed farmers answered that they had completed primary and secondary schooling. Due to a relatively low education level and limited access to markets, local agricultural development projects over the past decade had focused mainly on hybrid maize production on sloping lands where unsustainable production methods were being practised. Table 6.2 presents a summary of the information on the interviewed households.
Table 6.2: Basic information on interviewed farm households

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age of interviewee</td>
<td>Years</td>
<td>26</td>
<td>68</td>
<td>44.86</td>
<td>11.404</td>
</tr>
<tr>
<td>Average members of household</td>
<td>Person</td>
<td>2</td>
<td>7</td>
<td>4.45</td>
<td>1.325</td>
</tr>
<tr>
<td>Agricultural contribution to household’s 2013 gross income</td>
<td>%</td>
<td>70</td>
<td>100</td>
<td>94.14</td>
<td>10.095</td>
</tr>
<tr>
<td>Reinvestment for agriculture</td>
<td>%</td>
<td>10</td>
<td>60</td>
<td>33.10</td>
<td>8.174</td>
</tr>
</tbody>
</table>

Source: Results of semi-structured interviews with 29 farmers in Moc Chau and Yen Chau districts

In terms of housing facilities and living conditions, about half of the households had nha san\textsuperscript{11}. A large number of farmers said that they did not have concrete toilets. The majority of households accessed water from streams through pipes for their daily living and agricultural production needs. Participants in the FGDs in Phieng Luong commune reported that they lacked water for production and living in dry seasons. A lack of water in long dry seasons was seen by farmers as a main difficulty in diversifying agricultural production, especially on sloping lands. In addition, the farmers faced some problems in maintaining the water pipes crossing the fields to access water because the pipes were often damaged by cattle.

6.2.2. Agricultural production

Because agricultural production was a main source of income for the majority of farm households in the research areas, land was seen as the most important livelihood resource for the economic development of local communities. The average agricultural land per household in the research villages was quite large compared to the lowlands. Each household had from two to four ha of agricultural land in which they cultivated cash crops such as maize, canna, legumes, tea and fruit trees such as plums. However, there was a large standard deviation in the agricultural land among the farm households in the research communes. Table 6.3 summarises the information about the land use of the interviewed farm households.

Through the FGDs with farmers in Suoi Khem and Pieng sang village, Phieng Luong commune, it was found that the maize-based farming systems in the districts had been continuously diversified over recent decades to increase income for farm households. For example, before the 1990s, shifting cultivation (involving the burning of a section of forests and then growing cash crops) was a common practice in most of the research villages, and maize, upland rice and canna were the major cash crops. In that earlier period, most farmers in Phieng Luong and Muong Sang communes generally practised

\textsuperscript{11} Nha san: Traditional wooden stilt houses with tile or tin roofs, popular in the northern mountainous region of Vietnam.
five year crop rotations: upland rice (2 years), maize (2 years) and canna (1 year). Due to a lack of irrigation in the dry season and poor soil fertility, the maize monocrop and canna accounted for a majority of the production area.

Table 6.3: Land resource of interviewed households

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average total land area per household</td>
<td>m²</td>
<td>14300</td>
<td>70,000</td>
<td>33,937.93</td>
<td>14,863.32</td>
</tr>
<tr>
<td>Average agricultural land area per household</td>
<td>m²</td>
<td>4000</td>
<td>70,000</td>
<td>30,248.28</td>
<td>16,759.47</td>
</tr>
<tr>
<td>Average area of household’s largest maize field</td>
<td>m²</td>
<td>1000</td>
<td>40,000</td>
<td>15,879.31</td>
<td>11,521.45</td>
</tr>
</tbody>
</table>

Source: Results of semi-structured interviews with 29 farmers in Moc Chau and Yen Chau districts

Since the 1990s, the introduction of high yielding hybrid maize varieties such as NK66, NK4300 and NN88 had attracted farmers to expand commercial maize production. The production of temperate fruits and other perennial crops such as Tam Hoa plum and tea in Phieng Luong commune and apricots in Muong Sang commune was an alternative income source for farmers. Chemical fertilisers were also used by farmers to compensate for a reduction in soil fertility and enabled higher yields in the late 1990s. Due to the dramatic fall in apricot price in the early 2000s, apricot orchards were replaced by maize fields which brought more profit for farmers. The large area of canna was also converted into maize and other temperate fruit trees. Although the rapid development of commercial agricultural production, especially maize production, had pushed the socio-economic development of the local communities, it also resulted in emerging environmental problems such as deforestation, soil erosion and degradation, and the shortage of water for living and production.

From the FGDs and semi-structured interviews with farmers it was found that the main cash crops in the research communes at the time of this study were maize, plums, tea and canna (Phieng Luong and Muong Sang communes) and maize (Chiang Hac and Chiang Dong communes). The raising of cattle such as buffalo was mainly done for draft animals or local household consumption. However, in recent years, due to the introduction of new agricultural technologies (e.g. new seeds, sustainable agricultural production, and intercropping) by rural development programs and research initiatives including the three projects selected in the present study, efforts from local extension services and better access to markets, local farmers had expanded the secondary crops such as legumes, pumpkin and rapeseed in order to increase farm income. For example, in Muong Sang commune, pumpkin was grown as the secondary crop on maize fields in highland areas and on rice fields in flat areas. In Phieng Luong commune, pumpkin had been intercropped with maize since 2013. Legumes such as...
rice bean and black bean were also grown as complementary crops in maize-based farming systems in Chieng Hac commune.

6.2.3. Access to agricultural extension and market services

An agricultural extension network had been established in all research communes. The main training topics identified by local farmers were advanced production technologies for cultivation and animal husbandry such as maize, tea and plum production (Phieng Luong commune), maize production (Chieng Hac commune) and maize production, pig and chicken raising (Chieng Dong commune). Although a large number of participants said they could access at least one training course on agricultural production provided by the local agricultural extension stations, the farmers indicated that several trainings conducted by local extension services were not practical in terms of the local conditions and farmers’ interests and in regard to the training method, time and content. In addition, most of the farmers interviewed in Tong Han village (Chieng Hac commune) did not know the existence of commune extension staff. Moreover, the farmers also reported that they could sometimes participate in some training workshops provided by private companies such as CP Group and Sienta but these workshops focused mainly on introducing new crop varieties for the purpose of selling the seeds to farmers rather than on developing the farmers’ capacity. Agricultural researchers from the CIRAD ADAM Project also shared that, although the project had an agreement with local commune extension systems, the local extension staff were not involved in conducting research activities in the fields.

Farmers who had not been involved in the three projects had very limited opportunities to participate in agricultural trainings on sustainable maize production techniques such as mulching, minimum tillage, mini-terrace and intercropping. As acknowledged by both local farmers and extension staff, over the period from 2012 to 2014, there was a great change in maize production in most of the projects’ research villages. Many farmers had changed from conventional production with full tillage to minimum tillage or no-tillage farming systems and from one crop to two crops in maize-based farming systems. In regard to training courses on market and other social issues, only farmers in Phien Luong and Muong Sang communes had opportunities to participate in training and workshops on agricultural marketing and agricultural value chain development. These activities had been conducted by the ACIAR Northwest Project. There were no training courses on gender sensitivity, healthcare and household economic management for any of the local communities in the research villages.

In terms of access to market information, the local farmers reported that they often accessed information about input and output prices from relatives, neighbours and local traders. In most of the research communes, local farmers ranked relatives, neighbours and local agricultural input supply
agents as the main sources of input price information. Local extension services, TV and radio were not seen as important sources of market information by most of the interviewed farmers. The main sources of input price information are described in Table 6.4.

Table 6.4: Major sources of information about agricultural input price

<table>
<thead>
<tr>
<th>Sources</th>
<th>Count</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relatives and neighbours</td>
<td>28</td>
<td>96.55</td>
</tr>
<tr>
<td>Local village and commune leaders</td>
<td>9</td>
<td>31.03</td>
</tr>
<tr>
<td>Local extension staff at district level</td>
<td>2</td>
<td>6.90</td>
</tr>
<tr>
<td>TV, radio and local speaker system</td>
<td>2</td>
<td>6.90</td>
</tr>
<tr>
<td>Local input supply agents and traders</td>
<td>27</td>
<td>93.10</td>
</tr>
</tbody>
</table>

Source: Results of semi-structured interviews with 29 farmers in Moc Chau and Yen Chau districts

Some farmers believed that input prices were sometimes controlled by local input suppliers and collectors. These private actors sold agricultural inputs (e.g. fertiliser, seeds and herbicide) to farmers with differing payment types. In return, the farmers had to sell the agricultural products to these private sector actors when the crops were harvested.

Farmers in villages far from main roads such as Tong Han village (Chieng Hac commune) and Pieng Sang village (Phieng Luong commune) were more dependent on local input supply agents who played multiple roles of moneylenders, input suppliers and output collectors. The majority of farmers in Chieng Hac commune said that they had to buy inputs from local input supply agents because they could easily borrow money from these agents when they were in urgent need. Only farmers in Chieng Dong commune in Yen Chau district were more independent of input supply because of the commune’s location on the main road with easy access to Yen Chau town.

Through the FGDs and in-depth interviews with farmers in Phieng Luong and Muong Sang commune, it was also found that the farmers did not worry about a surplus of products such as maize, canna, pumpkin, legumes and rapeseed because of the high demand for these products in the market. However, the farmers identified the trend of increasing agricultural input prices and the frequent fluctuation of product prices as the main issues affecting the access of local farmers to markets and their ability to develop more profitable agricultural production. Maize farmers in most of the research communes identified a shortage of capital for production, limited access to market information, difficult access to farms and the lack of post-harvest processing and storage facilities as the main factors that led to their dependence on local input supply agents and collectors.
6.3. The ACIAR Northwest Project

6.3.1. Project objectives

The ACIAR Northwest Project was funded by ACIAR. The project was developed based on a scoping study commissioned by ACIAR to The University of Queensland in 2008, which aimed to identify the agricultural R&D needs and opportunities of rural upland communities in the Northwest Highlands. The main agricultural enterprises identified by this scoping study were livestock, maize, upland rice, tea and fruit trees, while specific topics that required further research attention included: i) land management to reduce soil erosion and degradation, and ii) marketing to improve market connectivity in a context of emerging opportunities resulting from ongoing improvements in infrastructure (Van de Fliert, 2008). The ACIAR Northwest Project was characterised by not only the implementation of multidisciplinary activities but also the adoption of a multi-institutional collaborative mechanism in the research process.

ACIAR decided that the Northwest Project should focus on two major crops that are part of the same production system, namely, maize and temperate fruits, while commissioning a separate project in the Highlands on livestock systems. Transitions in the maize and temperate fruit-based systems were primarily being driven by a rapid transition to a market economy, without proper attention being paid to sustainability issues, therefore warranting a systems-based approach to research. Unlike conventional agricultural research initiatives carried out in the Northwest Highlands, the ACIAR Northwest Project adopted an interdisciplinary approach that required strong collaboration among research partners from a range of institutions and disciplines. The research team included both Australian and Vietnamese researchers from different partner institutions and at different levels (central, provincial and district) to ensure the interdisciplinary perspective. The leading organisations were The University of Queensland and NOMAFSI. Other collaborative organisations included Vietnamese Government research organisations (e.g. PPRI, CASRAD) and universities (e.g. VNUA, TBU).

The overall objective of the ACIAR Northwest Project was “to increase smallholder engagement in competitive value chains associated with maize and temperate fruits based farming systems and to use this engagement to improve land and crop management in these rapidly transforming sectors”. The project had four major specific objectives (Van de Fliert, 2008):

1) Establish an understanding of constraints in maize and temperate fruit-based farming systems that limit smallholder engagement in profitable markets and identify opportunities to overcome these constraints.
2) Develop improved farm and value chain management practices to optimise sustainability and profitability in smallholder maize and fruit-based farming systems;

3) Build competitive value chain models, which engage smallholders with more profitable markets that support improved land and crop management.

4) Evaluate value chain interventions and improve land and crop management techniques to support the scale-out of successful technologies into government and non-government development strategies.

6.3.2. Project phases and activity implementation

The project involved four years of research that was predominantly of an applied and adaptive nature and that culminated in a pilot community outreach phase. The project was designed in five subsequent phases, all of which involved farmers, local government and extension staff in varying roles. Each phase contained a number of innovative processes and activities that built on one another, from conducting diagnostic studies and site selection to developing on-farm technologies and outreach mechanisms for the innovations developed in the project. The major phases of the project were: i) participatory diagnostic research, ii) participatory technology development, iii) outreach strategy research, iv) development and implementation, and v) evaluation. Figure 6.2 illustrates the five phases in the ACIAR Northwest Project (Stur et al., 2013). The key research activities and outputs of the project are detailed in Appendix 9.

The first phase aimed to understand the production and market constraints in maize and temperate fruit-based farming systems that limited smallholder engagement in profitable markets. This helped to refine the research problems and identify opportunities to overcome these constraints. In the first phase, diagnostic studies were carried out by a multidisciplinary team in eight villages in the four districts of the project in order to identify the research problems and local needs. A rapid value chain assessment (RVCA) of some crops such as plums, maize and complementary crops in maize-based farming systems was also carried out in the diagnostic phase. The review of the project’s documents and the results of in depth interviews with researchers involved in the project indicated that the diagnostic studies were led by the PPRI but involved researchers from various institutions such as NOMAFSI, CASRAD and VNUA and staff from local district extension services. This collaboration helped to mobilise resources and skills from different research organisations for the project. Although the formation of such a mixed team is rarely seen in agricultural research practices in Vietnam, this interdisciplinary team worked well due to a range of activities that were conducted to facilitate the collaboration. The diagnostic studies not only helped to understand the local communities’ situations, needs and priorities but also helped to build the confidence and partnerships among the research actors and with farmers. Through the interviews with researchers from NOMAFSI, CASRAD and TBU, it
was found that the team of multi-disciplinary field carried out the diagnostic studies with the active engagement of local extension staff and communities.

In the second phase of the project, technology was developed through various participatory research activities such as soil erosion measurement and management trials, integrated crop management trials in maize-based systems and temperate fruit management trials. The results from in-depth interview with local extension of Moc Chau district indicate that outreach development strategies and participatory capacity building for researchers and local stakeholders (farmers, extension staff and other private sector actors) were continuously implemented from the second year of the project. (Young et al., 2011). Communication mechanisms among the project research partners and between the project research partners and local farmers, DARD and extension systems were established in this phase. As agreed by both the interviewed researchers and local farmers in Moc Chau district that researcher and farmers carried out crop trials together and local extension staff were also involved in monitoring and evaluation of research activities. In the second half of this research phase, the project had identified appropriate management practices and began to design an outreach methodology to introduce more sustainable soil and crop management practices and market engagement mechanisms to smallholders. The outreach methodology was built on the FFS model (Van de Fliert, 1993) but integrated more elements of farm business management and market engagement; hence, it was called the “Farmer Field and Business School” (FF&BS).

In the third phase, the project focused on building the capacity in the local extension system to implement the outreach strategy in a larger number of communities. In this phase, a four-day training of trainers (TOT) course to facilitate the FF&BS on sustainable maize-based system management was conducted in September 2012 for 18 extension staff from the Son La and Lai Chau provincial extension centres and the participating district extension stations. The participants of this training became the facilitators of the FF&BS on sustainable maize-based system management at local communities in the selected communities.

As reported by the project coordinator and observed from project’ 2013 and 2014 annual reports, four FF&BS units were initiated in the first cropping season in 2013 engaging 44 farmers in two villages in Moc Chau district in Son La province and 39 farmers in another two villages in Lai Chau province. Draft modules for an FF&BS facilitator’s manual, photo stories, videos and extension leaflets were also developed to support the implementation of the outreach strategy. The results of the activities in the outreach strategy development phase helped to design an effective model and supporting materials for the FF&BS curriculum to further support and strengthen the capacity of the extension system to introduce the innovations for on-farm implementation.
The fourth phase of the project was implemented by the local extension system and the targeted farming communities. In this development and implementation phase, the developed innovations were introduced to local stakeholders such as local commune governments and farmers through FF&BS models initiated by the project. Farmers learned about and began to apply improved farm management practices by working closely with district and commune extension staff and getting certain supports from the project’s field researchers. The developed technologies were applied by farmers in both the research areas and outreach areas. As shared by two extension staff of Phiang Luong and Muong Sang commune, Moc Chau district, local extension was responsible for the implementation of maize production technologies developed by the project in a wider communities. Through FGDs with farmers in Suoi Khem village, Phiang Luong commune, it was also found that these farmers did not participate in the project’s trial activities. They participated in the outreach stage of the project and they worked more with local extension rather than the project’s field researchers.
In the evaluation phase, the outreach implementation of new technologies was evaluated by both researchers and local stakeholders with a focus on initial economic and environmental outcomes. Although the researchers took a lead in the evaluation process, local farmers were active in making their own assessment of the economic and environmental gains of applying the new sustainable techniques. In this phase, the final project review was also carried out at the end of the project by an external evaluation team commissioned by ACIAR. This team comprised researchers from multidisciplinary fields in collaboration with the project’s research partners and communities. As learned from the review of the project’s documents and interviews with the project’ researchers, it was known that the evaluation was conducted through various key informant interviews with stakeholders, a symposium with multiple stakeholders and field visits to the project research sites.

From the design as well as the actual observed participation of various stakeholders in each phase of this AR4D project, it was evident that agricultural researchers from various research institutions such as NOMAFSI, PPRI, CASRAD, TBU and VNUA took leading roles in Phase I. In contrast, it was acknowledged by farmer researchers in Pieng Sang village, (Phieng Luong) and La Nga II village (Muong Sang) that farmers took ownership of the transition process in farm management in the implementation phase. In Phases II and III, agricultural researchers and local farmers worked closely together in the design, implementation and monitoring and evaluation of trials of maize and temperate fruit-based farming systems in the fields (FGDs with farmers in Phieng Luong, 2015). This can be reflected in some statements of interviewed farmers as below:

A farmer in Pieng Sang village (FGD 1.4): “I was involved in the project as a farmer researcher. By participating in the project, I could work closely with the project’s researchers in the design and implementation of maize trials on my farms. It was the first time, I participated in such a participatory research”.

A farmers in Suoi Khem village (FGD 3.3): “By participating in the outreach of sustainable maize production techniques, I was trained on maize production on sloping lands by local extension staff. I was able to make my own decision on the application of new techniques but I often consulted with commune’s extension staff and also the project’s field researchers during crop seasons”.

The local extension staff from provincial and district extension stations were also involved in some activities such as planning and evaluation of trials on fields in this phase.

Although the local extension staff were involved in all research phases in most sites of the ACIAR Northwest Project, this stakeholder group was most active in the development phase during which the outreach strategy was implemented in targeted communities. While a small number of farmers were involved as farmer researchers in the trials during the participatory technology development
phase in each project site, larger numbers of farmers became involved in the development and implementation phase through their participation in the FF&BS. Subsequently, they began applying the innovations on their own farms to achieve better livelihood outcomes and impacts. Through the FGDs which were held in this study one year after the ACIAR Northwest Project’s field activities had terminated, it was found that the farmer researchers still maintained a connection with researchers from NOMAFSI and TBU to seek technical advice when they needed it. It was also observed that farmers in one of the outreach villages in Moc Chau district applied several of the project’s innovations, such as minimum tillage, intercropping and mulching in their maize crops.

6.3.3. Project monitoring and evaluation

Although the concept of PM&E was new to the partner institutions in the Northwest Highlands, the ACIAR Northwest Project introduced this concept from the design phase. In the participatory technology development phase, a PM&E system with comprehensive guidelines was developed and integrated into the planning and analysis of specific research components at all locations. The team of local researchers had distinct roles in adapting the guidelines and facilitating the monitoring and evaluation activities in the context of the participatory research with farmers. A specific workshop was organised in October 2012 for the purpose of developing the methodology and developing capacity for implementation. The PM&E guidelines involved detailed descriptions of the purpose and processes for field trial planning meetings, progress review meetings, community feedback sessions, and harvesting, analysis and evaluation workshops. In the process, the guidelines were modified by the Vietnamese researchers to be more specific to the cultural and institutional settings of the Vietnamese partner organisations and participating communities (ACIAR Northwest Project, 2012).

The PM&E system helped the project team to formulate new research activities and adapt ongoing research activities in order to make them more relevant to the realities of the targeted smallholder farmers. The PM&E system was therefore highly appreciated and accepted by both the Vietnamese research partners and local stakeholders (Nguyen, 2015). According to the results from in-depth interview with young researchers from NOMAFSI and TBU, the PM&E developed by the project not only helped them to make appropriate adjustments for project’s activities but also enabled them to work well with local farmers and extension officers. These researchers believed that after the project could be able to establish similar PM&E for other research activities. Two young researchers from TBU said that they already modified and applied this PM&E system in one current research project of their university.

Following the close collaboration between researchers, farmers and local extension staff in the PM&E processes, the capacity of the field researchers of the research organisations, the farmers and the local extension staff in planning, implementing and evaluating participatory field trials was strongly
enhanced. Farmer researchers in La Nga II village, Muong Sang commune said that they could know how to monitor and evaluate their maize farms that they have never done before they participated in the project. In addition, commune extension staff of Muong Sang shared that by involving in the monitoring and evaluation activities of the project he was more aware of the importance of PM&E approach and would apply this for his future work with local communities.

The PM&E approach allowed the field researchers to become more aware of the knowledge and skills that farmers could contribute to trial designs. In addition, farmers could learn new technologies well through their active involvement in carrying out, monitoring and analysing the research activities. The participation of local extension staff in the monitoring and evaluation of research activities helped them to understand the successes and failures of developed technologies. With this understanding, local extension staff can create an enabling environment that supports effective outreach activities. As reported by local farmers in Suoi Khem village, since participating in the PM&E activities of the project in local village, a commune extension staff work more closely with local villagers and he helped them more in dealing with technical problems such as crop disease, bad seed quality and inappropriate application of chemical fertilisers for maize and plum production. The PM&E system was transferred to local extension networks and incorporated in the outreach activities of the project in the last year of the project implementation.

6.4. The CIRAD ADAM Project

6.4.1. Project objectives

Being aware of the emerging problems caused by the conventionally practised unsustainable monoculture systems of crop production on sloping lands in the northern mountainous regions of Vietnam, NOMAFSI began collaborating with CIRAD and other international partners in 1998 to implement the “Project for Agrarian Systems in the Northern Mountainous Regions of Vietnam” (the SAM Project). This project focused on developing and evaluating no-tillage cropping systems on sloping lands through various sustainable land management techniques including direct seeding mulch-based cropping (DMC) systems with the aim to maintain permanent soil cover, sustainable intercropping systems and crop rotation. The results of the SAM Project were the basis for developing the CIRAD ADAM Project (NOMAFSI, 2007a).

The CIRAD ADAM Project was funded by the AFD and implemented by NOMAFSI with technical assistance from CIRAD. The project was approved in 2009 with the overall objective of supporting agro-ecology extension in the mountainous areas of Vietnam. According to the initial design, the
project was to end in 2013, but it was extended to 2014. The project had two specific objectives (NOMAFSI, 2015):

1) Design and evaluate conservation agriculture systems and practices that are suitable for local conditions to contribute to the protection of soil from erosion while stabilising/increasing economic profits for farmers;

2) Promote the adoption of these systems and practices for the sustainable production of annual crops in various biophysical and socio-economic contexts in the mountainous areas of Vietnam.

6.4.2. Project phases and activity implementation

The research activities of the CIRAD ADAM Project focused on two major farming systems: maize-based and tea-based farming systems. In three selected provinces, research activities were implemented in four districts: Van Chan district (Yen Bai province), Thanh Ba district (Phu Tho province), and Moc Chau and Mai Son districts (Son La province). In the initial project proposal, the research activities and outputs were designed only for the tea-based farming system. However, the focus was expanded to annual crops such as maize and other secondary crops intercropped with maize, such as legumes, buckwheat and stylo grass, following a mission conducted by several CIRAD researchers to support the technical planning of experiments at the early stage of the project (CIRAD and NOMAFSI, 2008).

The CIRAD ADAM Project included three major activities: i) development of DMC farming systems integrating agriculture, livestock and plantation at farm level; ii) training and extension activities on DMC to build the capacity of researchers from NOMAFSI and local extension staff; and iii) communication activities to promote the results of the project. As designed by the project, there were three major phases: i) agrarian system diagnosis; ii) agronomic on-farm research; and iii) extension of technologies. A number of field experiments, training activities and communication strategies were implemented through these research phases. Some research activities were designed at the very early stage of the project but some research activities were developed during the implementation process as project activities were designed only by researchers at the design stage. The key phases of this project are illustrated in Figure 6.3. Detailed information about the project’s major activities is presented in Appendix 10.

In the first phase, agrarian system diagnostic studies were conducted in early 2009 at all project sites. The aim of the diagnostic studies was to perform an in-depth analysis of the constraints in extending agro-ecology in the Northwest Highlands and to justify the experimental activities to be implemented by the project. In this phase, the research activities focused on assessing the crop species and varieties that would be suitable for intercropping and mulching. This assessment was performed through
economic surveys and an analysis of research problems in various tea-based and maize-based farming systems. The agrarian system diagnostic studies were led by researchers and experts commissioned by CIRAD in collaboration with researchers from NOMAFSI.

Experts from CIRAD visited the Ministry of Agriculture and Rural Development (MARD) and some Vietnamese research institutions to discuss existing research problems. Field visits to target areas to meet with local leaders and farmers were also made by researchers to identify plants and crop collection for potential use in developing the DMC systems and designing field experiments. Local stakeholders participated in the design phase as providers of information, while researchers developed the research plans and research protocol themselves. In this phase, relevant locations were identified for conducting on-farm experiments in a later phase of the project. In addition to the studies conducted by the research team, a number of Master’s research projects were initiated involving students from various countries such as Cambodia, France and the UK.

Figure 6.3: Phases of the CIRAD ADAM Project

Source: The review of the CIRAD ADAM Project documentation 2010–2014 and primary data analysis

In the second phase, on-farm experiments were conducted to design and evaluate different conservation agriculture practices and different DMC systems as alternatives to the monocropping of maize and tea. The research activities were designed and implemented according to existing cropping
systems and steep slopes of land in each province such as a monocropping system of maize in two cropping seasons in Yen Bai province, a monocropping system of maize in one cropping season on sloping and flat lands in Son La province and tea production systems in Phu Tho province (NOMAFSI, 2015). Capacity building activities for NOMAFSI researchers, local farmers and extension staff were conducted through training courses, field days and cross-field visits during the on-farm research phase.

Various on-farm DMC experiments on annual crops such as maize-based cropping systems on sloping lands were also conducted by the CIRAD ADAM Project in Moc Chau district. The research activities on developing DMC alternatives to maize-based farming systems were repeatedly implemented in Phiang Luong and Chieng Hac communes in Moc Chau. The major techniques that were tested included no-tillage and minimum tillage farming techniques for maize production, mulching, and intercropping maize with other annual secondary crops such as rice bean, finger millet, buckwheat, cowpea and *styro* grass. Capacity building activities such as conducting technical trainings and materials on sustainable farming systems, field visits and field workshops were conducted in the on-farm research phase for local farmers, local authorities and extension staff.

In the extension phase, the project focused on testing appropriate DMC systems using different cover crops and plant residues as mulch in non-project research sites. Some sustainable farming techniques such as vegetative mulching, minimum tillage and intercropping maize with secondary crops such as rice bean, H’Mong bean, *styro* grass and rapeseed were conducted on three ha of sloping lands with poor fertility in Co Noi commune, Mai Son district in Son la province in the 2013 and 2014 maize seasons. Local farmers and extension staff were provided with some technical training on conservation agriculture. The project also provided farmers in the testing areas with material inputs. The project carried out various activities to promote appropriate sustainable farming technologies such as an exhibition of conservation agriculture in Hanoi, producing newsletters, brochures and video products. Field workshops were organised for local stakeholders in this extension phase.

6.4.3. Project monitoring and evaluation

The CIRAD ADAM Project adopted a top-down monitoring and evaluation system. From the review of the project documents and in-depth interviews with field researchers of the project, it was found that the project established partnerships with the local provincial-level and district-level DARD and local agricultural extension networks to conduct research experiments, training and extension activities; however, local research partners such as DARD and the extension systems were informed about the research activities rather than actively involved in the research process (NOMAFSI, 2015). The logical framework with the project activity components and expected outputs was developed as a key strategy for monitoring and evaluation. The project’s monitoring and evaluation scheme was
based on periodic monitoring and evaluation systems that included internal quarterly, half-yearly and annual technical and financial reports, annual evaluation workshops, the mid-term evaluation and the final evaluation. As shared by a field researcher of the CIRAD ADAM project (RESR 8), all monitoring and evaluation activities had been carried out by researchers from the project. He often came to visit trial fields to instruct local farmers in Chieng Hac commune to follow crop trial protocols, but did not engage the farmers in monitoring and evaluation activities.

The project did not design a clear mechanism for measuring the expected output, outcome and impact indicators. From the review of the project documentation, it was found that there was a significant variation in the project’s actual research activities compared to its planned activities because of a shift in the project’s research focus from tea-based farming to also include annual crop farming systems. In addition, no monitoring and evaluation guidelines were designed for the specific research activity components and limited capacity building activities were conducted to enhance the monitoring and evaluation skills of researchers. The monitoring and evaluation of farm experiments was mainly done by the researchers. Local stakeholders, especially farmers and extension staff, had limited roles in the monitoring and evaluation of research trials. Although the on-farm evaluation of experiments was carried out with the participation of farmers, the impact indicators such as crop productivity, soil quality improvement, and economic efficiency and impact assessment methods were mainly developed by the researchers. Farmers were only in charge of preparing the sites and taking care of the crops, while the researchers monitored and evaluated the crop experiments themselves.

The project’s annual reports mainly focused on reporting the progress of the research implementation activities, the achievement of the expected output indicators, research planning for the coming periods and the budget rather than reporting on the different outcomes or short-term impacts of the project. The project’s monitoring and evaluation reports concentrated on measuring quantitative indicators without any consideration of the link between the research capacity of local stakeholders and the use of research outputs for development. Despite conducting a series of farm experiments with farmers, limited efforts were made to develop appropriate monitoring and evaluation systems that could be adaptable to the specific socio-economic contexts of the northern mountainous areas. As a result, little evidence of farmers’ capacity to monitor and evaluate research trials and carry out decision-making was observed. Finally, although a strong collaboration was made between NOMAFSI and CIRAD in conducting the research activities in local communes and villages, the initial external design of the research activities in which the farm experiments were to be conducted by the researchers themselves led to the absence of a suitable scheme for monitoring and evaluation from the commencement of the project.
6.5. The NOMAFSI Project

6.5.1. Project objectives

The NOMAFSI Project was implemented by NOMAFSI and funded by the Vietnamese Government from 2011 to 2013. As designed, the project was led by NOMAFSI in collaboration with other research institutions and development agencies including the Soil and Fertilisers Research Institute, NMRI, CIRAD and ACIAR. The project was developed based on the project proposal template provided by MARD that focuses on making linear links between research activities and the expected research outputs. The overall objective of the project was to identify appropriate measures for appropriate technologies for sustainable maize production and development on the sloping lands of the northern mountainous regions of Vietnam. The project had three specific objectives (Le, 2010a):

1) to assess the general situation of maize production on the sloping lands of the northern mountainous regions

2) to identify appropriate techniques for sustainable maize production on the sloping lands in the northern mountainous regions such as the selection of high yielding, quality and resistant seed collections; suitable fertiliser application techniques; mulching, intercrops and mini-terrace techniques that help to increase productivity and crop quality and improve income, minimise soil erosion and improve soil fertility

3) to develop integrated measures for maize production on sloping lands that meet both economic efficiency and environmental sustainability.

6.5.2. Project phases and activity implementation

In comparison with the ACIAR Northwest Project, the research phases of the NOMAFSI Project were most similar to the CIRAD ADAM Project. The project developed in a more linear way involving field experiments to achieve the research outputs. The research outputs were assumed to be transferred to local stakeholders for not only scaling-out in the target areas but also for scaling-up towards policy changes at the higher level in order to support the application of the research outputs into larger communities and regions. The major phases of the NOMAFSI Project were: i) diagnostic studies, ii) on-farm technology development, and iii) pre-extension of technologies. Each research phase was implemented in consecutive periods of time but some activities such as training for local farmers and extension staff were conducted throughout the research process (Le, 2013). The key phases and purposes of the project activities are summarised in Figure 6.4. Additional information about the NOMAFSI Project research activities is presented in Appendix 11.

In the first phase, the project focused on reviewing the overall situation of maize production on the sloping lands of the northern mountainous regions. The key research activity in this phase was
household surveys conducted by researchers in three provinces to assess the situation of maize production on the sloping lands in the target regions. Secondary data about maize production areas and productivity on sloping land was gathered and analysed to gain a better understanding of the basic situation of maize production on the sloping lands in the northern mountainous regions. Like the CIRAD ADAM Project, limited participatory techniques were used in the surveys to gain the active involvement of farmers in the process of designing the project.

**Figure 6.4: Phases of the NOMAFSI Project**

*Source: The review of the NOMAFSI Project documentation 2011–2013 and primary data analysis*

The second phase of the project included various farm trials on maize varieties and density, mulching, intercropping and mini-terrace techniques. Various training courses on sustainable maize production for farmers and local extension staff were also conducted in this phase in order to improve the awareness and capacity of these stakeholders. Another round of socio-economic surveys was implemented to assess livelihood resource conditions and the capacity of farmers to apply advanced agricultural techniques in the second year of the project. It was similar to the survey in the first phase, in that limited efforts were made to understand the real perspectives of local people in the survey process. The same structured research questions and top-down methods were designed by researchers
and used for different socio-economic contexts in the northern mountainous regions. From a review of the survey reports, it was found that attempts were made to quantify indicators such as production costs and economic-environmental efficiency and to explore farmers’ awareness of sustainable farming and difficulties in the application of sustainable production techniques. No clear mechanisms were identified to adapt the developed technologies to specific social contexts and take into account the constraints in the livelihood resources of the farmers.

In the final research phase, on-farm demonstrations of secondary crop intercropping with maize, mulching and the mini-terrace technique in combination with mulching were established in all the project sites except in Hoa Binh province. As designed by the NOMAFSI Project, the aim of establishing these demonstration sites was to assess the socio-economic and environmental efficiency of the developed technologies and evaluate the potential to scale-out the research outputs on a large scale. Although on-farm evaluation workshops at the demonstration sites were also conducted with the participation of multiple stakeholders such as farmers, local extension staff, local authorities and MARD, the dependence of farmers on external researchers and the limited involvement of local extension staff in the research process were limitations that could be a significant barrier to the scale-out of new techniques after the project was completed.

6.5.3. Project monitoring and evaluation

The monitoring and evaluation system in the NOMAFSI Project was characterised by a top-down and results-based approach. Although the research activity components, quantifiable expected outputs and research component implementers were well-defined in the project proposal, no detailed guidelines were developed by the project to monitor and evaluate each research activity component. Each research component was monitored and evaluated by a research team that was in charge of conducting that component. The project’s overall evaluation activities were a mid-term review and final evaluation that aimed to assess the achievement of research objectives as required by MARD rather than to measure the livelihoods impacts. It was agreed by both a field researcher (RESR 7) of the project and research farmers (SMI 27 and SMI 26) in Chieng Dong commune that they would implement project activities according to the project’s initial activities design. The interviewed researcher from NOMAFSI also emphasized that the researchers evaluated the trails themselves by taking a sample from maize trials.

Although various technical training courses and some on-farm demonstration sites were conducted in the NOMAFSI Project for farmers and local extension staff, a top-down communication approach was applied in almost all the research activities, from the design to the implementation, technical training and workshops and evaluation. Local farmers had a limited role in the monitoring and evaluation processes. Farmers participated in the project by providing fields and labour and following
the technical process guided by researchers. In return, they received seeds, training and some input supports from the project while carrying out crop trials. The project’s monitoring and evaluation activities were designed and implemented by the researchers. The major monitoring and evaluation activities of the project were the periodic monitoring and annual reporting systems, focusing on the achievement of research outputs for that period of time.

The mid-term review and the final evaluation were conducted by the project to meet the funding and technical requirements of MARD. The final project evaluation was internally conducted by the project and examined by MARD through a two-level management procedure (institutional and ministry level) after the project was completed. The final evaluation aimed to measure the accomplishment of research activities and the achievement of the designed outputs according to the funding allocation planned for each research activity (NOMAFSI, 2015). The project focused on evaluating quantitative and measurable output indicators such as increased yields, economic benefits and the number of publications and technologies. In addition, although the expected long-term benefits or impacts were mentioned in the research proposal, the project did not design any scheme for measuring livelihoods impacts in the target communities.

6.6. AR4D – What did it take

While all three projects described in this chapter were self-proclaimed AR4D and participatory projects as described in Chapter 1, the analysis in this chapter revealed distinct variations in research approaches, objectives, timelines and the engagement of stakeholders in the research planning, implementation and evaluation processes. This helped not only to understand these projects’ design but also explain how different research approaches could lead to different outputs, outcomes and impacts. As discussed in Chapter 3, AR4D is characterised by approaches and efforts that closely link the research to development outcomes. AR4D not only focuses on developing technologies to address urgent problems in agricultural production but also maximises the engagement of local communities and development institutions in the decision-making processes, empowers those stakeholders to change their situation and minimises the risks involved in achieving better livelihoods.

Among the three projects, the ACIAR Northwest Project was a genuine AR4D Project because it included the major components of AR4D. The underlying aim of the ACIAR Northwest Project was to enhance the engagement of local stakeholders, especially smallholder farmers, in the R4D process in order to develop innovations that would address the needs perceived by farmers and suit their conditions. It also engaged stakeholders in the development realm and developed a methodology and the farmers’ their capacity to facilitate the introduction of the innovations to the wider farming community and to eventually improve the human, social, economic, physical and natural capital for
livelihoods. The two other projects aimed primarily at achieving direct research outputs, such as appropriate technologies and publications, on the assumption that the development realm would absorb those outputs one way or another, but limited attention was paid to developing methodologies to build the capacity of the extension system and farmers to implement and sustain the developed technologies.

In regard to the projects’ approaches, in the ACIAR Northwest Project, the participatory, interdisciplinary and multi-institutional approaches were blended into one holistic research approach to address the problems of complex local farming and business systems. The participatory approach with various participatory activity components, such as participatory needs and opportunity assessment at local levels, participatory farm trials and the PM&E system, helped to enhance the engagement of local people in the design, implementation and monitoring and evaluation of AR4D, and hence made the processes and outcomes more relevant to the conditions of the local people. This led to changes in people’s knowledge, skills and behaviours towards better livelihood outcomes. As acknowledged by the local stakeholders, their roles in the decision-making processes throughout the research phases evolved from passive to consultative and collaborative relations and eventually reached a level of empowerment. These changes facilitated the better use of research outputs for local development. In addition, the interdisciplinary and multi-institutional approach applied by the ACIAR Northwest Project helped to create a blended methodology from multidisciplinary fields and facilitated effective multi-institutional collaboration.

Although the interdisciplinary and multi-institutional approach was new to the context of agricultural research in the Northwest Highlands, this approach was highly appreciated by research partner organisations. All interviewed researchers from NOMAFSI, VNUA, CASRAD and TBU had a common sharing that the ACIAR Northwest Project mobilized well human resource crossing disciplinary fields for dealing with complicated research issues. The project brought researchers from different disciplinary such as crop science and agricultural economics and business to work together with local farmers and extension staff in the design, implementation, monitoring and evaluation of research activities. In contrast, a conventional or top-down approach with a technical focus was used in the implementation and monitoring and evaluation of most research activities from needs assessment to on-farm experiments and pre-extension phases in the CIRAD ADAM Project and the NOMAFSI Project. In these projects, researchers and scientists from one major disciplinary field took the lead roles in the research processes. The results from FGDs with farmers in most research villages also indicated that the multi-disciplinary team helped farmers a lot in terms of improving both technical issues and market oriented production. Several farmers involved in FF&BS said that after being trained on FF&BS, they were able to improve their own crop production system by better considering market demand.
With reference to research design, as discussed in Chapter 3, AR4D is characterised by the inclusion of consecutive phases, involving diagnostic, basic, applied and adaptive research and development, implementation and evaluation phases. Through these phases, the relevant needs and opportunities are identified, and innovations are developed, tested, adapted and implemented under farm conditions and then evaluated. The review of the three case projects found that, in spite of differences in research approaches, the three projects all claimed to conduct diagnostic studies, on-farm technology development and some form of extension of innovations. However, only the ACIAR Northwest Project used participatory processes to actively engage farmers, local governments and extension systems in diagnostic studies. This not only helped the ACIAR Northwest Project team to understand existing production and resource use practices but also to define the real research needs of local stakeholders. As shared by the project’s field coordinator and researchers from NOMAFSI, the application of the participatory approach in the diagnostic studies is very important to understand fully local social complexity and real issues for intervention as local communities are culturally diverse with limited livelihood resources for development.

In addition, only the ACIAR Northwest Project designed a phase for the development, implementation and evaluation of outreach activities in order to leave behind a model for the extension systems to encourage farmers to implement and evaluate the innovations. The ACIAR Northwest Project also paid attention to assessing the impacts of the research interventions by multiple development indicators such as scientific, social, human and environmental impacts. In contrast, the CIRAD ADAM Project and the NOMAFSI Project focused on measuring scientific indicators such as the number of developed technologies, the publication of scientific papers and the attainment of academic degrees.

All three projects developed strategies to scale-out the developed technologies to the larger communities through establishing demonstration sites and providing training courses for building the capacity of farmers and local extension staff; however, only the ACIAR Northwest Project conducted ToT to develop the capacity of local extension staff to facilitate season-long FF&BS. In addition, the project passed the implementation and monitoring and evaluation of outreach pilots into the hands of local farmers and extension staff. This not only empowered local stakeholders but also facilitated the institutionalisation of the developed technologies in the target communities and in the region. Furthermore, the initial evaluations of the outreach pilots were carried out by the local farmers and extension staff themselves. For example, the results from FGDs with farmer groups in Suoi Khem village indicates that in the 2013 cropping season, local farmers conducted the evaluation of the farms in which minimum tillage technique for maize production was applied. Through this evaluation, they proved for themselves that this sustainable farming and mulching technique not only helped to reduce
land preparation and fertilizer cost but also reduced soil erosion by about 40 percent, compared to conventional cultivation methods.

Attributes such as those demonstrated in the ACIAR Northwest Project distinguish AR4D from conventional projects. The overall objectives, research approaches and major phases of the ACIAR Northwest Project are visually presented in Figure 6.5.

Figure 6.5: Key components of the ACIAR Northwest Project
Source: ACIAR Northwest Project documentation and primary data analysis

In conclusion, although the term “AR4D” was used by all three selected projects in this study, the ACIAR Northwest Project could be seen as a genuine AR4D project by reference to the basic concepts of AR4D discussed in Chapter 3. This project was distinguished from the other two projects because of its livelihoods focus, empowerment of people and multi-institutional partnerships and collaboration. The project’s innovations in both the formulation of research objectives and in the
application of appropriate research approaches and in using communication strategies to achieve those objectives resulted in better outcomes and impacts on people’s lives compared to the other two projects. The next chapter discusses the contribution of the research approaches and communication strategies used in the three selected projects to people’s empowerment and the development of sustainable livelihoods in the target communities.
Chapter 7
THE CONTRIBUTION OF PARTICIPATION AND COMMUNICATION TOWARDS SUSTAINABLE LIVELIHOODS

7.1. Introduction

In this chapter, the findings from the application of the holistic impact assessment framework presented in Chapter 5 to the three projects in the Northwest Highlands of Vietnam described in the previous chapter. These projects varied in the research approaches and supporting communication strategies they used for the research design, implementation and monitoring and evaluation. As concluded, the ACIAR Northwest Project attempted to link the research process closely to development processes and outcomes, and these efforts were facilitated by participatory processes throughout all phases of the project. The other two projects focused more on achieving direct research outputs that contributed scientific impacts that could be disseminated to a wider scale through the conventional communication system. This chapter analyses the contribution of participatory processes and communication strategies underpinning AR4D towards impact achievement and sustainability in the context of the Northwest Highlands of Vietnam, by applying the proposed holistic impact assessment framework that starts with the ToC approach. The aim is to show how AR4D approaches that target the immediate use of research outputs for development purposes from the onset can generate better livelihood outcomes and impacts for farming communities than those that prioritise scientific impacts. It also should provide evidence for the hypothesis that broader and deeper stakeholder engagement in the AR4D process, as facilitated by participatory processes, can result in stronger human and social capital impacts.

As the scope of the research activities in the three case project varied, the ToC analysis only focuses on the component that all three had in common, namely, research on the maize-based system. This chapter starts with a ToC analysis of the three projects. This analysis helps to gain a better understanding of the impact pathways of each of the projects, and to justify the assumptions of the critical conditions and rival factors that may have influenced their impact achievements as defined in component 3 of the proposed impact assessment framework. The next section presents a discussion of the processes and communication strategies that were implemented by each of the three projects and how these processes and communication strategies contributed to the research outcomes and, subsequently, the development of livelihoods.
7.2. Theory of change analysis: understanding plausibility impacts

7.1.1. Theory of change analysis for the three case projects

As mentioned in Chapter 5, the relevance of applying the ToC concept as a complementary tool for both ex-ante and post-ante evaluation of development projects is raised by various researchers, such as Stern and Mayne (2013), Barnett and Gregorowski (2013), Carpenter and McGillivray (2012, p. 29), Leeuw and Vaessen (2009) and Stein and Valters (2012). According to Stern and Mayne (2013, p. 28), ToC can be used as a basis for developing appropriate data collection and analysis and capturing evidence of change. In this study, the ToC analysis was adopted as a complementary tool in a holistic approach to the impact assessment of the three case projects. This analysis was based on the relevant literature on ToC, project documents, and the results from the interviews with researchers, farmers and local extension staff conducted in this study.

Because none of the three projects developed a separate impact assessment–ToC framework at the project design stage, for the purpose of ex-post impact evaluation, the ToC concept was adopted in this study to make a straightforward analysis on the expected outputs, outcomes and impacts of each project under the influences of various observed external factors and risks. This provided a basis for designing the data collection and analysis methods before carrying out an impact assessment. The causal links of changes were also understood by clarifying assumptions, risks and other possible rival factors that may have influenced the processes of changes. In addition, the ToC analysis helped to validate evidence for the impact assessment indicators. Each ToC analysis provides not only a visual ToC from research outputs to outcomes and impacts but also a straightforward and critical view about how change occurred under the influences of various external factors. The ToC analyses for the three selected projects are described in Figure 7.1, Figure 7.2, and Figure 7.3 for the ACIAR Northwest Project, CIRAD ADAM Project and NOMAFSI Project, respectively.

The next sections focus on discussing the two key components of ToC applied for the three projects. Section 7.1.2 describes the causal chain from research outputs to impacts designed or assumed by the three projects. This visual chain helps to understand what expected research outputs were linked to what expected outcomes and impacts of the three projects. Section 7.1.3 is a critical discussion on the actual identified assumptions and risks that could influence the achievement of impacts. The rival factors that could influence the observed impact findings are also taken into account. Section 7.1.4 discusses the strategy for measuring the impacts of the three projects. This complements the development of a methodology for the impact assessment of the three selected research projects.
7.1.2. Mapping the causal chain from outputs to impacts

Although the ToC was not designed as a separate framework in the design stage by the ACIAR Northwest Project, the planned impacts and adoption pathway was designed by the project to capture changes due to the research interventions in terms of scientific, capacity and community-level impacts. The communication approaches and strategies for facilitating multi-institutional collaboration and communicating the research processes and outcomes to relevant stakeholders were also taken into account by the project. According to the project design, the major components of the impact indicators were: i) scientific impacts, ii) capacity impacts (research institutions and local stakeholders), and iii) community impacts (economic, social and environmental). These impacts were designed in the project proposal and all were related to improved smallholder livelihoods, community engagement and capacity to change. Based on the review of the local socio-economic and natural conditions and from a livelihoods perspective, these impact groups could be divided into human, social, economic, physical and natural impacts. However, unintended effects such as the promotion of new technologies as well as new AR4D approaches to universities and wider agricultural extension networks were not clearly considered in the project design stage, leading to missing evidence about these potential outcomes and impacts. A visual description of the causal links from research outputs to impacts in the ACIAR Northwest Project is presented in Figure 7.1.

The review of the CIRAD ADAM Project proposal also showed that no planned impact pathway or ToC was developed by this project. The project’s research activities focused on two major output components: the design and testing of innovations based on agro-ecology for sustainable tea production, and the adaption of the DMC system for annual crops on sloping lands in various biophysical and socio-economic contexts. In Moc Chau district, the project conducted farm experiments on DMC alternatives to maize-based cropping systems. Although the project aimed to increase the competitiveness of the maize-based cropping system in order to improve the living standards of local people and natural resources in the northern mountainous regions of Vietnam, specific groups of expected long-term impacts were not clearly defined in the project proposal. In addition, as designed by the project, the developed technologies would be transferred to local extension systems through various capacity-building activities such as training, study tours and field visits for local farmers and extension staff, but limited efforts were made to make assumptions about the internal and external factors that could enhance or hinder local communities’ acceptance of these new technologies. The project’s strategy for communication of research outputs through open resource databases, conferences, workshops and publications was also designed as a final stage in the technology development. Figure 7.2 provides a visual description of the causal links between the expected research outputs and impacts in the CIRAD ADAM Project.
Similarly, there was no attempt by the NOMAFSI Project to design a ToC framework since the beginning of the project. This project focused on the linear links between research activities and research outputs. The project proposal was developed according to the project proposal template of MARD, in which research outputs are seen as the final products of the project. Although the expected long-term benefits or impacts were mentioned, no specific expected impact indicators were designed. Moreover, the causal chain of research implementation activities, expected outputs, outcomes and impacts was developed based on linear links rather than plausible links between different components in the chain. In addition, as designed by the project, the research outputs would be transferred to the local DARD, extension systems and high-level policy-makers; however, there was no clear plan to help improve the decision-making capacity of local farmers and extension staff and support the sustainability of the new technologies. The project did not have any scheme to conduct impact assessment in the future. These problems could lead to difficulties in identifying and measuring impacts of the project. The visual chain from the research outputs to impacts in the NOMAFSI Project is analysed in Figure 7.3.

As described by Douthwaite et al. (2003), there are two major interrelated ways in which impacts can be delivered: scaling-out and scaling-up. The scale-out concept refers to the spread of technologies from a small group of farmers to larger communities within the same stakeholder groups. The scale-up concept relates to the vertical expansion of technologies from grassroots organisations to policy-makers and development organisations towards the formation of an enabling environment for change. Van de Fliert et al. (2010a) state that the stakeholder participation in and ownership of a research process help to facilitate the outreach of the development model at a larger scale.

In the context of the Northwest Highlands, outcomes or intermediate impacts could be gained through making changes in the level of adoption of new technologies by larger groups of farmers, the formulation of local development policies, especially extension development programs, and the dissemination of developed technologies into wider research institution networks and development agencies. As agricultural research and extension services in the Northwest Highlands have experienced the conventional top-down approach, the local extension system plays an important role in facilitating local development strategies and the wider application of the developed technologies in outreach areas. Among the three projects, the active involvement of local extension staff and farmers from the design stage of the ACIAR Northwest Project was therefore better able to facilitate the application of research outputs towards achieving wider livelihood impacts.
Figure 7.1: Theory of change analysis for impact assessment of the ACIAR Northwest Project

Source: ACIAR Northwest Project reports and documents
Figure 7.2: Theory of change analysis for impact assessment of the CIRAD ADAM Project

Source: CIRAD ADAM Project reports and documents
Figure 7.3: Theory of change analysis for impact assessment of the NOMAFSI Project

Source: NOMAFSI Project reports and documents
7.1.3. Making assumptions and identifying risks

Understanding the social, political and economic settings in which a project is implemented is important in order to understand the impacts of the intervention (White, 2009). This understanding will help to fully assess what, how and why the impacts of the project were achieved or potentially achieved. This section discusses the assumptions and risks that may have affected the impact pathway of the three selected projects. These assumptions and risks were analysed by considering each project’s initial assumptions and the actual observable driving factors.

In the ACIAR Northwest Project, the initial assumptions focused on the willingness of stakeholders to participate in research and evaluation activities, the identification of suitable and accessible target communities and the availability of market and extension service information. The findings on the project implementation activities and research outputs indicated that most of these assumptions were helpful for research intervention in terms of making the research more adaptive to local conditions. However, the project’s innovative process itself could also mediate the effects of interventions on outcomes and impacts. This project adopted various participatory processes and collaborative mechanisms such as interdisciplinary and multi-institutional approaches, PM&E and a clear outreach strategy for the application of the developed technologies for the development of livelihoods in the target communities; these participatory processes and collaborative mechanisms could definitely have had an influence on the achievement of the designed impacts.

In addition, the ACIAR Northwest Project had a strong collaboration with local extension staff and local leaders, especially in the outreach strategy research phase. The active involvement of local leaders and staff from the provincial DARD and the district and commune extension systems in the evaluation of research trials, the mid-term and final reviews of the project and the transfer of technologies into non-project communities could influence the achievement of impacts. Other factors such as the commitment and strong support from local authorities (e.g. DARD, commune and village leaders) and support from the research institutes after the project was completed should be considered when carrying out an impact assessment. Finally, impact achievement could have been affected by critical conditions and risks such as the instability of input and output markets, natural disasters and crop diseases. Although some of assumptions (such as the willingness of the local communities and leaders to participate in research, the community’s interest and the value chain development in interaction with land and crop management activities) were justified by the ACIAR Northwest Project, there was limited consideration of the potential market-related risks faced by small farmers.

Because the CIRAD ADAM Project was conducted in a similar context as the ACIAR Northwest Project, it was also influenced by existing top-down structures and vulnerability factors. In addition, in the initial project proposal, the CIRAD ADAM research activities and outputs were designed only
for the tea-based farming system. The research protocol with the planned activities and expected outputs was designed for each research component by the researchers who were commissioned by CIRAD at the early stage of the project. Although it was expected that the research outputs would be applied by farmers, leading to better outcomes and impacts, there were no clear assumptions about the impact pathway from the application of the research outputs to the outcomes and final impacts for the target communities and regions.

In addition, the CIRAD ADAM Project did not design extension activities for research outputs until the project was extended in 2013. Local extension staff were not involved in most of the research activities from implementation to monitoring and evaluation except for some technical training and cross-field visits. These issues could result in a weak capacity and a low commitment from local extension systems, especially commune extension staff, in scaling-out the research outputs to larger communities towards the goal of livelihood impacts. The findings from the FGDs with project and non-project farmers in Tong Han village (Chieng Hac commune) indicated that a few farmers knew the existence and roles of the local extension staff in local agricultural production and business development. In the design of the project, several assumptions were made about the transfer of the developed technologies to target communities after the project was completed; however, these assumptions were very general and were not directly connected to specific causal links between the project’s expected outputs and impacts. The key assumptions made by the project included the urgent need for sustainable technologies, the high economic competitiveness and technical feasibility of new technologies, and the good collaboration and partnership between the private sector and local stakeholders to transfer these new technologies into a large scale. These assumptions were mainly based on the views of the researchers rather than on consultation with local stakeholders. In addition, the project focused more on developing the technology packages and strengthening research capacity than on empowering local stakeholders such as extension staff and farmers. Finally, the project did not clearly identify the outreach communities, leading to difficulties in identifying the plausible links between research outputs and wider-level impacts over a long-term period.

In both the CIRAD ADAM Project and the NOMAFSI Project, the contextual factors such as the local cultural, socio-economic conditions and top-down extension practices that could have influenced the change processes were not taken into account. An AR4D project with a better designed and planned impact pathway or ToC from its early phase could achieve better observable livelihood impacts and facilitate better impact assessment than a research project without a ToC design. By having a deep understanding of these issues, the real impacts of these projects could be well measured.
7.1.4. *Strategy for measuring changes or impacts*

As described in Figures 7.1, 7.2 and 7.3 above, the expected outcomes and impacts of these projects could be achieved through causal links and may have been influenced by various external factors. Utilising ToC helps to form appropriate strategies for data collection and analysis as well as to gather evidence to prove the ToC. Because of the differences in the intervention design and the socio-economic settings of target communities, measuring outcomes and impacts should not only pay attention to identifying causal links in the impact pathway but also to understanding the critical conditions that influence impact achievement. Both the qualitative and quantitative methods are important to measure the impacts of a project in changing contexts.

Although there is clear agreement in the literature that choosing the methods for data collection and analysis depends on the focus of an impact assessment and the degree of development of ToC, White (2009) calls for the combination of qualitative and quantitative approaches in a single evaluation. This is based on the argument that using rigorous quantitative or factual analysis could complement the qualitative counterfactual analysis of impact evidence. In developing a theory-driven evaluation design, Van Belle et al. (2010) recommend a neutral approach that uses both quantitative and qualitative data collection methods for evaluation and argue that the choice of data collection methods could be shaped by the objective of the research as well as the degree of development of a theory-based program. Taking a similar view, Stern and Mayne (2013) recommend the development of appropriate mixed-method evaluation designs according to the evaluation issues and attributes of the research intervention in the natural resource management field.

As mapped in ToC analysis, the initial planned impacts of the ACIAR Northwest Project and the specific outputs and objectives of the other two projects included both quantitative and qualitative variables. The quantitative impact indicators such as a reduction in production costs and an increase in income and savings could be gained by surveys or semi-structured interviews. At the same time, qualitative variables such as improved human capital, social network development, formulation of development policies and environmental sustainability could be achieved by various participatory qualitative data collection techniques. Choosing the most appropriate data collection and analysis methods could also depend on local socio-economic and political contexts. However, using participatory methods to achieve both the qualitative and quantitative impact indicators of these three projects in the Northwest Highlands could not only help to understand the plausible links between the project outputs and developmental changes but also to more accurately measure the impacts.
7.3. Communication processes facilitating the engagement of stakeholders

This section focuses on discussing different communication processes applied by the three selected agricultural research projects. It aims to build an understanding how purposely planned communication can influence the active engagements of local stakeholders, especially farmers, in a research for development process. This not only helps to validate the first component of the proposed holistic impact assessment framework for AR4D, as presented in Figure 5.4, but also provides the basis for understanding different levels of impacts that are defined in the second component of the framework.

7.3.1. The ACIAR Northwest Project

The participation of stakeholders, especially local beneficiaries, is very important for achieving the objectives of a research project. Unlike the conventional top-down research approach in most agricultural research projects in the Northwest Highlands, the ACIAR Northwest Project applied the participatory approach with the use of various participatory processes to engage key stakeholders in all research phases of the project. The project integrated two major research approaches into one integrative research approach: i) the interdisciplinary and multi-institutional approach, and ii) the participatory approach. The integration of these two approaches supported by participatory communication strategies helped to build the capacity of individuals (researchers, farmers, extension workers, local authority staff, and private sector and value chain actors) and facilitate effective institutional collaboration and partnership among stakeholders in the research process. On the other hand, communication efforts were made by the project to enhance the participation of local people in a research process as “an end”; that is, the participation empowered people by equipping them with the capability to change their own situations. The benefits of this type of participation are identified in the literature on agricultural and rural development by researchers including Pretty (1995a) and Van de Fliert et al. (2010c).

Participatory processes for research needs assessment

In the first phase of the ACIAR Northwest Project, the participatory diagnostic studies were designed in order to define the research problems, needs and priorities and to propose solutions for target communities (Van de Fliert, 2009). These studies were also important in order to gain the active involvement of local stakeholders, especially farmers, in the research processes. Before carrying out the diagnostic research, comprehensive guidelines were developed with the participation of all research partner institutions in consultation with local stakeholders. These guidelines provided a set of various participatory methods and tools for baseline data collection. In each project village, participatory techniques and tools such as transect walks, FGDs, seasonal calendars and village and resource mappings were used to gain the in-depth understanding of the local socio-economic and
agro-ecological conditions, constraints and opportunities in the communities and to help establish collaborative relationships. The results of FGDs with farmers in Pieng Sang village in Phieng Luong commune and La Nga village in Muong Sang commune of Moc Chau district show that it was the first time local farmers were actively engaged in needs assessment activities of an agricultural research project. According to a leader of Pieng Sang village, by engaging in the participatory sessions of the diagnostic study, such as resource mapping, transect walk, and photo stories, local villager and leaders could understand better about their own problems as well as identify opportunities and strategies for improving their production and accesses to markets.

The benefits of using such participatory methods and techniques to engage local communities in the development process and understand real needs are discussed in the literature by various researchers such as Chambers (1994b), Pretty (1995a) and Neef et al. (2006). Community meetings were organised before and after the diagnostic research activities in order to define the priority issues and get feedback from local communities. The result of this study’s FGDs with farmers in Pieng Sang and La Nga villages in Moc Chau district showed that farmers were actively involved in all participatory sessions of the diagnostic research activities. It was agreed by local village leaders and farmers in Phieng Luong commune that farmers had become more active in some activities such as village mapping, photo stories and FGDs to share what they know about local issues and their visions for the future. It was also acknowledged by the local village leaders and commune extension staff in the Moc Chau research area that these local leaders and extension staff also participated in most of the activities in the diagnostic studies at local villages.

These participatory processes and supporting communication strategies helped not only to improve the understanding about the basic socio-economic and natural conditions and to define the research needs and opportunities of target communities but also to develop the partnerships between researchers and local stakeholders. The diagnostic study results were then discussed with community leaders and farmers at meetings on the project in all districts in December 2009. These findings were refined again among researchers and representatives of provincial-level DARD at a “Reflection and Planning Workshop” in March 2010 to reach agreement on the major activities to be undertaken to address the major issues of the target communities. However, the results of the in-depth interviews with some researchers from NOMAFSI in this study and the mid-term review report of the project indicated that, although detailed site selection criteria were developed, several selected sites were sub-optimal for project implementation. For example, the project activities were not successful in Lang Mo and Lung Su Phin villages in Sin Ho district. This was explained by the limited connection of these villages to markets, extremely difficult access and the low levels of commitment from farmers, community leaders and local officials to the project.
A female researcher (RESR 6): “In the design phase of the project, due to ambitious needs of local leaders who were involved in the diagnostic studies, the research team did not pay sufficient attention to the difficulties in terms of market access and low commitment of a local commune in Sin Ho district. This resulted in unsuccessful research trials on maize towards market improvement. Therefore, research activities in Lang Mo and Lung Su Phin villages in Sin Ho district were not continued in the last year of the project”

**Participatory processes for technology development and extension**

Through the review of the project’s annual report and in-depth interviews with researchers, it was found that the project’s research activities were implemented in a participatory way and by a multidisciplinary team with an interdisciplinary perspective. The aim of these activities was to identify the different land and crop management practices that were best suited to the conditions of each research site for increasing production and sustaining the natural resource base. The project used various communication strategies in order to gain strong collaboration and partnership among the research partners and between the researchers, local farmers and extension systems in the planning, implementation and monitoring and evaluation of research activities.

The annual “Reflection and Planning Workshops” were organised with the participation of all research organisations to design detailed methodologies and work-plans, review the research progress and collectively define the roles of research partners. The other annual collective activity of the research partners was an “Innovation Workshop” that opened the opportunities for team leaders and researchers to share and learn experiences about the project’s novel processes and develop appropriate methodologies to contribute to the overall project outcomes and learning processes. The annual innovation workshops were also flexibly organised in different project years to achieve the most focused and action-oriented outputs. Other inter-institutional and interdisciplinary collaboration was observed through a series of collaborative activities across institutions such as periodic meetings of leaders of research components, training on capacity for researchers and the joint publication of research from multidisciplinary areas.

Various participatory soil and crop trials were conducted in both the NOMAFSI research centre in Son La province and in the eight selected villages of the two project provinces. In each village, five farmers were involved in the research as farmer researchers. These farmers led the trials on their own farms with technical support from external researchers. In Moc Chau district, the project conducted a series of trials on two agricultural enterprises: maize production and plum production in Phieng Luong and maize production in Muong Sang communes. Complementary crops such as pumpkin, rice bean and rapeseed were also taken into account by the project in the final year in an attempt to develop effective intercropping maize-based systems. The findings of this study’s FGDs with farmer
researchers in these two communes showed that the all farmer researchers highly appreciated the participatory trials on their farms. For example, according to a farmer researcher in Phieng Luong, his knowledge and capacity for applying sustainable agricultural techniques such as mulching and minimum tillage for maize production on sloping lands were greatly improved. The sharing of this farmer is as follows:

A farmer researcher in Phieng Luong commune (FGD 1.4): “I have learned production techniques such as mulching and minimum tillage for maize production from the project. I conducted maize and plum trials myself on my own fields with strong technical supports from the project. I am now confident that I can apply these production techniques myself”

Other farmer researchers in Phieng Luong also reported that, by conducting research themselves with technical support from researchers, they could make their own decisions, better understand the importance of applying mulching and minimum tillage techniques for maize in their sloping fields. They said that they could apply new technologies well after the project completion and they shared these techniques with many other farmers in their villages. In addition, non-project farmers in Phieng Luong indicated that several farmers in the village came to ask the farmer researchers about the application of minimum tillage and mulching for maize production and followed the farmer researchers’ practices.

A non-project farmer in Pieng Sang village (FGD 1.7): “I observed that maize fields of my neighbours where minimum tillage and mulching techniques were applied in the crop season 2013 was more fertile than other field. In addition, less soil erosion was seen in these fields compared to other fields in the same location. This encouraged me to ask my neighbour to share the techniques and I have applied them on my field in the 2014 crop season.”

The findings from the in-depth interviews with most agricultural researchers and extension staff involved in the project indicated that although the interdisciplinary and multi-institutional approach was seen as a new approach in the research context of the Highlands region, this approach was well accepted by the partner institutions. Various training workshops on participatory research methodology, sustainable agriculture and participatory value chain development were conducted for both researchers and local stakeholders. Interviewed junior researchers from NOMAFSI, TBU and CASRAD believed that they learned a lot from the project and the research partners in regard to both the interdisciplinary research approach and the technical knowledge and skills across different disciplinary fields as reflected below:

A young male researcher from TBU (RESR 11): “I did not participate in any project with interdisciplinary and multi-institutional approach before this project. At the start of the project, I felt it was difficult to work in the same team with other researchers from various
disciplinary fields, such as agronomy, agricultural economics and agribusiness, but then I realized that the interdisciplinary approach is appropriate to deal with complicated problems in agricultural development. I have learned a lot from other members of the interdisciplinary research team”.

Local extension staff in Moc Chau also appreciated the effective collaboration among research partners in conducting research activities in the local areas. They reported that their capacity was strengthened by having strong collaboration with the project’s researchers in carrying out trials and some value chain analysis and market engagement activities. An extension staff of Muong Sang commune shared:

A male extension staff of Muong Sang commune (EXT 3): “I was involved in most research activities of the project, especially in the design, monitoring and evaluation activities. This strengthened not only my technical skills but also enhanced the partnership with local communities and research institutions”.

A male extension staff of Moc Chau district agricultural extension station (EXT 1): “By being involved directly in all activities of the project, I not only understood more about new agricultural production techniques but also established a good relationship with researchers from institutes such as NOMAFSI and PPRI”.

The application of the PM&E system could be seen as the most significant contribution of the project towards enhancing the engagement of stakeholders in research activities. The “Participatory Monitoring and Evaluation Guidelines for Field Teams” developed by the project helped to bring local farmers and field researchers closer in the planning, implementation and evaluation of trial results (ACIAR Northwest Project, 2012). It was found from the review of the project document and in-depth interview with researchers that the detailed PM&E guidelines for each research component were then flexibly modified and adapted to the specific context of target communities, making it more applicable to local conditions. This adaptation was very useful for conducting research activities with farmers from different ethnic groups who had different cultural and livelihood resources, perceptions and knowledge about local issues. Farmer researchers in Phieng Luong and Muong Sang communes said that the project’s researchers worked together with them in the planning and implementation of maize trials.

A male farmer researcher in Phieng Luong commune (SMI 21): “It was the first time that I worked closely with external researchers in the design of maize trials on my farm as well as in the implementation of the research activities. This helped me a lot in learning new production techniques”.
The researchers visited frequently and met with farmers, developing close collaboration between the researchers and local farmers and extension staff in the monitoring and evaluation of the trials. This is reflected by a farmer participated in FGD session:

A male farmer researcher in Muong Sang commune (FGD 5.3): “The project’s researchers frequently visited my trial fields. I also asked them for getting their advice about technical issues such as maize disease, soil erosion and rodent control. At the end of crop season, I evaluated maize productivity of trial fields together with researchers from TBU. Local extension staff was also involved in the evaluation”.

In addition, the results of most trial activities on soil conservation, maize and temperate fruit production were evaluated on farms with the participation of farmers and representatives from local extension services and authorities. The involvement of district and commune extension staff was also acknowledged by both local farmers and extension staff in Moc Chau during the FGDs with farmers and in-depth interviews with extension staff.

However, limitations and challenges were faced by the project in both the application of the multi-institutional and interdisciplinary approach and participatory processes in the context of the Northwest Highlands. The final review of the project concluded that the complexity of the project with the involvement of multiple institutions, disciplines and farm enterprises was very difficult to manage (Stur et al., 2013). The design of the outreach strategies also needed the active involvement of both local extension systems and target farmers. This conclusion was supported by this study’s findings from the in-depth interviews with various researchers. The researchers from NOMAFSI and TBU suggested that it was necessary to have more commitment from research partners with the necessary collaborative capability to establish effective interdisciplinary collaboration and achieve better outcomes in the project. Some extension staff of Moc Chau district indicated that the strategy for the extension of developed technologies was mainly designed by the project with limited involvement of local extension staff and farmers, leading to a lack of understanding of extension initiatives in the outreach areas.

In addition, building the interdisciplinary and multi-institutional collaboration capacity of research partners and changing the attitudes of research funding agencies about interdisciplinary research will help to facilitate the institutionalisation of the interdisciplinary approach in conventional top-down research systems in the region. Table 7.1 below presents a summary of the key participatory processes used in the ACIAR Northwest Project, the level of stakeholder involvement and the major benefits and limitations of these participatory processes as identified by researchers and local stakeholders involved in the project.
<table>
<thead>
<tr>
<th>Participatory process</th>
<th>Key stakeholders involved</th>
<th>Major benefits</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual reflection and planning workshops</td>
<td>Researchers from multi-research institutions - Local extension staff</td>
<td>Help to design methodology and work-plans and define roles of all partners - Establish closer engagement of local extension staff and leaders - Analyse results based on the viewpoints of all stakeholders</td>
<td>High travel costs to bring stakeholders together</td>
</tr>
<tr>
<td>Annual innovation workshops</td>
<td>Researchers - Local farmers - Local extension staff</td>
<td>Build partnership and share research results and learning experience among partners - Develop participatory methodology</td>
<td>Difficulties in handling a large team of researchers from multi-disciplinary fields</td>
</tr>
<tr>
<td>Quarterly meetings of the leaders of the various research components and research partners</td>
<td>Leaders of the various research institutions participating in the project</td>
<td>Gain cross-institutional understanding of skills and knowledge - Achieve better dialogue, agreement and collaboration among research partners - Adjust issues in time</td>
<td></td>
</tr>
<tr>
<td>Participatory diagnostic studies using a set of participatory tools</td>
<td>Farmers - Researchers - Local authorities and extension staff - Private traders</td>
<td>Bring farmers, local extension, traders and researchers from several institutions together in defining key research problems - Build partnership between researchers and local stakeholders and strengthening collaboration among research institutions</td>
<td>Consuming time, funding and human resources - Requiring good facilitation skills of researchers</td>
</tr>
<tr>
<td>Participatory value chain analysis and development using RVCA techniques</td>
<td>Farmers as researchers - Researchers - Traders - Customers</td>
<td>Link traders (e.g. plum collectors, wholesalers and retailers) with farmers - Build capacity of local actors (farmers and traders)</td>
<td>Rigorous economic analysis focus</td>
</tr>
<tr>
<td>Pilot roll-out using FF&amp;BS program for scaling out technologies</td>
<td>Farmers - Provincial and district extension staff</td>
<td>Build capacity of local extension and farmers - Transfer the developed technologies to local extension for scaling-out</td>
<td>Limited involvement of farmers in the design of the outreach strategy</td>
</tr>
<tr>
<td>Participatory technology development using PM&amp;E systems and participatory on-farm trainings</td>
<td>Farmers as researchers - Researchers - District extension staff</td>
<td>Build capacity for farmers, extension staff and researchers - Improve the engagement of farmers in PM&amp;E of trials - Enhance relationships between farmers and extension staff</td>
<td>Time and human resource-consuming</td>
</tr>
</tbody>
</table>

*Source: ACIAR Northwest Project documents and primary data analysis*
In regard to the communication of the research results to stakeholders, the ACIAR Northwest Project set up a clear communication mechanism to achieve the effective dissemination of research outputs to stakeholders, especially local farmers, from the design stage. As well as using a conventional approach to communicating the research results through developing and sharing various research products and communication schemes such as publications (e.g. value chain workbooks, research papers, FF&BS curriculum, laminated leaflets, information and training materials), websites and conferences, the project also adopted various innovative communication strategies such as participatory videos on sustainable agriculture (Stur et al., 2013).

The photo story technique was an innovative method adopted by the project in which farmer researchers shared their perceptions about changes and problems in their villages. Farmer researchers in Phieng Luong and Muong Sang communes reported that the photo stories not only helped them to understand changes in their communities but also helped them to learn and share experiences with other farmers in the communities and between farmers and researchers through community feedback meetings during the field trials.

A female farmer in Phieng Luong commune (SMI 22): “With a digital camera given by the project, I took a lot of photos about my houses, gardens and farms. I learned what was changing on my sloping farms as I applied minimum tillage and mulching techniques. I also sometimes shared nice photos of my farms with my neighbours, researchers of the project and local commune extension staff when they visited my farms.

The project conducted various capacity-building activities such as training on technical and communication capacity and study visits for project team members and local district and commune extension staff. On-farm evaluations of demonstration sites were conducted in most trials and these evaluations helped to engage local farmers and extension staff in sharing research outputs and research experience with other farmers, external stakeholders and research partners (Nguyen et al., 2015). Based on a review of the project’s documents (Stur et al., 2013; Van de Fliert, 2010a, 2011, 2012; Young et al., 2011) and the findings from the in-depth interviews and discussions with the project’s researchers, local extension staff and FGDs with farmers, the key communication methods used by the project for communicating the research results and the major strengths and weaknesses of these processes are summarised in Table 7.2.
<table>
<thead>
<tr>
<th>Communication method</th>
<th>Key stakeholders involved</th>
<th>Benefits</th>
<th>Limitations</th>
</tr>
</thead>
</table>
| Participatory videos on sustainable production techniques | - Farmers  
- Local extension staff  
- Researchers | - Disseminate research outputs among farmers and extension services  
- Share research results with policymakers and research partners  
- Build capacity for research institutions and extension services to enhance the dissemination of research outputs | - Time and human resources consuming  
- High cost |
| Photo stories | - Farmers | - Learn and share experience among farmers in local communities and between farmers and researchers  
- Raise awareness and improve understanding of farmers about sustainable farming | - High cost  
- Challenged by farmers with limited capacity |
| On-farm evaluation of demonstration sites | - Farmers  
- Researchers  
- Local extension staff and leaders | - Learn and share knowledge and experience among stakeholders  
- Select the most suitable technologies by contexts  
- Build the interest of local authorities and extension services in the scale-out of developed technologies | - Formal participation of local authorities |
| Provincial-level workshops | - Researchers  
- Provincial authorities  
- Local extension staff | - Mutually share research results with local research partners  
- Facilitate the policy development and institutionalisation of research outputs in local areas  
- Build partnership and collaboration between research organisations and local development institutions | |
| Project’s mid-term and final review | - Farmers  
- Researchers  
- External evaluators  
- Local extension staff and leaders | - Reach common understanding about research results, successes and failures of the project  
- Make adjustments in issues and draw lessons  
- Achieve evidence about project outputs and impacts to report to donors and funding agencies | - Research methodology designed only by evaluators  
- Limited use of participatory approaches |
| Conferences, central-level workshops and website | - Researchers  
- Donors  
- Research partners  
- Policy-makers | - Community-appropriate technologies for maize-based systems to stakeholders  
- Facilitate high-level policy-making | - Limited sharing of research innovations by farmers |

Source: ACIAR Northwest Project document and primary data analysis
From the in-depth interviews with local extension staff it become clear that, although the ACIAR Northwest Project established a good partnership with the local extension system in the context of the research process, the local extension staff believed that the results of small-scale pilot roll-out models could not deliver very convincing examples of success in farmer adoption of improved crop management practices in maize-based systems. This could have been the result of low immediate incentives for other farmers to apply research outputs on a larger scale. As is the case with sustainable soil management, the impacts of innovations are only visible in the long-term. Therefore, it is crucial for the project to have an appropriate strategy to follow through with outreach activities and provide further support to both local farmers and extension services in order to achieve enough evidence on the successful technologies that will facilitate a wider application of the research outputs and achieve impact sustainability. It was shared by an extension staff as follows:

An extension staff in Moc Chau (EXT 1): “A large-scale pilot roll-out models will attract local farmers to apply improved maize production techniques such as mulching and minimum tillage because the awareness of local farmers is still limited. Farmers apply new technologies quickly if they observe these technologies are successful in a large production area”.

The other concern was the project’s website which was mainly for internal communication among the research institutions participating in the project. This design did not allow for much sharing and learning about the research outputs and experiences with external research partners. This issue was reported by one researcher of the project:

The project’s full time field staff from NOMAFSI (RESR 6): The project’s website was developed and project documents were uploaded to this website. At this stage, the website is mainly accessed by researchers from research institutions participating in the project. Local extension staff and governments have not had access to this website”.

Levels of stakeholder engagement

As discussed in Chapter 3 on the participation or engagement of local stakeholders in agricultural research projects, the major levels of stakeholder participation can be divided into passive participation, consultation, collaboration and empowerment (Bessette, 2004; Pretty, 1995a; Van de Fliert, 2010b). This study explored how the participatory processes used by the ACIAR Northwest Project could lead to different levels of stakeholder engagement in different research phases. An assessment of the engagement levels of local stakeholders such as farmers, local extension staff and local authorities in the decision-making processes of the project was done in the FGDs with farmers and in-depth interviews with local extension staff and leaders. The radar technique of participation (Bessette, 2004; Catley et al., 2008; Leisher et al., 2012) was used to visualise the engagement of stakeholders in the project. Agricultural researchers involved in the project were also consulted to
gain better understanding about the local stakeholders’ engagement in the research processes. Four major levels of engagement in the ACIAR Northwest Project were identified: i) passive participation (receiving information), ii) consultative participation, iii) collaborative participation, and iv) self-decision-making or empowerment. These engagement levels are visually presented in Figure 7.4.

![Engagement levels of local stakeholders in the ACIAR Northwest Project](image)

*Legend: 1 = Passive, 2 = Consultative, 3 = Collaborative, 4 = Self-decision-making*

**Figure 7.4: Engagement levels of local stakeholders in the ACIAR Northwest Project**

As can be seen in Figure 7.4 above, there was a shift in the roles of local stakeholders throughout the research phases of the project. Local farmers and extension staff were involved in most of the phases since the project started. In the initial phases, they were consulted by the project team through participation in the diagnostic research activities. The roles of the farmers increased in the second phase as farmers became co-researchers in carrying out and monitoring and evaluating the research trials on their own farms. Decisions were jointly made by the local farmer researchers and the project researchers. Local government authorities were consulted by the project from the planning phase to the implementation of research activities. In the development and implementation phase, decisions were made by the local communities themselves with little support from the researchers.

Farmers in both research and non-research areas reported that they were confident to apply the new maize production techniques learned from the project. However, it was suggested by local extension system staff that a wider scale of research activities and a longer period for the outreach phase could create better opportunities for local extension staff to communicate the successes of the project to local communities. This would facilitate the application of the developed technologies on a large scale in the whole province. This can also provide a good basis for the provincial extension centre to
propose development programs to MARD and influence the formation of high-level policies for the development of the Northwest Highlands.

**7.3.2. The CIRAD ADAM Project**

**Communication processes in agrarian diagnostic studies**

Although communication was designed as a key component of the training and extension activities in the CIRAD ADAM Project, most of the project’s communication efforts were focused on gathering data for research planning and the promotion and dissemination of new technologies to local communities and research partners rather than on empowering these stakeholders to apply the new technologies. Farmers who participated in the project in Tong Han village (Chieng Hac commune) said that the researchers were the decision makers in relation to trial design while farmers were only followers. The project conducted agrarian system diagnosis at all research sites at the early stage. In this initial research phase, technical and economic surveys were conducted with local farmers, agricultural extension staff and local authorities by researchers from NOMAFSI in collaboration with experts commissioned by CIRAD. Other complementary agrarian research activities were also implemented by several postgraduate students supported by the project. These data collection activities aimed to assess suitable crop species and varieties for intercropping and mulching in tea-based and maize-based farming systems and to design farm experiments. Experts from CIRAD also held meetings with the AFD, NOMAFSI and some MARD research institutes to discuss existing research practices and potential research issues. This was shared by a researcher involved in this project:

“A male researcher from NOMAFSI (RESR 3): “I was involved in the project since it started. In this project researchers from NOMAFSI and expert from CIRAD designed research protocols and instructed farmers to follow these protocols. Local extension staff were informed but not involved in research activities of the project”

Apart from informal meetings and open discussions conducted with farmers at local villages and communes in the agrarian diagnosis, limited participatory techniques were used to achieve the active involvement of local farmers and extension staff in the research processes. External researchers defined the research problems and validated a proposal for demonstration-training experiments targeting the development and application of DMC techniques themselves. This resulted in weaknesses in the design and implementation of on-farm research activities as well as in the capacity-building for local stakeholders.
Communication processes for on-farm research and pre-extension

The CIRAD ADAM Project conducted a large number of experiments and trials to design and evaluate different conservation agriculture techniques and different DMC systems in tea-based and maize-based farming systems. Although a close partnership between farmers and researchers was established by the project through the research process, it was indicated by local stakeholders in Chieng Hac commune that the conventional top-down communication approach was used by the project in almost all the on-farm research activities. For example, it was reported by local farmers in Chieng Hac commune that, despite the researchers working together with them in the planning and implementation of experiments, they had a very limited role in the decision-making in the research experiments on their own farms. The farmers said that they followed the instructions of researchers from the planting to the harvesting of experiment crops. Some farmer researchers reported that they participated in the project in order to gain input supports such as seeds and fertilisers. The farmers also claimed that the project conducted too many trials of new imported crops such as crotalaria, finger millet and oat without having a discussion with the farmers about the major benefits they could expect from conducting those experiments. This was shared by one farmer during semi-structured interview in Tong Han village of Chieng Hac commune:

A farmer participated in the ADAM project in Chieng Hac (SMI 14): “I did not know anything about the techniques that were tried and developed by the project but my family received support such as seed and fertilizers from the project. I am not sure we will continue to apply the technique in the future”.

According to interviewed extension staff in Moc Chau and researchers of the project, local extension staff were also not involved in the research process. They were involved in only some evaluations of farm demonstration sites. Although the project conducted various technical trainings to build the capacity of both farmers and extension staff in the research areas, the use of the lecturing method in training sessions together with the limited involvement of local extension staff in almost all the on-farm research activities led to a weak improvement in local extension capacity for the scale-out of good conservation agriculture practices and DMC systems. Farmers who participated in this study’s FGDs in Chieng Hac commune criticised the limited involvement of local agricultural extension staff and authorities in helping them to apply the project’s new technologies.

Two farmers who participated FGD in Chieng Hac (FGD 7.3 & FGD 7.5): “We did not know the presence of commune extension staff or about their roles in this village. We grew crops mainly based on our own production experiences and through learning from our neighbours”.

The major communication strategies adopted by the CIRAD ADAM Project and the resulting benefits and limitations are summarised in Table 7.3. As described in this table, in promoting conservation
agriculture practices, the project made attempts to translate various participatory videos and technical guidance on sustainable farming into the Vietnamese language and shared these materials with local stakeholders and research partners. However, many local farmers who participated in FGDs in Chieng Hac indicated that they did not follow the instruction in these provided document.

Farmers FGDs in Chieng Hac: “Although the sustainable techniques delivered by the project are good, we cannot apply them on our fields because these techniques are complicated to us and we did not have enough materials such as organic mulching, new seeds, or labour for the application of such techniques”.

Various newsletters, brochures and training materials on conservation agriculture were also published by the project and distributed to local farmers and extension staff. These publications aimed to support farmers to test and apply the best-bet DMC systems and conservation agriculture practices in their fields and to strengthen the capacity of local extension service to scale-up the appropriate farming practices. Various fieldwork activities and cross-field visits for local stakeholders were conducted by the project to raise stakeholders’ awareness of sustainable farming and provide opportunities for learning and sharing experiences among local farmers and between local farmers and extension staff. However, it was again acknowledged by local stakeholders that the communication strategies used in these activities were mainly top-down. In addition, because of a weak connection between local extension system and farmers, very limited information sharing about sustainable farming techniques was made between farmers and local extension staff after fieldwork activities organized by the project. This resulted in little improvement in the capacity of local stakeholders, especially the links between local agricultural extension system and farmers.

A website was developed by the project to share information among research partners. This website was only active in the initial research phases, leading to limited sharing of information about the project because of a change in the project’s CIRAD-commissioned personnel. Other communication methods such as conferences and workshops were implemented in the project but these activities focused on sharing and disseminating the new technologies rather than discussing how to successfully transfer the technologies to the target communities.
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<th>Communication process</th>
<th>Key stakeholders involved</th>
<th>Major benefits</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-farm research planning with farmers</td>
<td>Farmers, Researchers</td>
<td>Establish partnership between researchers and farmers, Strenthen learning and sharing process between researchers and farmers</td>
<td>Limited use of participatory techniques, Decisions made by researchers</td>
</tr>
<tr>
<td>Training on conservation agriculture and DMC farming systems</td>
<td>Researchers, Farmers, Local extension staff</td>
<td>Improve capacity of local stakeholders to scale-up developed technologies, Develop researcher–farmer partnership</td>
<td>Dominant top-down communication, Lack of practical visual training materials</td>
</tr>
<tr>
<td>Field workshops, and cross-field visits for local stakeholders</td>
<td>Farmers, Researchers, Local extensions staff, Local authorities</td>
<td>Raise awareness of stakeholders about conservation farming, Share and learn among stakeholders, Build the interest of local authorities</td>
<td>Formal participation of local authorities, Dissemination of technologies rather than empowerment</td>
</tr>
<tr>
<td>Scientific publications (video, technical guidance, newsletters, brochures and leaflets)</td>
<td>Researchers, Researchers from research partner organisations</td>
<td>Raise awareness of stakeholders about sustainable agriculture, Facilitate the policy development and institutionalisation of research output at local areas, Share research results with research partners</td>
<td>Lack of visual participatory products based on research experience from local contexts</td>
</tr>
<tr>
<td>Project’s mid-term and final reviews</td>
<td>Farmers, Researchers, Local extension staff, Local authorities, External evaluators</td>
<td>Improve the understanding of stakeholders about research results, successes and failures, Make better adjustments of issues and draw lessons, Validate evidence of project outputs and impacts</td>
<td>Research methodology designed only by evaluators, Limited use of participatory approaches</td>
</tr>
<tr>
<td>Conferences and workshops on conservation agriculture, the project’s website</td>
<td>Researchers, Research partners, Policy-makers</td>
<td>Dissemination of appropriate technologies to larger stakeholder groups, Website was used as a platform for internal project communication across project research institutions and extension providers, Facilitate the high-level policy-making process</td>
<td>Inactive website, Focused on sharing scientific impacts rather than the development of livelihoods</td>
</tr>
</tbody>
</table>

*Source: CIRAD ADAM Project documents and primary data analysis*
Levels of stakeholder engagement

The CIRAD ADAM Project mainly used a top-down approach in the design, implementation and monitoring and evaluation of the research interventions. This resulted in limited engagement levels of local stakeholders including local farmers, extension staff and local authorities in decision-making processes. Based on the results of the FGDs with farmers and in-depth interviews with local extension staff and local village leaders in Chieng Hac commune, the levels of stakeholder engagement in the major phases of the CIRAD ADAM Project were assessed, as presented in Figure 7.5.

Figure 7.5: Engagement of local stakeholders in the CIRAD ADAM Project

Legend: 1 = Passive, 2 = Consultative, 3 = Collaborative, 4 = Self-decision-making

Through discussions and interviews with local stakeholders, it was found that although the on-farm research activities conducted by the CIRAD ADAM Project helped to improve the local farmers’ practical knowledge and skills, the farmers were still passive in testing and applying the new production techniques. Local extension staff and authorities were not actively involved in the design of the experiments and the selection of crops for these experiments. It was reported by local farmers that their decision-making capacity was not greatly improved because they participated in the project mainly in the form of providing farms and labour while the decisions on planning, implementing, monitoring and evaluating these on-farm experiments were made by the researchers.
7.3.3. The NOMAFSI Project

Communication processes in diagnostic studies

Although the NOMAFSI Project claimed that the survey method in combination with participatory techniques was used for data collection and analysis, the use of the conventional top-down approach was found in most of the project’s research activities. In the diagnostic phase, surveys with farmers in the target research areas using structured questionnaires were conducted by the project to assess the overall situation of maize production on sloping lands in the northern mountainous regions. Limited participatory techniques were utilised for data collection at local villages and communes. As reported by local leaders and extension staff, meetings with local authorities and extension staff were held to discuss farming practices in the local research areas during the diagnostic research process; however, the final decisions about research priorities were mainly made by the researchers. This could be seen in the small variation between the planned and actual implementation of the diagnostic research activities. The results of the project’s diagnostic studies indicated that the diagnostic research focused on measuring and presenting quantitative finding indicators such as farmers’ educational attainment levels, maize productivity, production costs, farm income and the percentage of farmers who applied sustainable techniques in maize production rather than on providing insights into the rival factors that could enhance or hinder the achievement of economic and environmental efficiency in the existing maize farming systems and the market risks and opportunities in the northern mountainous regions. In addition, local farmers, extension staff and leaders reported that the results of the diagnostic studies were not shared back with them. This was reflected by farmers participating in FGDs in Chieng Dong commune:

Farmers participated in FGD in Chum village, Chieng Dong commune: “We did not know anything about the results of a diagnostic study. We only provided information when researchers asked and followed the technical protocols provided by researchers during the maize trials”.

Communication processes for technology development and pre-extension

Like the CIRAD ADAM Project, the NOMAFSI Project used a top-down communication approach in the whole research process. All the research activities were implemented rigorously according to the project’s initially designed plan of activities. This resulted in limitations in developing the capacity of local stakeholders to facilitate the scale-out of the developed technologies. Based on the results of the FGDs with farmers in Chieng Dong commune and the in-depth interviews with researchers and local district extension staff, the contributions of the communication strategies used by the NOMAFSI Project and the major benefits and limitations of these strategies are summarised in Table 7.4.
Table 7.4: Key communication processes in technology development and pre-extension of the NOMAFSI Project

<table>
<thead>
<tr>
<th>Communication process</th>
<th>Key stakeholders involved</th>
<th>Major benefits</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-farm research planning and implementation with farmers</td>
<td>Farmers, Researchers, Local extension staff</td>
<td>Establish partnership between researchers and farmers, Improve learning and sharing between researchers and farmers</td>
<td>Top-down communication, Limited use of participatory techniques</td>
</tr>
<tr>
<td>Technical training on sustainable maize production</td>
<td>Researchers, Farmers, Local extension staff</td>
<td>Build capacity of local stakeholders to scale-up developed technologies, Build researcher–farmer partnership and collaboration in conducting research</td>
<td>Top-down communication, leading to low empowerment of people</td>
</tr>
<tr>
<td>Socio-economic survey to assess farmers’ capacity to apply technologies</td>
<td>Researchers, Farmers</td>
<td>Improve farmers’ awareness of applying sustainable maize production techniques, Facilitate strategies to scale-out appropriate technologies</td>
<td>Conventional structured survey questionnaires, leading to a lack of understanding social contexts</td>
</tr>
<tr>
<td>Evaluation of on-farm maize demonstration models</td>
<td>Farmers, Researchers, Local extension staff, Local authorities</td>
<td>Raise awareness of local stakeholders, Share and learn among stakeholders, Build the interest of local authorities and extension services</td>
<td>Formal participation of local authorities, resulting in limited interest in scaling-out technologies</td>
</tr>
<tr>
<td>Project’s mid-term review and final evaluation</td>
<td>Farmers, Researchers, Local authorities, Local extension staff</td>
<td>Make adjustments of issues and draw lessons, Facilitate policy development and the institutionalisation of research outputs</td>
<td>Top-down communication, Focus on measuring research outputs rather than developing livelihoods</td>
</tr>
<tr>
<td>Publications</td>
<td>Researchers, Postgraduate students</td>
<td>Share research findings with local stakeholders, Disseminate knowledge among research partners</td>
<td>Lack of visual publications</td>
</tr>
<tr>
<td>Final evaluation workshop</td>
<td>High-level policy-makers, Provincial authorities, Extension staff, Research partners</td>
<td>Share research results among stakeholders at all levels, Facilitate policy development and the institutionalisation of research outputs</td>
<td>Top-down communication</td>
</tr>
</tbody>
</table>

Source: NOMAFSI Project documents and primary data analysis
In the implementation of research experiments such as the identification of appropriate maize varieties and densities and the practice of mulching, intercropping and mini-terrace techniques, various technical training courses were conducted for project and non-project farmers in the local areas. However, a conventional lecturing method was used in these training courses. Socio-economic surveys were also conducted to assess the farmers’ awareness of sustainable maize production techniques and their capacity to apply these techniques. The aim of the survey was to develop effective measures for improving farmers’ accessibility to advanced maize production technologies in the northern mountainous regions of Vietnam. On-farm demonstration models that applied integrative technical measures of maize production on sloping lands were established by the project on eight ha in three research provinces in the final year of the project.

In Son La province, maize demonstration farms were established on 2.5 ha in Chieng Dong commune located close to National Highway No. 6. The on-farm evaluations of these demonstration farms were conducted with the participation of local farmers, extension staff and authorities. Technical documents and leaflets were also delivered to stakeholders to facilitate the future wider application of sustainable technologies in local communities. Farmer of FGD in Chum village, Chieng Dong commune said that they received technical documents on maize production on sloping land during on-farm evaluation of maize trials. They also needed more technical and material support from the local extension officer to apply these techniques in the future. This was reflected by a farmer in Chieng Dong commune as follows:

A research farmer in Chieng Dong (FGD 9.1): “The project provided me with production inputs and technical handouts for maize production in on-farm trials. However, my household has limited funds to buy inputs such as fertilizers and mulching materials to follow the sustainable farming techniques developed by the project. Therefore, when the project finishes, we hope local extension services could continue to provide support for technical advice and production inputs for my households to apply sustainable farming techniques”.

In terms of sharing the research results, the NOMAFSI Project organised a final evaluation workshop with representatives from MARD, research partner institutions, local provincial authorities, extension staff and farmers who were involved in the project. The aim of the workshop was to communicate the research results to target stakeholders and facilitate the institutionalisation of the developed technologies for sustainable maize production on the sloping lands in the northern mountainous regions. The results of the semi-structured interview with a project farmer (SMI 26) in Chieng Dong indicated that only a small number of farmers were invited to participate in this workshop resulting in a low sharing of project outputs to other farmers in their local village.
The publication of journal papers and postgraduate theses was another communication strategy used by the project to share the research results to research partners. Although some initial economic and environmental benefits of applying sustainable techniques such as mulching and intercropping were acknowledged by local farmers in FGDs at Chum village, these farmers were not interested in applying the new technologies on a large scale without getting further support from the project. They believed there was limited potential for scaling-out the technologies because of the unavailability of materials for mulching, the consumption of time, high labour costs and low additional economic profit from complementary crops such as rice bean and peanuts.

**Levels of stakeholder engagement**

According to the project design, the appropriate technologies would be transferred to target communities through local existing agricultural extension systems with support from local provincial and district DARD; however, these stakeholders were unsure about the potential to scale-out the developed technologies. The results of the FGDs with farmers and in-depth interviews with a local extension staff member and a village leader in Chieng Dong commune indicated that farmers were not involved in most of the research activities in the project, leading to their high dependence on the project’s researchers. The criticism was also made by farmers that the evaluation of the productivity and economic efficiency of the demonstration farms was carried out by the researchers themselves. The levels of stakeholder participation in the three major phases of the NOMAFSI Project are presented in Figure 7.6.

![Figure 7.6: Engagement of local stakeholders in the NOMAFSI Project](image)

*Legend: 1 = Passive, 2 = Consultative, 3 = Collaborative, 4 = Self-decision-making*

**Figure 7.6: Engagement of local stakeholders in the NOMAFSI Project**
In comparison with the ACIAR Northwest Project and the CIRAD ADAM Project, local stakeholders, especially farmers, involved in the NOMAFSI Project were more passive in most research activities. In addition, the researchers from the NOMAFSI Project took the lead role in pre-extension activities at local communities, with the farmers following instructions as the implementers. This led to low levels of participation by local research partners in decision-making. It could potentially have resulted in the low application of the developed technologies in the target communities after the project’s completion.

7.4. Contribution of communication processes to livelihood impacts

7.4.1. Scope of impact assessment

The variations in research processes and communication strategies were discussed in the previous sections of this chapter. Applying the holistic impact assessment framework to these three projects in two districts of Son La province helped to gain a better understanding about the contribution of AR4D underpinned by participatory processes to livelihood impacts in comparison with top-down processes in conventional agricultural research projects. Therefore, the analysis in this section focused on measuring key groups of impact indicators, discussed in the second component of the holistic impact assessment framework. It was found that, although the three projects involved a small number of farmers in trials and limited extensions of the research outputs, initial human, social, economic and natural outcomes and impacts were observed. Being guided by this impact assessment framework, this section analyses the achievement of the major research outputs, institutional impacts, livelihood impacts and changes in vulnerability contexts that affected the projects’ impact achievement.

As impact assessment was only conducted in some sites of these selected projects, no attempt was made in this study to conduct a comprehensive assessment of the entire projects. The testing of the holistic impact assessment framework concentrated mainly on measuring the major outputs and initial impacts of the maize production research components of these projects in the research areas. A comparison of the outputs and impact indicators among these projects was also made to provide insights into how different research approaches with different communication strategies could lead to different levels of outcomes and impacts on people’s lives. Using the proposed holistic impact assessment framework, four major groups of indicators were measured: i) direct research outputs, ii) livelihood impacts, iii) institutional impacts, and iv) impacts in the vulnerability contexts.
7.4.2. **Direct research outputs**

In terms of the direct research outputs, all three research projects aimed to achieve their expected research outputs, but they varied in the levels of output achievement. The research outputs achieved by the NOMAFSI Project were almost consistent with its initially specified research outputs. In the ACIAR Northwest Project and the CIRAD ADAM Project, the direct research outputs were varied in comparison with the planned outputs because of the adjustments in research activities to make the project more adaptive to local conditions. In addition, the project length was fixed in the NOMAFSI Project but was extended in the two other projects, leading to a variation in research outputs. Through the review of the three projects’ documentation and the results of the interviews with farmers and research partners, it was found that the direct research outputs such as developed technologies, publications and the attainment of academic degrees were the main objectives of the three projects over a short-term period. A summary of the major direct research outputs is presented in Table 7.5.

The NOMAFSI Project aimed to achieve these outputs to meet indicators, as planned in the research proposal and approved by MARD. The CIRAD ADAM Project similarly focused on achieving direct research outputs as scientific impacts that could be disseminated on a wider scale through conventional communication channels. In contrast, the ACIAR Northwest Project aimed to achieve research outputs as a result of an adaptive and innovative process that facilitated both the farmers’ adoption and the institutionalisation of the research outputs towards wider livelihood impacts. Overall, by comparing the planned and actual research outputs, all three projects delivered the direct research outputs that they expected.

Some additional outputs were identified in the ACIAR Northwest Project such as the FF&BS guidelines, scientific papers on sustainable land and crop management, evaluation reports on farmers’ and researchers’ perceptions of erosion and its impact on farmers’ livelihoods and a report on the communication pathways among the project research partners and between the project research partners and local stakeholders. In the CIRAD ADAM Project, due to the extension of the project, some additional demonstration sites of successful DMC technologies in non-project areas were established in 2014 in Mai Son district in Son La province. The pilot impact assessment conducted in the present study focused only on the demonstration farms set up by the CIRAD ADAM Project in 2013.
Table 7.5: Major direct research outputs of the three projects in the Northwest Highlands

<table>
<thead>
<tr>
<th>Outputs</th>
<th>ACIAR Northwest Project</th>
<th>CIRAD ADAM Project</th>
<th>NOMAFSI Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology development</td>
<td>- Profile of existing maize-based and temperate fruit-based farming systems</td>
<td>- Identification of cover crops for use in developing DMC systems</td>
<td>- Assessment report on maize production in northern mountainous regions</td>
</tr>
<tr>
<td></td>
<td>- Improved soil and crop management practices in maize-based farming systems</td>
<td>- An agrarian diagnosis research report of farmers’ constraints and opportunities</td>
<td>- Appropriate maize varieties and planting density recommendations</td>
</tr>
<tr>
<td></td>
<td>- An innovative approach to AR4D and PM&amp;E systems</td>
<td>- Adaptive sustainable farming systems for maize production on sloping lands</td>
<td>- Eight demonstration sites of appropriate technologies for maize production on sloping lands</td>
</tr>
<tr>
<td></td>
<td>- Evaluation reports for potential complementary crops in maize-based systems</td>
<td>- Demonstration sites established to support scale-out of successful technologies</td>
<td></td>
</tr>
<tr>
<td>Outreach capacity building</td>
<td>- Capacity building for a large number of researchers from research partner institutions participating in the project such as NOMAFSI, PPRI, CASRAD, VNUA and TBU</td>
<td>- Training on conservation agriculture for researchers and local stakeholders (148 researchers, 570 local farmers and 135 extension staff)</td>
<td>- Two advanced technical processes for sustainable maize production on sloping lands submitted to MARD for approval</td>
</tr>
<tr>
<td></td>
<td>- 29 undergraduate students from TBU received scholarships from UQ to conduct and contribute to numerous studies, and four researchers from Vietnamese partner institutions received John Allwright Fellowship scholarships and enrolled in UQ postgraduate courses</td>
<td>- Three master students were supported by the project</td>
<td>- Six technical training courses and six on-farm workshops at demonstration sites for 360 farmers in three provinces</td>
</tr>
<tr>
<td></td>
<td>- 18 local extension staff participated in season-long TOT courses in FF&amp;BS methodology, sustainable soil and crop management</td>
<td>- Several field visits to experiments organised for stakeholders including local farmers, extension staff and authorities</td>
<td>- Publication of two journal articles</td>
</tr>
<tr>
<td></td>
<td>- Co-organisation of one international conference on conservation agriculture and a series of technical workshops and field days</td>
<td>- Co-organisation of one international conference on conservation agriculture and a series of technical workshops and field days</td>
<td>- One PhD student involved and supported by the project</td>
</tr>
<tr>
<td></td>
<td>- Translation of video and guide on conservation agriculture from Madagascar into the Vietnamese language</td>
<td>- Translation of video and guide on conservation agriculture from Madagascar into the Vietnamese language</td>
<td>- One evaluation report on maize production on sloping lands of the northern mountainous regions of Vietnam</td>
</tr>
<tr>
<td></td>
<td>- Publications, training materials, FF&amp;BS guidelines, participatory video</td>
<td>- Publications, training materials, newsletters, brochures, academic degree attainment</td>
<td>- One final evaluation workshop with the participation of multiple stakeholders</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Final evaluation reports examined by MARD</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Three projects’ documents and primary data analysis*
Among the three projects, the ACIAR Northwest Project produced the most innovative AR4D process. The project’s interdisciplinary and multi-institutional approach, which involved a number of partners and collaborating research institutions, was highly accepted by researchers from different research institutions, local authorities and extension agencies. As agreed by both researchers and local extension staff, the innovative AR4D process of the ACIAR Northwest Project itself could be seen as an important direct research output of this project. A number of local extension staff and farmers were trained in the FF&BS methodology and crop management practices by the ACIAR Northwest Project. This training enhanced the capacity of local research partners to scale-out the direct research outputs. The other two projects also conducted various technical training courses, on-farm demonstration sites and cross-field visits for local farmers and extension staff; however, a top-down approach was applied in both research implementation and training activities.

7.4.3. Livelihood impacts

Human impacts

In terms of livelihood impacts at a community level, there were positive changes in the awareness and capacity of local communities, especially research farmers; however, these changes varied among the three projects. In general, the application of different approaches and communication strategies led to different levels of impacts on the capacity of local farmers. Sustainable agricultural techniques such as minimum tillage, mulching and intercropping in maize-based systems were assessed by project and non-project farmers as positive for reducing the risk of soil erosion and other related environmental problems. Through the results of the FGDs and observation of participants engaging in FGDs sessions in most research villages and semi-structured interviews with farmers, it was found that the farmers’ level of understanding about the major benefits of applying sustainable techniques (e.g. minimum tillage, mulching and intercropping) in maize production on sloping lands had been improved. Farmers participating in the semi-structured interviews identified the key benefits from applying those techniques, as presented in Table 7.6.

Table 7.6: Major benefits of the application of sustainable techniques in maize production

<table>
<thead>
<tr>
<th>Major benefits</th>
<th>Responses</th>
<th>% of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Soil conservation</td>
<td>19</td>
<td>25.00</td>
</tr>
<tr>
<td>Reduced labour cost for land preparation</td>
<td>13</td>
<td>17.11</td>
</tr>
<tr>
<td>Reduced production cost</td>
<td>19</td>
<td>25.00</td>
</tr>
<tr>
<td>Increased yield and income</td>
<td>18</td>
<td>23.68</td>
</tr>
<tr>
<td>Ecosystem protection</td>
<td>7</td>
<td>9.21</td>
</tr>
</tbody>
</table>

Source: Semi-structured interviews with 29 farmers at research villages in July 2014
More than 70% of the interviewed farmers believed that the application of sustainable techniques helped not only to increase income but also to improve soil quality and protect the ecosystem. However, despite a high level of awareness among the farmers of the benefits of sustainable maize production, the application of sustainable techniques after the projects’ completion was varied among the research areas and was limited in some communes such as Chieng Dong (the NOMAFSI project) and Chieng Hac (the CIRAD ADAM project). In addition, the farmers preferred to apply a single technique or partly integrative measures (a combination of two or more techniques) due to the lack of mulching materials on local farms, the conventional practice of burning vegetation and crop residuals before planting and the lack of technical knowledge and skills. Many farmers also paid attention to short-term economic benefits rather than long-term benefits. Non-project farmers who participated in FGDs in Chieng Hac said that they expected to get hand-outs and support, such as maize seeds, fertilizers and technical trainings from the project to increase maize productivity and did not know much about soil improvement. Table 7.7 shows the evaluation of farmers about the key benefits from applying sustainable techniques in maize production in the project area.

Table 7.7: Major benefits of the application of sustainable techniques in maize production by respondents by projects

<table>
<thead>
<tr>
<th>Major benefits</th>
<th>The ACIAR Northwest project</th>
<th>The CIRAD ADAM project</th>
<th>The NOMAFSI project</th>
<th>No participation in projects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Soil conservation</td>
<td>11</td>
<td>100.00</td>
<td>4</td>
<td>80.00</td>
</tr>
<tr>
<td>Reduced labour cost for land preparation</td>
<td>6</td>
<td>54.55</td>
<td>2</td>
<td>40.00</td>
</tr>
<tr>
<td>Reduced production cost</td>
<td>9</td>
<td>81.82</td>
<td>3</td>
<td>60.00</td>
</tr>
<tr>
<td>Increased yield and income</td>
<td>9</td>
<td>81.82</td>
<td>5</td>
<td>100.00</td>
</tr>
<tr>
<td>Ecosystem protection</td>
<td>5</td>
<td>45.45</td>
<td>1</td>
<td>20.00</td>
</tr>
</tbody>
</table>

*Source: Semi-structured interviews with 29 farmers at research villages in July 2014*

In an attempt to assess the contribution of each project to the improved understanding of farmers about sustainable techniques, farmers were asked to identify the projects or extension programs from which they acquired knowledge about sustainable techniques. The findings from the semi-structured interviews with farmers at local villages showed that the highest proportion of farmers learned sustainable techniques from the ACIAR Northwest Project. The smallest number of farmers reported that they acquired knowledge on sustainable techniques from local extension systems. A large number of farmers learned sustainable farming techniques from other farmers. This finding was consistent with the results from the FGDs in Phieng Luong and Muong Sang communes where many outreach
research farmers pointed out that they applied sustainable techniques such as minimum tillage and intercropping by learning from other farmers in their villages. The results of the analysis of farmers’ views about the major sources of knowledge on sustainable techniques are represented in the diagram in Figure 7.7.

The findings from the FGDs with farmers involved in the three research projects indicated that, despite understanding the importance of applying sustainable techniques in maize cropping, only farmers in the ACIAR Northwest Project said they would continue to apply some of those techniques, such as minimum tillage and rice bean intercropping with maize, without further support from the projects. The results of the FGDs with farmers in the CIRAD ADAM Project and the NOMAFSI Project areas showed that farmers were not sure about applying the new techniques if they did not get support from these projects. The FGDs and semi-structured interviews with farmers identified that the reasons for this hesitance were the lack of mulching materials, the requirement for more labour to source mulching materials, and the prospect of receiving little and unstable additional cash income from the complementary crops.

Figure 7.7: Contribution of information sources (including the three case projects) to farmers’ application of sustainable farming practices

Source: Semi-structured interviews with 25 farmers in Moc Chau and Yen Chau districts, July 2014

Although the application of mulching in combination with minimum tillage in maize production on sloping lands was considered to be good by most of the interviewed farmers, the study’s results showed that this technique was applied mainly by farmers who had been involved in one of three selected projects. This was supported by the results of the Pearson Chi-square ($\chi^2$) statistical test of
the data gathered from the 29 semi-structured interviews with farmers. A Chi-square test of independence was performed to examine the relation between the participation of farmers in one of the three selected research projects and their application of the mulching technique in maize production. The results showed a statistically significant association between these two variables, \( \chi^2 (d.f=1; N=29) = 14.399; p<0.05 \) and Fisher’s Exact Test<0.05 (Appendix 12). The study’s findings also showed that, in the 2014 maize season, only farmers in Phieng Luong and Muong Sang communes (ACIAR Northwest Project sites) continued to apply mulching in combination with minimum tillage.

Farmers who participated in FF&BS groups established by the ACIAR Northwest Project in Suoi Khem village, Phieng Luong commune, shared their better understanding about market-oriented production. The local farmers had become more active in finding markets for their products. In the FGDs in Phieng Luong and Muong Sang villages, many farmers also agreed that they paid more attention to meeting increased market requirements such as product safety and quality, which they would usually have ignored.

Farmers of FGD in La Nga village, Muong Sang commune (FGD: “Before the project, we were not aware of market requirements for our agricultural products such as plums, maize and pumpkins. However, by involving in FF&BS group, we have become more aware that we can get a higher price if we can produce high quality and better good-looking products”).

A significant change in farmers’ capacity was the innovation made by the farmers themselves in applying new production techniques. The findings from the FGDs and semi-structured interviews with local farmers indicated that, among the three projects, farmers’ innovations in adapting better technologies to their conditions were only found in the research and pilot roll-out areas of the ACIAR Northwest Project. For example, the application of the mulching technique requires more labour to bring additional mulching materials to their fields and fields with mulching materials attract more rodents than other fields: to deal with these problems, some farmers in Pieng Sang village made an innovation by making mulch strips of maize straw and fresh grass strips. This helped to reduce the mulching materials needed for the maize fields and to prevent soil erosion. Another farmer innovation was identified in Suoi Khem village where farmers kept the mulching materials such as maize straw on the fields but covered the soil a short time after planting in order to prevent rats from eating the maize seeds. These innovations were very important for making technologies more adaptable to local contexts and more accepted by farmers. The summary of human impacts is presented in the first part of Table 7.8.
Social impacts

The participatory approach of the ACIAR Northwest Project involved the active participation of the community. This helped to build trust between field researchers and farmers and between local extension staff and farmers. By participating in farm trials and in the FF&BS groups, farmers also established new relationships with other farmers and collectors and other private sector actors. These relationships facilitated better access to extension and market information. Farmer researchers in research sites such as in Phieng Luong and Muong Sang communes became more confident in sharing their research experiences in the community meetings, helping to strengthen social relationships among members of local communities and with external research partners. The communication channels between local farmers and researchers were also established since the ACIAR Northwest Project started. Some farmer researchers and extension staff in Phieng Luong and Muong Sang communes reported that they still sometimes called researchers from NOMAFSI and PPRI to ask about technical and market issues after the ACIAR Northwest Project finished. This was shared by a farmer researcher in Phieng Luong commune (SMI 21):

“I often contacted the project researchers by mobile phone for getting their advice about technical issues such as crop diseases, new varieties of maize and plum price”.

Lower levels of farmers’ participation in research activities were seen in the CIRAD ADAM Project and the NOMAFSI Project because farmers said that they only followed what researchers asked them to do in those projects. In addition, the results of the semi-structured interviews with farmers showed that more than 85% of farmers in Phieng Luong and Muong Sang communes (ACIAR Northwest Project site), while less than 50% of farmers in Chieng Hac commune (CIRAD ADAM Project site), participated in at least one training course or research activity on sustainable agriculture such as mulching, minimum tillage and intercropping, conducted by these projects. These differences resulted in different levels of awareness of farmers about sustainable agriculture. In addition, unlike the ACIAR Northwest Project, the CIRAD ADAM Project and the NOMAFSI Project conducted field trials with the limited involvement of local extension staff in both the research planning and implementation.

In FGDs with farmers in all research villages, the Venn diagram technique was employed to identify the active institutions, organisations, groups and important individuals in local communities and visualise the relationships among these organisations and individuals. The figure 7.8 and 7.9 and 7.10 are the results of the Venn diagram analysis of actives social organisational networks in three projects’ villages.
Figure 7.8: Venn diagram analysis of social organisational networks in Chum village, Chieng Dong commune, Yen Chau district

Source: FGDs with farmers in Chum village, Chieng Dong commune in Yen Chau district, July 2014

Figure 7.9: Venn diagram analysis of social organisational networks in Suoi Khem village, Phieng Luong commune, Moc Chau district

Source: FGDs with farmers in Suoi Khem village, Phieng Luong commune in Moc Chau district, July 2014
As can be seen from the organisational networks in Suoi Khem village, farmers described the important roles played by the FF&BS groups established by the ACIAR Northwest Project in collaboration with local extension services and the village management board in the agricultural development of the village. Farmers also emphasised the limited roles of mass organisations such as the farmers’ and women’s associations. A different situation was revealed in the Venn diagram exercise in Tong Han village where farmers did not acknowledge the role of local extension staff in local agricultural development. In Chum village, Chieng Dong commune, limited emphasis was also placed by farmers on the roles of the NOMAFSI Project in local agricultural development. Unlike Chieng Hac and Phieng Luong commune, farmers in Chieng Dong had a close relationship with community organisations such as farmers’ and women’s associations. It was also found from the FGDs in this village that farmers could get loans from banks through these local people’s associations. In addition, Because Chieng Dong is close to the national highway No 6, so local farmers had better connections with agricultural input suppliers like Syngenta and CP group. Through a Venn diagram exercise, it also became apparent that farmers in the areas of the CIRAD ADAM project and the NOMAFSI project had better links with banks, such as Vietnam Agricultural Bank for Agriculture and Rural Development, and other credit institutions than farmers in Phieng Luong commune - the ACIAR Northwest Project site. Farmers in Phieng Luong shared that although they needed capital, it took a long time for them to get loans from local banks. Therefore, they often
got loans when they needed money from input suppliers with higher interest rates or from relatives. When discussing about the roles of research intervention to agricultural development of the local community, only farmers in the ACIAR Northwest Project’s site placed this project very close to the centre of the circle in the Venn diagram. It was explained by farmers that the ACIAR Northwest Project played a key role in local agricultural development. This could be also explained by the higher level of application of sustainable techniques for maize on sloping lands such as minimum tillage, mulching and intercropping in the ACIAR Northwest project areas compared to two other projects. The summary of social impacts is presented in the second part of Table 7.8.

**Economic impacts**

In terms of economic impacts, the main fieldwork of this study was conducted with local farmers in July 2014 when the 2014 maize crop had just started, so measuring the initial economic impacts of the three projects focused mainly on the 2013 crop season. It was reported that sustainable techniques such as minimum tillage and intercropping helped to reduce labour and to increase maize yield and income for farmers. Farmers in most of the research sites also reported that the maize yield of farms applying minimum tillage and intercropping with legumes increased by 1.5 to 2 tons/ha/crop season, leading to an additional net income of 3 to 3.8 million VND/ha (about 140 to 178 USD/ha) for farmers in the 2013 crop season. Farmers in Phienh Luong and Chieng Hac communes said that the continuous application of minimum tillage for maize production could help to reduce labour and fertiliser costs by about 30% over three crop seasonal years.

According to farmers in Pieng Sang village, intercropping soybeans or peanuts with maize could help them to earn a combined net income for both crops at over 40 million VND/ha (approximately 1.878 USD), compared to about 25 million VND/ha (approximately 1,174 USD) from maize monocrop production. Similarly, farmer researchers in Chum village also pointed out that, in the 2013 crop season, maize farm pilots that applied mulching provided an additional net income of about 4 million VND/ha (approximately 188 USD). However, farmers also stated that it could be difficult for them to apply the mulching technique due to the unavailability of mulching materials such as the coffee bean pulp and rice husks that were used in the experiments of the NOMAFSI Project.

A male farmer researcher participated in the semi-structured interview in Muong Sang commune (SMI 27): “I know the application of mulching is good for soil and helps to increase maize yield. However, I did not have enough mulching material such as coffee shells and rice husks and dead plants for covering soil for maize production. If I do not get support from the project, I will not be able to continue the application of these good farming techniques”

In addition, although an intercropping system was developed by all three projects, the most successful application and scaling-out of this technique was in the target communities of the ACIAR Northwest
Project. In Phieng Luong commune, pumpkin had been intercropped with maize since 2013 and provided additional economic profit for farmers. It was estimated by farmers in Phieng Luong that growing pumpkins as a second crop on maize farms could help them to achieve 10–12 tons/ha and gain an additional net income of about 7 million VND/ha (approximately 329 USD). Local farmers and extension staff also indicated that pumpkins grown at local maize farms had high quality and, at the time of this study, could be sold easily. However, farmers had increasing concerns about selling pumpkins if they expanded the pumpkin production area.

Farmers in the research areas of the ACIAR Northwest Project and the CIRAD ADAM Project appreciated the technique of intercropping rice bean with maize. They reported that intercropping rice bean with maize helped to generate significant additional income. Rice bean plants and leaves were also good for soil quality improvement. Similarly, some farm households in Tong Han village in Chieng Hac commune had recently intercropped legumes such as rice bean, black bean and peanut with maize but on a very limited scale. Farmers said that by intercropping rice bean with maize, they could get additional rice bean produce of about 0.5 to 0.6 ton/ha with very low investment cost. However, regarding the 2014 crop season, a higher number of farmers in both the research and outreach areas of the ACIAR Northwest Project said they would continue to apply rice bean intercropping with maize. In contrast, only farmer researchers in the CIRAD ADAM Project village believed they would continue to apply this intercropping technique. In the NOMAFSI Project area, although farmers evaluated that intercropping legumes such as black beans and peanuts with maize helped to improve soil and gain higher maize yield, they stopped applying this farming system since 2014 because no additional income was gained from these complementary crops. The summary of key economic impacts is presented in the third part of Table 7.8.

**Physical impacts**

In regard to physical and natural impacts, due to the small scale of the three projects, positive changes in the physical assets such as local infrastructure, farm equipment and household facilities could not be clearly captured in this study. However, it was possible to capture some initial changes in households’ farm equipment and entertainment facilities in research areas. For example, farmers interviewed in Pieng Sang village, Phieng Luong communes shared that because of having an increase in maize yield, some farmers could have savings to buy household facilities such as electric pumps, televisions, and motorbikes. Farmers participated in the FGD in Pieng Sang also shared that: “The road from our village to the main road has recently been repaired so traders now can come to buy our agricultural products such as maize and plums more easily than before”.

Farmers in most research areas believed that higher income from maize production would help them to buy more farm equipment and household facilities in the future. As shared by a village head of Pieng Sang village that by having better income from maize production, in the future local villagers
can upgrade their village road system so their children could access to school easily in rainy days and they could sell our products such as maize, plums, pumpkin at higher price. Therefore, it is important for these projects to conduct impact assessments in the future in order to measure the contribution of the research interventions to the physical assets of the local communities. The summary of key physical impacts is presented in the fourth part of Table 7.8.

Natural impacts

Although the three projects were implemented on a small scale and were completed a short time prior to the present study, the initial natural outcomes and impacts could be assessed. Observing from maize slopping fields in Suoi Khem village (in Phieng Luong commune) in crop season 2015, the researchers found that minimum tillage technique was widely applied by farmers in this village. The shift from maize monocropping to intercropping was likely to improve the soil quality. Farmers and local extension staff agreed that higher soil fertility, reduced soil erosion and improved vegetation were the likely benefits in sloping fields where farmers had applied minimum tillage and intercropped legumes with maize. Among the sustainable production techniques developed by the projects for maize cropping, the minimum tillage technique was highly accepted by farmers in the research and outreach areas of the ACIAR Northwest Project and the CIRAD ADAM Project. Despite the small number of trials and extension sites and the low number of farmers involved, in the 2014 maize season, farmers applied the minimum tillage technique in about 80% and 70% of fields in areas where the ACIAR Northwest Project and the CIRAD ADAM Project, respectively, had conducted trials and extension demonstrations. As discussed by farmers in Chieng Dong commune (NOMAFSI Project site), fewer than 25% of local farmers applied the minimum tillage technique for maize production on sloping lands.

According to farmers in Phieng Luong and Muong Sang communes (ACIAR Northwest Project sites), the application of the minimum tillage technique (involving the opening of a narrow trench to apply seed and fertiliser, either by hoe or harrows pulled by buffalo), coupled with the use of in-situ organic material for mulch could help to reduce soil erosion by between 40% to 50% after 3 to 4 continuous years of application of these techniques. Farmers in these two communes also reported that intercropping rice bean and pumpkin with maize helped not only to increase income for farmers but also improve soil fertility. However, several farmers, especially farmers in the NOMAFSI Project and CIRAD ADAM Project site were hesitant to confirm that they would continue to apply any of the sustainable techniques except for minimum tillage without getting further support from the projects. The FGDs and semi-structured interviews with farmers identified that the reasons for this hesitance were the lack of mulching materials, the requirement for more labour to source mulching materials, and the prospect of receiving little and unstable additional cash income from the complementary crops. The summary of key natural impacts of three projects is presented in the last part of Table 7.8.
Table 7.8: The summary of major livelihood impacts of projects in the Northwest Highlands

| Impacts           | ACIAR Northwest Project                                                                                                                                                                                                 | CIRAD ADAM Project                                                                                                                                                                                                 | NOMAFSI Project                                                                                                                                                                                                 |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Human capital     | - Improved understanding on sustainable maize-based farming systems and decision-making capacity of both research and non-research farmers at local villages  
- Improved PM&E capacity for research farmers  
- Enhanced decision-making capacity for farmers, leading to some innovations made by farmers to adapt technologies to local contexts | - Improved awareness of local communities on sustainable maize production techniques but limited change in decision-making capacity at local villages  
- No farming innovations were made by farmers | - Improved awareness and capacity of farmer researchers on sustainable maize production but at limited scale  
- Improved technical knowledge and skills for farmers in research areas but limited change in decision-making capacity of local farmers and no innovations made by farmers |
| Social capital    | - Development of strong collaboration between local farmers and researchers, and between local farmers and extension staff  
- Improved community relationship among villagers through participating in research activities and in FF&BS groups | - Established partnerships between local farmers and researchers but a weak collaboration between local farmers and extension staff  
- Limited evidence on the improvement in community relationship | - Establishment of partnership between local farmers and researchers but weak collaboration between local farmers and extension staff  
- Limited evidence on the improvement in community relationship |
| Economic capital  | - Maize yield increased by 1.5 to 2 tons of dried seeds/ha when applying minimum tillage intercropping with legumes  
- Enabling the growing of two crops (pumpkin and rice bean intercropped with maize), leading to an income increase by 30-40%  
- Rice bean yield (intercropped with maize) was 0.5 to 0.6 ton/ha and brought additional income of about 16 million VND/ha (about 750 USD) | - Maize yield increased by 1.0 to 1.5 tons of dried seeds/ha when applying minimum tillage and intercropping with legumes  
- Rice bean yield intercropping with maize was 0.5 ton/ha and brought additional income of 15 million VND/ha (about 703 USD) but at a limited scale | - Maize yield increased by 1.0 to 1.5 tons of dried seeds/ha when applying minimum tillage intercropping with legumes but farmers were not interested to continue applying intercropping techniques  
- Net economic profit of maize intercropping with peanut farm increased by about 20%/ha compared to mono maize farm but in a very limited scale |
| Physical capital  | - Evidence not available due to the short period of time since project completion | - Evidence not available due to the short period of time since project completion | - Evidence not available due to the short period of time since project completion |
| Natural capital   | - Minimum tillage had been applied in about 80% of maize areas and rice bean intercropped with maize in large areas, leading to significant improvement in soil quality  
- Application of minimum tillage and organic mulching helped to reduce soil erosion by between 40-50% after 3 to 4 years | - Minimum tillage had been applied in about 70% of maize areas, leading to initial improvement in soil quality and reduction in soil erosion | - Minimum tillage technique applied in less than 25% of maize areas, leading to initial improvement in soil quality and reduction in soil erosion |
7.4.4. Institutional impacts

Regarding institutional impacts, because the selected projects were implemented on a small farm scale and finished a short time prior to this study, researchers, local farmers and extension staff only acknowledged initial observable institutional impacts on research institutions and local development policy. There was an agreement in the literature that, although the understanding of the institutional impacts of agricultural research is crucial for enhancing the institutionalisation of research outputs and changing the attitudes of funding agencies, it was often ignored by conventional impact assessment practices. In this study, institutional impacts were measured by looking at initial positive changes or impacts in policies, institutions and processes that facilitated the enabling environments for the scaling-out of successful technologies towards sustainability of impacts. A summary of the major initial institutional impacts contributed by these projects is presented in Table 7.9.

In regard to the improvement in research capacity in research and development institutions, initial positive changes were also acknowledged by the research institutes and universities involved in these projects. The researchers from TBU and CASRAD highly appreciated the innovative research approach and the PM&E system implemented by the ACIAR Northwest Project. They believed that, after participating in the project, they were able to carry out experiments independently. The application of the PM&E approach in research and extension activities also helped to improve the capacity of local farmers and extension staff to conduct research and make decisions for local agricultural development. As shared by a local leader in Muong Sang commune (LEADR 4):

“I have observed that the relationship between local farmers and extension officers has been strengthened since they participated in the ACIAR Northwest Project. There have been a stronger collaboration between project farmers and extension staff in carrying out agricultural trainings and agricultural and rural development activities. However, I think that the number of farmers involved in this project is still limited.”

In addition, a number of researchers from NOMAFSI who were involved in the CIRAD ADAM Project were trained on conservation agriculture and DMC, leading to an improvement in their research capacity. Because NOMAFSI was involved in the implementation of the selected projects, learning from the strengths and weaknesses in each project will help the institute to implement more successful research projects, especially AR4D interventions in the future. All the researchers involved in the ACIAR Northwest Project interviewed in this study pointed out that they would use the knowledge and skills learned from the project, especially PM&E skills in research trials in their future research.

The implementation of the research projects helped to strengthen the capacity of the local extension staff who were actively involved in the research activities. For example, an agricultural staff of Phieng
Luong commune said that his capacity on sustainable maize farming on sloping lands was strengthened by participating in the technical training, planning and PM&E of farm research activities conducted by the ACIAR Northwest Project. He had provided good advice to the district extension station on promoting sustainable farming practices. He had been invited as a facilitator of many TOT courses conducted in non-project communes in Moc Chau. The extension staff from the agricultural extension centre of Son La province also indicated that their direct involvement in TOT courses on FFS and implementation of the pilot roll-out models supported by the ACIAR Northwest Project helped them to gain a better understanding about the contribution of the sustainable farming techniques such as minimum tillage, mulching and intercropping to sustainable maize production on sloping lands. This also facilitates the centre’s formulation and recommendation of sustainable agricultural development programs and policies to the Son La provincial government.

Table 7.9: Major institutional impacts of the three projects

<table>
<thead>
<tr>
<th>Institutional impacts</th>
<th>ACIAR Northwest Project</th>
<th>CIRAD ADAM Project</th>
<th>NOMAFSI Project</th>
</tr>
</thead>
</table>
| **Institutional research capacity** | - Enhanced capacity of field researchers from partner organisations through integrative research approach  
- Innovative AR4D approach utilised by the project’s research partner organisations  
- Improved capacity on PM&E of trials and technology extension for local extension staff | - Enhanced technical capacity for field researchers but lack of facilitation and PM&E skills  
- DMC research approach tested by the project was utilised by NOMAFSI for other research projects | - Enhanced technical capacity of field researchers and local extension staff but lack of community facilitation and PM&E skills  
- Potential impacts on facilitating initial change in high-level agricultural development policies if two technical processes are approved by MARD |
| **Development policies and processes** | - Major contribution to the formulation and execution of Decision No. 14/QĐ-UBND of Son La province on maize production on sloping lands  
- Local project communes had initiated a program utilising sustainable farming techniques developed by the projects | - Limited contribution to the formulation and execution of Decision No. 14/QĐ-UBND of Son La province on maize production on sloping lands | - Limited contribution to the formulation and execution of Decision No. 14/QĐ-UBND of Son La province on maize production on sloping lands |

Source: Three projects’ documents and primary data analysis

In terms of the impacts on policy development, although all three projects were implemented in Son La province and established partnerships with local farmers and provincial and district-level DARD, and implemented extension systems in designing, carrying out trials and scaling-out technologies, the
ACIAR Northwest Project had closer collaboration with local extension systems. Through the in-depth interviews with extension staff in Moc Chau and the researchers who participated in the three projects, it was learned that this improved partnership had already helped to facilitate recent research activities conducted by NOMAFSI and its research partner organisations in local areas. At the time of this study, the NOMAFSI Project had also developed two advanced technical processes for sustainable maize production on sloping lands and submitted these to MARD for approval. If these advanced technical processes are approved, they can contribute to future development policies and programs introduced by MARD to target sustainable farming systems on sloping lands in Vietnam.

The clear short-term institutional impacts of these research projects in the Northwest Highlands region could be seen in the change in the formulation of recent local development strategies. Son La province issued Decision No. 14/QĐ-UBND, which aimed to pilot the application of sustainable farming techniques for maize production on sloping lands from early 2014 on at least 30 ha per commune, with priority for the poorest communes. This decision was executed in 2014 with 2,800 ha of maize on sloping lands in 12 districts of the province. Agricultural extension staff of Muong Sang commune (EXT 3) reflected that:

The Decision No. 14/QD-UBND of Son La province on piloting the application of sustainable farming techniques for maize production on sloping lands is very important for dealing with existing unsustainable production practices. Although the capacity of local farmers is still limited, farmers have become more aware of problems such as soil erosion, land degradation and low crop yield. Therefore, in the maize crop season 2014, Muong Sang commune has been successful in piloting the sustainable maize techniques on 30 ha of sloping land.

The provincial centre of agricultural extension – the key partner involved in conducting the pilot roll-out models of the ACIAR Northwest Project – was in charge of monitoring and implementing this local government extension development program. Although the three projects were all implemented in Son La province with a similar focus on developing sustainable maize-based farming systems, the ACIAR Northwest Project was evaluated by local extension staff and farmers as a main contributor to the issuance of Decision No. 14. The major reasons were explained by the difference in the application of outreach strategies of these projects. The ACIAR Northwest Project conducted season-long TOT courses on the FF&BS methodology for local extension staff and passed the implementation, monitoring and evaluation of the pilot roll-out models to the local extension system. This helped the local extension staff to develop capacity in scaling-out research outputs. The season-long TOT courses on FF&BS were conducted for local extension staff and the FF&BS guidelines were developed by the ACIAR Northwest Project.
In addition, the evaluations of two outreach crop seasons applying new production techniques in the ACIAR Northwest Project were implemented through a strong collaboration with local extension staff and farmers, helping to provide convincing evidence of the initial socio-economic and environmental benefits from the application of new technologies to local development institutions. This was an important basis for formulating long-term development programs. Local extension staff believed that building the capacity of local extension systems and establishing a strong collaboration with the local DARD could be a decisive factor for facilitating change in local development strategies. This is an important step to institutionalise successful sustainable farming technologies in the province.

7.4.5. Impacts in the vulnerability context

As identified in the literature, agricultural research interventions could have an impact on the vulnerability context of target communities (Adato & Meinzen-Dick, 2002; Carpenter & McGillivray, 2012). Because the three research projects were completed a short time prior to this study, it was difficult to capture significant changes in the local livelihood contexts such as changes in human health, crop prices and market trends which have an influence on both the institutional and livelihood impacts. However, initial change in crop diversification and resource use were observed in some villages in the research areas of the ACIAR Northwest Project. The shift from the application of full tillage to minimum tillage for maize production on sloping lands could be seen as the most significant impact on trends in resource usage in local communities. These positive changes affected local farmers’ choices in the livelihood strategies in maize based systems they pursued to achieve livelihood outcomes such as improved income and the reduction of soil erosion on sloping lands.

In this study, seasonal calendars were used in the FGDs with farmers to capture the changes in crop patterns before and after the projects. As described by farmers in La Nga village (the ACIAR Northwest project’s site), there was a significant change in crop diversification at local farms between 2008 and 2013. In particular, maize monocropping had been practised by most farmers for a long time. Ploughing soil before planting maize was a common practice of most farmers before 2009. Since the intervention of the ACIAR Northwest Project, complementary crops such as pumpkins and rice beans were intercropped with maize, bringing additional income for farmers. In the research areas of the CIRAD ADAM Project and the NOMAFSI Project, no evidence was found on changes in crop diversification. Changes in crop diversification were acknowledged by both project and non-project farmers in La Nga village (Muong Sang commune), as presented in Figure 7.11.
The ACIAR Northwest Project also contributed initial impacts on changing farmers’ perspectives about commercial production and bringing farmers and traders closer. In addition, the involvement of market actors such as collectors, wholesalers, retailers and processors in several training workshops under the value chain research components of this project helped to improve stakeholders’ understanding about agricultural value chain organisation and strengthened the market connections between local farmers and traders. As shared by several farmers during FGDs in Suoi Khem village, local traders came to the village more often in harvesting seasons to buy products on farms. In addition, due to better crop diversification in local villages such as Suoi Khem, Pieng Sang (Phieng Luong commune) and La Nga (Muong Sang commune), more frequent interactions between farmers and local traders (e.g. collectors, agricultural input suppliers, Moc Chau milk company and other food processors) have been made that facilitate the market capacity of local farmers. Through the FGDs with farmers in Phieng Luong and Muong Sang communes, it was also found that the communication channels between local farmers and maize traders were improved, resulting in better negotiation between farmers and traders in recent crop seasons. A village head participated in FGD in Suoi Khem village, Phieng Luong commune shared that local farmers had become more independent from local collectors. They could get higher maize price because they could access better market information from different buyers from Moc Chau town through mobile phones. The initial impacts on local

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**Figure 7.11: Change in crop diversification in La Nga village, Moc Chau district**

Source: FGDs with farmers in La Nga village, Muong Sang commune, July 2014
vulnerability contexts identified by the researchers and local stakeholders involved in the three projects are summarised in Table 7.10.

Table 7.10: Initial impacts in the vulnerability context

<table>
<thead>
<tr>
<th>Vulnerability context</th>
<th>ACIAR Northwest Project</th>
<th>CIRAD ADAM Project</th>
<th>NOMAFSI Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crop diversification</strong></td>
<td>- A large number of farmers shifted from the application of full tillage to minimum tillage for maize production</td>
<td>- Initial changes from maize monocropping to legume intercropped with maize farming system but on a limited scale</td>
<td>- Limited change in farming practices by local farmers regarding the shift from one maize crop per year to two crops (two maize crops or complementary crops intercropped with maize) in research areas</td>
</tr>
<tr>
<td></td>
<td>- Increasing number of farmers shifted from one maize crop per year to two crops (two maize crops or complementary crops intercropped with maize) in research areas</td>
<td>- Limited evidence of changes in maize-based production on sloping lands by local farmers except the application of minimum tillage</td>
<td></td>
</tr>
<tr>
<td><strong>Market engagement</strong></td>
<td>- Initial improved market engagement identified by farmers participating in FF&amp;BS groups</td>
<td>- No evidence in improved market engagement identified by farmers</td>
<td>- No evidence in improved market engagement identified by farmers</td>
</tr>
</tbody>
</table>

*Source: The three projects’ documents and primary data analysis*
8.1. Introduction

Using a holistic approach towards the assessment of impacts of AR4D underpinned by participatory processes is important for supporting social change and sustainable development in the Northwest Highlands of Vietnam, a region with relatively high levels of poverty and high ethnic diversity. The results of impact assessment help to improve the understanding of the benefits of research for development and facilitate the formulation of appropriate measures and development strategies towards the sustainable development of target areas in the future. However, as described in the previous chapters, impact assessment approaches to existing agricultural research including AR4D initiatives in the Highlands are hindered by weaknesses in both the formulation of suitable objectives and the selection of appropriate methods that match those objectives. In addition, few efforts have been made to assess the impacts of AR4D projects and understand how different engagement processes could enhance the ability of AR4D outcomes to achieve livelihood impacts in these highland areas. These limitations have led to the low validity and reliability of findings and unconvincing evidence about the contribution of interdisciplinary and participatory processes towards the development of sustainable livelihoods in the Highlands.

This study sought to gain a better understanding of the benefits and limitations of a more holistic method of impact assessment in AR4D projects that would allow attributing impacts achieved to efforts that facilitate stakeholder engagement in the research process. The study was carried out to serve three research objectives: i) to review and analyse the strengths and weaknesses of existing impact assessment approaches to AR4D, ii) to develop a holistic impact assessment framework for AR4D, and iii) to validate the utility of such an impact assessment framework in three agricultural research projects in the Northwest Highlands. As the final chapter, this chapter focuses on drawing conclusions and lessons learned from the development of the holistic impact assessment framework and its application to three projects in the Northwest region. These conclusions and lessons learned provide useful feedback that can be used for developing future impact assessment methodologies to show how a more participatory and interdisciplinary approach to AR4D could make a change in people’s lives, particularly in such culturally diverse regions as the Northwest Highlands.
8.2. Holistic framework for impact assessment of AR4D projects

8.2.1. Development of the holistic framework for impact assessment of AR4D

The framework for holistic impact assessment of AR4D projects was developed in this study based on the critical review and analysis of different development theories and practices related to the impact assessment of agricultural research including research for development, sustainable livelihoods frameworks, PIA approach and ToC approach. These development theories, concepts and practices are interrelated when blended into a holistic approach to the impact assessment of AR4D projects in a comprehensive livelihoods perspective. The framework not only helps to measure the wide range of impacts of AR4D projects but also to empower local people to more actively engage in social change and sustainable development in their communities. The holistic impact assessment framework for AR4D projects was developed in this study by raising and answering key questions about what, why and how impacts of AR4D should be measured and communicated among stakeholders.

The holistic impact assessment framework proposed in this study utilises the sustainable livelihoods framework developed by DFID as a lens for the key groups of impacts that AR4D projects could have on people’s livelihoods. This sustainable livelihoods framework provides the parameters for a comprehensive conceptual analysis of what and how outcomes and impacts can be achieved by development interventions (DFID, 1999). Through the lens of the sustainable livelihoods framework, four main groups of impacts on people’s livelihoods generated by AR4D can be identified by taking into account the direct research outputs:

1) Direct research outputs such as improved varieties or technologies, innovative research processes, publication of scientific papers, training for capacity building, and the attainment of academic degrees;

2) Changes or impacts in the livelihood asset base such as human capital (e.g. knowledge, skills, health), social capital (e.g. trust, membership, informal safety net and communication), economic capital (e.g. income and saving and credit opportunities), physical capital (e.g. road, transportation, sanitation, healthcare systems) and natural capital (e.g. soil fertility, water conservation and biodiversity);

3) Changes or impacts in policies, institutions and processes such as formal and informal institutions (e.g. development policies, culture, organisational capacity) and development strategies that affect people’s access to livelihood assets, their vulnerability context and their choice of livelihood strategies towards achieving livelihood outcomes and impacts;
4) *Changes or impacts in the vulnerability context* such as i) shocks (e.g. changes in human or animal health, natural disasters, and sudden economic changes), ii) trends in migration, livelihood resource use, and other indicators such as prices, governance and technologies, and iii) seasonality in production, price, employment and health.

The application of a sustainable livelihoods framework is believed to help to define and unravel the assessment of impacts that occur in the complex realities of individuals, households and communities (Adato & Meinzen-Dick, 2002; Carpenter & McGillivray, 2012). Therefore, applying the sustainable livelihood frameworks is very applicable for the culturally diverse regions like the Northwest Highlands. Drawing from the literature, the results of this study indicate that researchers should be aware of the limitations of applying the sustainable livelihoods framework in the impact assessment of AR4D. Some major challenges in the impact assessment of AR4D are recognised by this study, including the lack of a full understanding of the local cultural diversity and complexity, the presence of economic and resource gaps among people and communities, the heavy reliance on participatory techniques and qualitative data, and the absence of the notion of power, politics and empowerment in the categories of livelihoods. These problems were learned from both the review of existing literature in impact assessment of agricultural research projects in the Northwest regions but also in testing the holistic impact assessment framework with minority ethnic groups in these regions. Failing to deal with these problems could lead not only to weak evidence on the impacts of AR4D projects but also to the low sustainability of impact assessment findings towards the development of local livelihoods and social change.

In addition, the holistic impact assessment approach for AR4D developed in this study utilises participatory impact assessment (PIA) in order to empower local communities and generate information and data on the extent to which changes can be attributed to future development activities. The results from the review on existing PIA theories and practices, such as Holland (2013, p. 15), Cramb and Purcell (2001) and Krall et al. (2003), indicate that impact assessment indicators should be designed and assessed with local stakeholders, especially farmers. The strong collaboration between researchers and local research partners such as farmers and extension staff is also important for establishing good mechanisms to obtain feedback and share the impact assessment findings among stakeholders at different levels. However, efforts on applying participatory processes for impact assessment of AR4D in such the Northwest regions could be constrained by existing top-down research approach in this region and the limited capacity of minority ethnic communities. If no attempts are made for changing on-going research system and local stakeholders are not well empowered, the application of participatory approach will be unsuccessful. In addition, because of language barrier, it will take longer time to establish a relationship between researchers and local
people, a lack of time and financial resource for developing participatory tools and carrying out participatory activities in the field could result in less reliable findings.

There are no clearly identified methods that could be used in the impact assessment of AR4D projects in culturally diverse regions like the Northwest Highlands. In the proposed holistic impact assessment framework, paying particular attention to the context of the Highlands, the use of participatory methods and techniques in combination with documentary research for data collection and analysis is suggested. The key qualitative methods and techniques used in the framework are FGDs with farmers using visual data collection techniques such as resource mapping, seasonal calendars, radar techniques of participation and Venn diagrams, semi-structured interviews with individual farmers, in-depth interviews with key informants such as local extension staff, authorities and researchers, and direct observation. The use of these methods and techniques helps to gather the necessary qualitative and some quantitative data on the impacts of AR4D projects but they should be implemented in participatory way to also contribute to the empowerment of the community. However, the use of these tools and techniques for impact assessment of AR4D in a social context such as the Northwest Highlands should be flexible. It was found by this study that most of interviewed researchers believed that these tools and techniques could be used for impact assessment of agricultural research without questioning their adaptability to different social economic conditions. In addition, while in-depth interview have been used by many international funded projects, structured interviews have been used more by most Vietnamese research institutions in the Northwest Highlands.

Being aware of the limitations of rigidly applying participatory methods and techniques for impact assessment, this study recommends that researchers pay careful attention not only to the emerging issues identified by Dietz et al. (2013) and Carpenter and McGillivray (2012) such as the lack of good facilitation skills and the constraints in time, funding and human resources allocated to participatory methods but also to the potential influence of existing conventional top-down research and extension approaches and power structures in the Northwest Highlands. In addition, beyond the somewhat vague discussion in the literature about the utilisation of impact assessment findings for development, this study’s results also highlight that impact assessment should not only focus on achieving measurable impacts but also on the empowerment of people in order to facilitate the better use of research findings for the sustainable development of local communities.

Finally, in the proposed holistic framework for impact assessment of AR4D, the ToC approach is adopted as a complementary tool to understand the plausible links between research outputs and impacts. The findings from the review of existing theories and practices related to the ToC approach, such as Stern and Mayne (2013), White (2009), Vogel (2012) and Templeton (2005), indicate that the application of the ToC approach not only helps to map the causal links between the use of research
outputs and better livelihoods impact achievement but also to gain better understanding of the contexts, assumptions and risks that could have an influence on impact achievement.

In the development of the proposed framework in this study it was assumed that, if an AR4D project is designed in ways that enable it to deliver impacts, it is easy to measure the long-term, social, human, economic and environmental impacts of the project, especially in remote and culturally diverse regions such as the Northwest Highlands. Therefore, the ToC approach is incorporated in the proposed framework with adequate consideration of how different communication processes could help to facilitate the engagement of local stakeholders in research processes, leading to different levels of livelihoods impacts. This assumption has been ignored in most existing impact assessments that attempt to use the ToC approach for the impact assessment of agricultural research.

Because, the AR4D process often takes a long time to deliver impacts in a complex social and agro-ecological environment, leading to the fact that some impacts cannot be observable over a short-term period. It was also found from the study that most research projects including AR4D carried out in the Northwest Highlands did not have plans to assess fully impacts in a long term, this may lead to the failure in the application of a ToC approach for impact assessment of these existing agricultural research intervention. The results of the study pointed out that an impact assessment of AR4D should also pay attention to complex and dynamic local farming systems with various internal and external non-linear factors that may enhance or hinder impact achievement, such as barriers of language and culture that offer challenges for capturing changes in local livelihood among different locations and ethnic groups. Finally, although a ToC approach should be designed before a project starts, a straightforward analysis of ToC is also useful for the impact assessment of AR4D projects.

8.2.2. Validating the holistic framework for impact assessment of AR4D in the Northwest Highlands

Interdisciplinary and multi-institutional approach to AR4D

The research findings showed that all three research projects selected in this study were implemented in a similar socio-economic context in the Northwest Highlands. These projects involved the improvements of farm management practices towards the development of sustainable livelihoods for farmers in the region. All three projects were self-proclaimed AR4D projects; however, they varied in research approaches and methods, research focus and impact assessment strategies. Among the three selected projects, the ACIAR Northwest Project attempted to integrate the dependent disciplinary research activities, such as farm trials on sustainable land and crop management practices and farm economic and value chain analysis, in one project. The interdisciplinary and multi-
institutional nature of this project not only helped to strengthen the collaboration and partnership among research partners from a range of institutions and disciplines, and between research institutions and local research partners, but also facilitated the institutionalisation of the research outputs for the livelihood development of local communities.

The ACIAR Northwest Project was conducted by multi-institutional teams with multidisciplinary areas of expertise such as UQ, NOMAFSI, CASRAD, VNUA and DARD. The activity teams, each consisting of an Australian researcher, Vietnamese researcher and field staff from central, provincial and district levels, were set up to conduct different research activity components. Each research component was led by one research institution but also involved the participation of researchers from other partner institutions in order to maintain an interdisciplinary perspective. This helped to develop appropriate methodologies for technology development in order to improve soil and crop management towards sustainable farming systems. Although the interdisciplinary and multi-institutional approach adopted by the ACIAR Northwest Project was new to the context of the Northwest Highlands, this approach was highly accepted by the research partners, especially young researchers.

In contrast, the other two research projects investigated in this study focused mainly on achieving direct research outputs, such as appropriate farming technologies and publications. It was assumed that these outputs would later be used by local stakeholders and external development actors, and limited attention was paid to devising methodologies to enhance the capacity of the extension system and farmers to apply the developed technologies. Research activity components such as on-farm trials and experimentation involving minimum tillage, intercropping, mini-terrace and vegetative mulching in maize-based farming systems were conducted mainly by researchers from one major disciplinary field. This resulted in a weak methodology innovation and poor capacity development in the face of complex problems in maize-based farming systems in the Northwest Highlands.

However, some limitations of an interdisciplinary approach can be identified, including high cost for involving various research institutions in the same project, overlapping work schedules among research institutions and difficulties in making a good strategy to collaborate among research partners for sharing research designs and results and applying innovations on a large scale. In addition, the Interdisciplinary approach can be constrained by existing conventional research systems in which research institutions have been working in their most comfortable zones.

**Participatory processes facilitating the engagement of stakeholders in AR4D**

The results from testing the holistic framework in three projects, namely, the ACIAR Northwest Project, the CIRAD ADAM Project and the NOMAFSI Project, indicated that AR4D projects could benefit from using participatory processes within a socio-economic context like the Northwest
Highlands. The ACIAR Northwest Project adopted participatory processes with various participatory communication strategies to enhance the active engagement of local stakeholders in decision-making processes. In both the CIRAD ADAM Project and the NOMAFSI Project, a conventional top-down approach was used in most of the research and extension activities.

The application of participatory processes could not only help AR4D to achieve objectives but also to empower people towards the development of sustainable livelihoods (Hogh-Jensen et al., 2010). The participatory approach can be considered a core element in the whole research process from identifying the research priorities, to the implementation, monitoring and evaluation of research activities. At the design stage, using participatory processes helps to assess the real needs of local communities because local people often have a better understanding of the complexity of their farming systems and existing political power institutions. In the ACIAR Northwest Project, various participatory techniques such as FGDs, participatory mapping, transact walks, participatory photo stories and seasonal calendars were used with communities at local village level in participatory diagnostic studies in the early phase of the research. Local village leaders and extension staff also participated in the diagnostic studies. This helped to gain an in-depth understanding of the local socio-economic and agro-ecological conditions, constraints and research opportunities for the target communities and to build partnerships between the researchers and local stakeholders, especially farmers. In contrast, in the CIRAD ADAM Project and the NOMAFSI Project, the research activities were externally designed by researchers and experts. Although farmers and local extensions staff were consulted in the agrarian diagnosis, the decisions were made by the researchers. Structured surveys and formal discussions with local stakeholders were the main types of communication for identifying the research problems and priorities. This resulted in minimal empowerment of local people in the first phase of the project.

In the on-farm technology development and extension phase, participatory processes can be used to involve farmers as co-researchers and to involve local extension staff as research partners in a research process. Farmers who were involved in the ACIAR Northwest Project reported that the researchers worked together with them in the planning and implementation of plum and maize trials. The researchers frequently visited trial farms and met with farmers, establishing close collaboration between the researchers, local farmers and extension staff in carrying out research activities. As a result, the capacity of farmers and local extension staff was strengthened. The active involvement of local extension staff and authorities in the evaluation of research trials, technology pilot sites and in the final evaluation of the project helped to develop capacity for local partners and facilitate the scaling-up of the application of the research outputs. In contrast, the CIRAD ADAM Project and the NOMAFSI Project applied a top-down approach in the conduct of on-farm experiments. Farmers were involved in research activities but they were not engaged in the planning and implementation of
on-farm experiments and other training activities. Local extension staff and local authorities also had limited roles in carrying out research activities. They only participated in technical training, field visits or on-farm evaluation workshops at demonstration sites. These problems led to the limited improvement in technical capacity and communication skills of local stakeholders, especially local extension staff.

In regard to the monitoring and evaluation schemes, the application of the PM&E system helps to better manage research activities and build the capacity of researchers, local farmers and extension staff compared to the conventional top-down reporting system. The PM&E guidelines, which are adaptable to the specific socio-economic contexts of target communities, could make AR4D interventions more applicable to complex local social conditions. The ACIAR Northwest Project established a comprehensive PM&E system in which the roles of different research partners were defined by involving partners at the early stage. In the other two projects, the design and implementation of monitoring and evaluation activities were mainly conducted by researchers. The final evaluation of the NOMAFSI Project focused on measuring the accomplishment of research activities and the achievement of designed outputs in comparison with the project’s expected quantitative indicators rather than on understating how the research outputs can be utilised for development.

Concerning impact assessment, although the expected long-term benefits or impacts were mentioned in the research proposals of all three projects, only the ACIAR Northwest Project took into account an impact pathway for the research interventions and proposed a scheme to transfer the PM&E system to local extension staff and farmers through building the capacity of local extension services to implement the pilot roll-out of successful technologies in non-research areas. However, none of these projects had clear strategies for assessing and sustaining the impacts of their research interventions in the long term. Therefore, measuring impacts of AR4D not only requires having developed such a holistic impact assessment framework for AR4D but also changing interests of various research stakeholders such as research institutions, research funding agencies and local research partners.

**Contribution of the three research projects to sustainable livelihoods**

The findings from applying the holistic impact assessment framework in three projects in the Northwest Highlands helped to measure the initial impacts of these research projects. The findings indicated that the ACIAR Northwest Project – which was underpinned by participatory processes – achieved better impacts than the CIRAD ADAM Project and the NOMAFSI Project. The four key groups of impacts have been identified by the study including: i) direct research outputs; ii) livelihood impacts; iii) institutional impacts, and iv) impacts in the vulnerability context.
First, from testing the holistic impact assessment framework, it was found that despite some variations in the project timelines, all three projects achieved their expected research outputs. Although there were differences in research processes and communication strategies in the research phases, these three projects all attempted to develop appropriate technologies for sustainable maize-based farming systems in order to achieve better livelihoods for the target communities. The key designed outputs of the three projects were sustainable farming technologies, capacity training for national researchers, local farmers and extension staff, publication of scientific papers, and various workshops and conferences. Among the three projects, the ACIAR Northwest Project implemented the most innovative research processes including interdisciplinary approach and multi-institutional collaboration and the use of participatory processes to facilitate the engagement of local stakeholders in research activities. The ACIAR AR4D approach was highly accepted by researchers from different research institutions, local authorities and extension agencies. The identification of such direct research outputs indicators is not only important to understand fully about each project’s outputs but also the value of these direct research outputs towards achieving long-term multiple impacts.

Second, the research findings indicated that the ACIAR Northwest Project generated better human, social, economic and natural impacts on local communities. Local farmers and extension staff who participated in the project believed that their capacity was enhanced. Innovations made by farmers to adapt to limited mulching materials, soil erosion and mulching material run-off were identified in both the research and outreach areas of the ACIAR Northwest Project. These innovations were important for making the developed technologies more adaptable to local contexts. In addition, the farmers’ high adoption levels of appropriate technologies such as minimum tillage, mulching and intercropping not only provided a significant increase in income for farmers but also improved soil quality and reduced soil erosion. The application of minimum tillage and intercropping with legumes helped to increase the maize yield by 1.5 to 2 tons/ha, bringing additional net income in the range of US$140 to US$178/ha in the 2013 crop season. In addition, it was expected that the intercropping of pumpkins and rice bean with maize could also bring a significant increase in income with little investment in the project areas. In contrast, there was little improvement in the capacity of the farmers involved in the CIRAD ADAM Project and the NOMAFSI Project. Although the application of minimum tillage and intercropping with legumes helped to increase the maize yield by 1.0 to 1.5 tons/ha, with additional net income of US$90 to US$130/ha, a low level of adoption of sustainable techniques such as mulching and legume intercropping with maize was found in these two projects’ areas, leading to little change in crop diversification and a lower increase in income for farmers.

In terms of the physical and natural impacts on local livelihoods, because the impact assessment using the proposed holistic framework took place a short time after the completion of these projects, no evidence was found on the physical impacts on local communities. It was expected that significant
natural impacts would not be observable in the short-term; however, there was evidence of positive changes in crop patterns and soil quality. The shift from maize monocropping to intercropping (maize intercropped with rice bean or pumpkin) helped not only to increase the farmers’ incomes but also to improve soil quality and reduce soil erosion. The high level of application of minimum tillage in maize production on sloping land had also initially resulted in soil improvement in most research areas, especially in the ACIAR Northwest Project villages. To date, most existing impact assessment works has focused mainly on economic quantifiable indicators such as maize yields and improved income for farmers. However, limited efforts have been made on measuring the sustainability of these impacts such as changes in crop-patterns, soil and environmental improvement, and especially the connection between farmers’ innovation and the level of technology adoption. Therefore, measuring multiple livelihood impacts by using this holistic framework can potentially results in better use of these impacts for local development through persuasive policy intervention to local government, development agencies as well as lessons learned from how and what impacts can be delivered by AR4D.

Third, despite the small research scale of the three projects, the achievement of institutional impacts was acknowledged by local extension staff and farmers. The institutional impacts identified by this study were the enhanced capacity of the research institutions and local stakeholders participating in these projects, and the formulation of new local development policies. It was accepted by the national agricultural researchers participating in the three projects that their research capacity had been strengthened. Researchers in the ACIAR Northwest Project believed that the project equipped them with good technical knowledge, multi-institutional collaborative skills, and participatory methodology and PM&E experience, while researchers in the CIRAD ADAM Project and the NOMAFSI Project considered their technical knowledge to have improved due to their involvement in these two projects. In addition, local extension staff appreciated the benefits of the ACIAR Northwest Project in terms of building their capacity in sustainable maize-based farming systems, PM&E and participatory approaches. The extension staff involved in the ACIAR Northwest Project became good facilitators of training on sustainable maize production in sloping lands. The other short-term significant positive change in local development policies was the development and execution of Decision No. 14/QĐ-UBND issued by Son La province to pilot the application of sustainable farming techniques for maize production on 2800 ha of sloping lands from early 2014. It was believed by most researchers and local extension staff that the ACIAR Northwest Project played a crucial role in facilitating the formulation of this development program. In such a context of the Northwest Highlands, measuring institutional impacts are clearly crucial for understanding why and how different AR4D with different approach can lead to different level of outputs, outcomes and impacts.
It not only helps to propose better policy development for the regions but also share lessons among development stakeholders towards designing more efficient AR4D intervention in the future.

Last, looking at impacts in the vulnerability context, because the three projects were completed only a short time before this study was conducted, it was difficult to capture significant changes in the local livelihood contexts such as changes in human health, crop prices and market trends which have an influence on both the institutional and livelihood impacts. However, initial changes in crop diversification and production practices were observable. Intercropping complementary crops such as rice bean, peanut and pumpkin with maize in the maize-based system was being practised in most of the research areas of the three projects, especially the ACIAR Northwest Project. The rapid shift from the application of full tillage to the minimum tillage technique for maize production on sloping lands could be seen as the most significant impact on resource use in the local communities. These positive changes had affected local farmers’ choices in pursuing livelihood strategies to achieve livelihood outcomes, leading potentially to positive impacts on the local environment. Measuring impacts of AR4D in the vulnerability contexts may not be fully achieved in a short-term but can be captured in a long-term. Because measuring such types of impacts have been ignored by conventional impact assessment approaches, the holistic impact assessment framework has potentially made a great contribution to impact assessment of AR4D initiatives in the future.

Despite of the strengths of the application of the sustainable livelihood approach in defining types of impacts of AR4D, the study found some constraints. First, most agricultural research focuses on the achievement of direct research outputs (e.g., new technologies, publications and training) and quantifiable impacts at community level (e.g., crop yields, a reduction in production cost and an increase in household incomes). Therefore livelihood impacts such as human and social capital are often not the core interest of research intervention. In addition, as the vulnerability context of local communities are often influenced by many social economic factors, it is hard to identify a strong link between research interventions and changes in local vulnerability. The study also indicates that institutional impacts of AR4D can be achieved and measured at a local or organizational level but it may be a lot more difficult to achieve such change at a higher level in Vietnam because of the existence of the top-down political system.

**Recommendations from assessing the impacts of the three research projects**

Based on the impact assessment findings for the three agricultural research projects, it is recommended that, in complex farming systems and diverse cultural conditions such as the Northwest Highlands, AR4D should be based on the participatory and interdisciplinary approach innovated by the ACIAR Northwest Project. Furthermore, these approaches should be institutionalised in order to replace the conventional top-down research approach.
However, this requires the research and collaborative capacities of the research institutions, local farmers and research partners to be strengthened. The use of participatory processes could help to enhance the role of local farmers and research partners in decision-making processes towards empowering them to change their situations. In addition, AR4D interventions should place the development of livelihoods for target communities as the core objective of the intervention. Moreover, the application of the developed technologies should be based on a careful consideration of the specific socio-economic and natural conditions of the communities and region.

The outreach piloting of successful technologies in non-research areas is necessary for the scale-out of research output applications; however, these roll-out activities should be handed over to local extension agencies and farmers to implement, monitor and evaluate themselves on a large enough scale over several seasons. This would help to improve their understanding about the applicability of the technologies in their local contexts of livelihood resource availability. Although research institutions are not expected to be involved in the development and implementation of outreach strategies, their continuous connection with local farmers and extension institutions – through continuous encouragement, sharing of technical materials and the provision of advice to these local stakeholders – could facilitate the successful scale-out of new technologies. In addition, attention should be paid to assessing the long-term livelihood impacts of research interventions in order to make use of the impact assessment findings for local development and for future research interventions.

8.2.3. Lessons learned from developing a holistic impact assessment framework for AR4D

Through validating the holistic impact assessment framework for AR4D projects in the Northwest Highlands, some valuable lessons can be drawn.

First, it is important to understand the key aspects that distinguish AR4D from conventional agricultural research. Although many agricultural research projects claim to be AR4D, the practical communication strategies for enhancing the engagement of stakeholders in the research process vary in effectiveness. In the case of the findings in the present study, this explains the misunderstanding about AR4D concepts among the research institutes. As discussed in section 6.4, among three selected agricultural research projects for this study, the ACIAR Northwest Project could be seen as a genuine AR4D Project which aimed to enhance the engagement of local stakeholders, especially smallholder farmers, in the research process in order to develop innovations that are adaptable to local socio-economic and natural conditions. However, it has been found from the study that it is still challenging to have both agricultural researchers from different research institutes and local stakeholders fully understand the concept of AR4D.
Second, the impacts of AR4D can be better achieved if research projects are well designed and implemented with a particular focus on the development of local livelihoods. The use of different research processes and communication strategies in AR4D projects could facilitate different levels of stakeholder engagement in a research process, leading to different outcomes and impacts on the livelihoods of the target communities. Therefore, the impact assessment of AR4D should focus not only on identifying and measuring impact indicators but also on understanding why and how impacts have been generated and sustained through complex and dynamic farming systems. The findings from validating the holistic impact assessment framework with three agricultural research projects in the context of the Northwest Highlands indicated that participatory processes used by the ACIAR Northwest Project had facilitated active involvement of local stakeholders in a research processes leading to higher levels of impacts, especially in the development of human capital. In contrast, conventional top-down approach used by the CIRAD ADAM and NOMAFSI Project resulted in minimum participation of local people in decision-making and lower level of new technology adoption.

Third, the integration of the ToC approach from the design stage helps to map a plausible pathway with underlying assumptions and hypotheses about how an AR4D intervention can potentially lead to changes in people’s capacities and behaviours and their adoption of research outputs towards achieving livelihood impacts. The application of interdisciplinary, multi-institutional and participatory approaches to AR4D can potentially create a good methodology to deal with the real problems of specific locations and communities; however, it can be expected that challenges will be faced in the application of these approaches, especially in regions where development projects have been historically dominated by conventional top-down research practices. Among the three selected projects, the ACIAR Northwest Project had made attempts to develop an impact pathway since the design stage to capture change. However, if the ToC had been designed in a participatory way with more detailed assumptions and descriptions about links from expected direct research outputs to expected outcomes and impacts, the impacts can be comprehensively measured by applying the holistic impact assessment framework.

Fourth, the participation of local stakeholders such as farmers, extension staff and private sector actors in a research process, together with strong collaboration among research institutions, can be seen as a key factor in the success of AR4D interventions in socially complex and disadvantaged regions. Farmers know best their complex farming systems; therefore, improving the research partnership between researchers and farmers by involving farmers as co-researchers from the planning stage to the implementation and monitoring and assessment of AR4D can help to achieve better impacts. The engagement of local stakeholders in AR4D can be enhanced by using participatory mechanisms. Although the ACIAR Northwest Project and the CIRAD ADAM Project
were carried out in the same district of Son La province, it was the involvement of farmers and local extension staff in planning, monitoring and evaluation, and in the scale out of successful technologies that had helped the ACIAR Northwest Project to deliver better outcomes even in a short period after the project completed.

Fifth, the impact assessment of AR4D should not only focus on measuring the contribution of the research intervention but also aim to build the capacity of local people so that they can utilise the impact assessment findings for development. The success of the new technologies and their potential to be scaled-up and scaled-out depend on both the efforts of farmers and the support from local extension staff and authorities. Farmers must have adequate knowledge and skills in order to apply those technologies. At the same time, local extension staff and policy-makers must facilitate institutional-enabling environments and provide technical support to farmers in order to sustain the impacts of AR4D. Without paying attention to local social complexity, the historical dominance of conventional top-down approaches and the constraints in time, funding and human resources that affect farmers’ attendance in participatory impact assessment sessions, real impacts may not be measured.

Sixth, the findings from applying the proposed holistic impact assessment framework in three projects highlight that there is no one set of standard participatory techniques to fit all AR4D impact assessments. Using participatory communication techniques for impact assessment requires researchers to pay careful attention to both the local social complexity and the available resources in order to develop the most relevant impact assessment strategies. The use of simple and understandable language should also be carefully considered when communicating impact assessment findings in line with the level of education or relevant skills of the key stakeholders. The dissemination of visual products, such as participatory videos, photo stories and posters in international conferences and seminars, agricultural extension training courses and online databases can help to sustain the impacts effectively. Finally, the design and application of impact assessment as part of ongoing PM&E mechanisms in an AR4D project could not only help to achieve effective adaptive research processes but also provide convincing evidence about the outputs, outcomes and impacts of a research intervention. Maximising the ownership of the research process could lead to effective PM&E systems.

8.3. Limitations of the study

In spite of efforts to develop the most appropriate research methodology, this study had some limitations in regard to both the development and the application of the research methodology to achieve the research objectives.
The overall objective of this study was to develop a holistic impact assessment framework for AR4D and to test this framework in the context of the Northwest Highlands. As AR4D initiatives have only become more transparent in the region since the late 2000s and few attempts had been made to review the existing AR4D projects and their impact assessment approaches, both agricultural researchers and local stakeholders such as local farmers, extension staff and local leaders had limited understanding about the potential contribution of impact assessment to local development. This made it difficult for the study to gather data and information related to the theories and practice of impact assessment of AR4D in the region. To mitigate this limitation, the researcher reviewed and analysed the literature on existing impact assessment theories and practices in regions with similar socio-economic and natural conditions as the Northwest Highlands. In the early stage of this study, the researcher held meetings with researchers from leading research institutes and universities carrying out agricultural research in the region and engaged in in-depth discussions with them about existing impact assessment practices in agricultural research. This helped the researcher to gain insights into how agricultural research activities were implemented and evaluated and the extent to which the impacts were utilised for development.

For data collection and analysis, the study adopted some participatory approaches with various participatory techniques, such as FGDs with farmers, semi-structured interviews with farmers, in-depth interviews with key informants and observation, in combination with documentary research. The use of multiple methods required the researcher to have adequate skills and knowledge in order to understand and mix these methods to achieve the study’s objectives. In addition, although the application of participatory and visual techniques helped to gain valuable qualitative and quantitative data, it also required a lot of time, funds and human resources from the testing to the implementation of methodologies. The researcher had the advantage of prior experience in using these methodologies and techniques for the monitoring and evaluation of agricultural research. Support was also received from researchers at NOMAFSI, TBU and VNUA not only in terms of assistance to make contact with local communities and extension staff but also in terms of sharing secondary data and information and participating directly in in-depth interviews for the study. Future applications of the proposed holistic framework for impact assessment of AR4D projects may be hindered by these issues if researchers lack capacity or neglect to pay careful attention to constraints in funds, time and human resources.

AR4D projects often take a long time to generate impacts, leading to the fact that some impacts may not be observed over a short-term period. As the three projects selected for testing the proposed holistic framework for impact assessment were completed in 2013 and 2014, the full impacts of these projects could not be measured. Moreover, because of constraints in time, budget and human resources, the study could not conduct research activities at all the research sites of these projects.
Although the scale of the sites selected in the study was suitable for validating the impact assessment framework, more comprehensive theoretical and practical findings could have been gained if the impact assessment was conducted in all the sites of these projects. In addition, reliable results from statistical tests such as the Pearson Chi-square test are more likely to be achieved if semi-structured interviews are conducted with a large and random research sample. This would help to make more convincing conclusions about the contribution of AR4D projects in regard to the indicators, particularly relating to economic impacts or statistical tests about the correlation between variables such as the participation level in a project and the adoption level of new technologies, and the farmers’ levels of access to capacity training and their willingness to apply sustainable farming techniques.

Overall, addressing these limitations would help to facilitate the immediate utilisation of AR4D impact findings and the formulation of appropriately targeted development policies and strategies in regions such as the Northwest Highlands.

8.4. Implications for future research

This study makes both theoretical and practical contributions to development through its review of existing theories and practices related to the impact assessment of agricultural research and its development and validation of the holistic framework for impact assessment of AR4D projects in the context of the Northwest Highlands. The proposed holistic impact assessment framework can be applied to analyse fully the contribution of AR4D projects. The theoretical and empirical evidence from the study can be utilised for better impact assessment of AR4D projects in the future.

In regard to the theoretical contribution, the proposed holistic impact assessment framework is approached from a comprehensive livelihoods perspective and can be applied to assess the impacts of AR4D. It is noted that it would be necessary to modify the framework and its participatory techniques in order to adapt them to the specific local socio-economic and geographical contexts in which it is applied. In addition, the impact achievement of AR4D projects depends on many factors such as the active involvement of the target beneficiaries in research, the availability of support from institutional systems and the research and development objectives of the funding agencies. Therefore, it is vital to identify appropriate strategies to change all the stakeholders’ development perspectives and to develop the capacity of both researchers and local stakeholders in order to achieve a shift from a top-down approach to a bottom-up approach and from defined project outputs to a livelihoods focus in the impact assessment of agricultural research. The results of these efforts will influence the extent to which the holistic impact assessment framework is institutionalised as a tool for social change and development in remote and culturally diverse regions.
In terms of the practical contribution, the study enhances stakeholders’ understanding about existing impact assessment frameworks and approaches and the impacts of AR4D projects. The study’s findings and recommendations also contribute to the formulation of appropriately targeted development policies and strategies for the Northwest Highlands. The research findings were largely based on testing the proposed framework on several research components in certain sites of three recently completed AR4D projects, meaning that the full impacts of these projects could not be captured. Therefore, there is a need to apply the proposed holistic impact assessment framework for AR4D projects to completed research projects over a longer period of time in order to make comprehensive conclusions about the contribution of the projects. This will also potentially result in a further-enhanced impact assessment framework for AR4D that can be utilised in other regions with similar socio-economic and natural settings.

As discussed in regard to the limitations of the study, the application of the proposed holistic impact assessment framework will require the sufficient allocation of time, funding and financial resources. Future impact assessment efforts should pay careful attention to the flexible use of participatory techniques and resources by reference to the specific context of the research setting. In addition, impact assessment findings can only be sustained if the multiple direct and indirect impacts are shared among different groups of interested stakeholders and at different levels. In this study, because of constraints in time and resources, sharing the impact assessment findings and getting feedback from the key stakeholders mainly occurred during the data collection process rather than in separate local-level workshops. In future impact assessments, it would be important to hold dedicated workshops with the participation of local stakeholders in order to share and validate the impact assessment findings with the beneficiaries and to strengthen the partnerships between the relevant research institutes, local communities and extension systems. This can help to facilitate the utilisation of the impact assessment findings for development.

Finally, the integration of ToC as a complementary tool for the impact assessment of AR4D is important in order to measure the changes that occur within complex and dynamic agricultural systems. The impact assessment of AR4D proposed in this study utilised the ToC approach to unravel the plausible links between a research intervention and its impacts. However, the framework was tested in three selected AR4D projects in which only limited attempts had been made in the project design stage to map the impact pathway and consider the assumptions about various critical conditions and the rival factors likely to influence the impact achievement of agricultural research. Therefore, it is recommended that ToC approach is integrated in the research planning stage of AR4D projects as part of the impact assessment scheme in order to trace the full impacts of agricultural research.
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APPENDICES

Appendix 1: Observational note-taking form

(Used for field observation)

Assessing impacts of agricultural research for development in culturally diverse environments in the Northwest Highlands of Vietnam — Sustainability, participation and communication

Date: ______________________

Name of village and commune: ..................................................................................................................

KEY ISSUES TO BE CAPTURED DURING OBSERVATION

<table>
<thead>
<tr>
<th>INFORMATION NEEDED</th>
<th>DESCRIPTIVE INFORMATION</th>
<th>PERSONAL REFLECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Social economic situation of the local study villages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Village road systems;</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>- Types of houses;</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>- Access to electricity and communication systems (telephone, speakers, TV and radio)</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>- Primary cash crops, land and forestry resources;</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>- Accessibility to markets;</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>- Farming activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Outcomes and impacts of AR4D interventions (e.g., the ACIAR Northwest, the CIRAD-ADAM, the NOMAFSI project)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human: Observable changes in the capacity of local stakeholders (local farmers, extension workers and leaders) such as their being active or passive to participate in this research activities or in their own community activities, communication skills, their being happy or unhappy about the research interventions.</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Social: Observable levels of cooperation, engagements in in research or local common activities among community members and between minority and majority members, between men and women, the poor and the better-off farmers.</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Economics: Positive or negative changes in economic conditions of local villagers (such as new houses, new farm equipment</td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>INFORMATION NEEDED</td>
<td>DESCRIPTIVE INFORMATION</td>
<td>PERSONAL REFLECTION</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>and transportation means, and transport vehicles.</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>Natural:</strong> Evidences of change in soil erosion pattern in sloping lands, forestation, and the improvement and soil fertility or crop diversification, resulted from the application of sustainable farming techniques such as minimum tillage, mulching, intercropping systems in maize based systems,</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>Physical:</strong> Evidences of any improvement or change in transportation, roads, buildings, communication systems.</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>Changes in institutional capacity:</strong> Evidences of any improvement in capacity of local leaders and extension workers who involved in selected AR4D compared who did not involve in AR4D, an existence of any policy documents or posters about technologies, promoted by AR4D interventions at local villages and communes.</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>Changes in vulnerability context:</strong> Changes in crop diversification on the fields, human or animal health, crops or animal diseases, accessibility to market</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>3. Key conclusion from field observation in the project area………</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>- General characteristics of research communities</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>- Observable obtained outcomes and impact of research interventions</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>- Any risks or assumptions to be recognized.</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>
Appendix 2: Household Semi-Structured Questions

(Used for semi-structured interview with farmers)

Research: Assessing agricultural research for development in culturally diverse environments in the Northwest Highlands of Vietnam – Sustainability, participation and communication

Name of Interviewer: ______________________
Date: ______________________

I. BACKGROUND INFORMATION

1. Full name: ______________________________________________________________

2. Village: ______________________________________________________________

3. Sex: 1 – Male  2 – Female

4. Age: Ethnic:

5. Educational Attainment:
   □ Illiteracy  □ Primary  □ Secondary  □ High school  □ Vocational, college & university

6. Total Number of Household Members (including Respondent):_______

7. Estimated household income of 2013: ____________ (million VND)

8. Estimation of gross income and investment for agricultural production of farm households?

<table>
<thead>
<tr>
<th>Total</th>
<th>Agriculture (%)</th>
<th>Off-farm (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross income</td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Investment</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

9. Major source of incomes:

<table>
<thead>
<tr>
<th>Ord</th>
<th>Activities</th>
<th>Level (rank 1 as the most important)</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cultivation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Animal husbandry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Poultry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Selling labor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Small business</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Other off-farm activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Other (Please specify__________</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Note, rank 1,2,3...)

10. Accommodation, hygiene and drinking water

- **Type of houses**
  - Cottages
  - Brick house with leave/straw roof
  - Brick house with tile/corrugated ironroof
  - Concrete house, one storey
  - Concrete house, two or more storey
  - Nha san (traditional wooden houses)

- **Drinking water**
  - Source
    - Dig well
    - Spring/stream
    - Pond/lake
    - Rain
  - Facilities
    - Buckets
    - Hand pump
    - Electric pump
    - Auto-run pipe
Natural water source

Other

Toilets

No toilets
Holes
Double latrines
Other (specify)

Nhà cầu
Toilets

II. PRODUCTION AND MARKETING

Production Inputs

11. Total agricultural and forestry land area (m²): ____ of which, agricultural land (m²): _________

12. Primary agricultural products of households?

<table>
<thead>
<tr>
<th>Agricultural products</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Present</td>
</tr>
<tr>
<td>1………………………</td>
<td></td>
</tr>
<tr>
<td>2………………………</td>
<td></td>
</tr>
<tr>
<td>3………………………</td>
<td></td>
</tr>
<tr>
<td>4………………………</td>
<td></td>
</tr>
<tr>
<td>5………………………</td>
<td></td>
</tr>
</tbody>
</table>

Note: Rank from 1 to 2, 3... (1 is the most important agricultural product)

13. What kind of seeds/varieties do you currently use?

<table>
<thead>
<tr>
<th>Primary crops and livestock</th>
<th>Local varieties</th>
<th>Buy from input supply agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percentage %</td>
<td>Source</td>
</tr>
<tr>
<td>1………………………</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2………………………</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3………………………</td>
<td></td>
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<tr>
<td>4………………………</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5………………………</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1= Self-supply, 2= buy from outside seed input supply agents

14. How do you evaluate the quality of seed supply services at local commune?

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Evaluation (1= Yes 2= No)</th>
<th>Why</th>
</tr>
</thead>
<tbody>
<tr>
<td>Much in quantity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Much in kinds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reasonable price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Providing advice on how to use seeds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy access to seed supply agents</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
15. How do you evaluate the quality of fertiliser, pesticides at local commune?

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Evaluation (1 = Yes 2 = No)</th>
<th>Why</th>
</tr>
</thead>
<tbody>
<tr>
<td>Much in quantity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Much in kinds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reasonable price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Providing advice on how to use seeds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy access to seed supply agents</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16. Where do you get information about price for buying agricultural inputs (e.g. fertilisers, seeds) (Number 1 as the most important)

[ ] Relatives or neighbours
[ ] Local extension staff
[ ] Village/commune leader
[ ] TV, radio, local speakers
[ ] Local markets
[ ] Agents and sellers
[ ] Local collectors or traders
[ ] Others (please specify).............................

17. How do you decide prices to buy inputs (e.g. for seeds, fertilisers,…)?

[ ] Current market price
[ ] Fixed price
[ ] Negotiation between sellers and buyers
[ ] Other (specify): ____________________

18. How do you evaluate the capacity of current local irrigation system?

[ ] Meet the need for about (90-100%)
[ ] Meet the need for about (70-89%)
[ ] Meet the need for about (50-64%)
[ ] Meet the need for about (20-49%)
[ ] Meet the need for about less than 20%
[ ] No irrigation system

19. Do you apply any sustainable cultivation methods or techniques for agricultural production (such as mulching; mini-terrace, intercrop…)?

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

230
20. If yes, how do you know these techniques and how long your households have applied these methods or techniques (local extension, development projects, NGOs…)?
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

21. What are benefits of applying these methods and techniques?
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

22. If NO, why did your household not apply these sustainable methods and techniques?
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

23. Are you willing to apply new production methods and techniques if you are provided with technical support?
   [ ] Willing
   [ ] Not willing
   [ ] Waiting for other to apply successfully then follow
   [ ] Other (Specify)
   Why?
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

24. Does total production cost of ……(maize/plum) increased over the past three years? If Yes what are the main reasons?
   [ ] Not increase   [ ] little increase   [ ] Medium increase   [ ] Much increase
   Why?
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
Production cost and revenues

25. Total production cost, productivity and price of 1 primary crop in 2013 (for the largest field of household)?

Crop ___________ Area ___________ (m²)

<table>
<thead>
<tr>
<th>Items</th>
<th>1st crop</th>
<th></th>
<th>2nd crop</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount</td>
<td>Price ('000d/kg)</td>
<td>Amount</td>
<td>Price ('000d/kg)</td>
</tr>
<tr>
<td></td>
<td>(kg)</td>
<td></td>
<td>(kg)</td>
<td></td>
</tr>
<tr>
<td>1. Major input cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Seed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Manure</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>- Urea</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Phosphorus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Potassium</td>
<td></td>
<td></td>
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<tr>
<td>- NPK (kg)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>- Pesticide</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Herbicide</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Hired labour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Land preparation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Seed sowing/transplanting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Cultivation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Harvesting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Transport cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Irrigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Field protection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Storage before sale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Total production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Main products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- By products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Product sale and marketing

26. Ways of selling primary products of households
   [ ] Selling at farm, percentage ________(%)
   [ ] Selling as soon as harvesting at home, percentage ________(%)
   [ ] Selling at after storage at home, percentage ________(%)
   [ ] Selling as soon as harvesting at markets, percentage ________(%)
   [ ] Selling at after storage at market, percentage ________(%)

27. Percentage of selling products according to customers
   [ ] Final consumer, percentage ________(%)
   [ ] Collector, percentage ________(%)
   [ ] Processor, percentage ________(%)
   [ ] Firms, percentage ________(%)
   [ ] Other farmers to use as seed, percentage ________(%)
   [ ] Others, percentage ________(%)

28. Who decides price?
   [ ] Buyers    [ ] Both buyers and sellers
   [ ] Sellers    [ ] Market
   [ ] Other (Specify)____________________

29. Where do you get information about price for selling your major agricultural products? (1 as the most and 4 as the less important source)
   [ ] Relatives or neighbours
   [ ] Local extension staff
   [ ] Village/commune leader
   [ ] TV, radio, local speakers
   [ ] Local markets
   [ ] Agents and sellers
   [ ] local collectors or traders
   [ ] Others (please specify)...........................................

30. How do you get information about product prices?

<table>
<thead>
<tr>
<th>Information Source</th>
<th>2014</th>
<th>Before 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relatives or neighbours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local extension staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Village/commune leader</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TV, radio, local speakers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local markets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agents and sellers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local collectors or traders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1 = very often; 2 = often; 3 = sometimes; 5 = rarely

31. Way to access information?

<table>
<thead>
<tr>
<th>Information Source</th>
<th>2014</th>
<th>Before 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relatives or neighbours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local extension staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Village/commune leader</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TV, radio, local speakers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local markets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agents and sellers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local collectors or traders</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
32. Difficulties in product selling of households?

III. ACCESS TO AGRICULTURAL EXTENSION SERVICE

33. Did you participate in any training courses and workshops conducted at local community by agricultural research projects?

☐ Yes  ☐ No

34. If Yes, what are trainings and workshops you participated in the last three years? What are the most important trainings or workshops to your household?

<table>
<thead>
<tr>
<th>Trainings</th>
<th>Contents</th>
<th>Ranks</th>
<th>Projects or programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Sustainable agricultural method and techniques</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Animal husbandry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Marketing and product selling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Healthcare</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>☐ Gender sensitivity</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>☐ Credit and saving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Household economic management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Sustainable natural resource management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Production planning and decision making</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Others (Please specify): __________</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Ranking 1 to 2,3...(1 is the most important)

35. What do you think the successes and failures of recent projects (1 - 3 the most recent projects)?

Project 1: ...............  

<table>
<thead>
<tr>
<th>Successes</th>
<th>Failures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project design</td>
<td></td>
</tr>
<tr>
<td>Project implementation</td>
<td></td>
</tr>
<tr>
<td>Monitoring and evaluation</td>
<td></td>
</tr>
<tr>
<td>Project 2: ...............</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Successes</strong></td>
<td><strong>Failures</strong></td>
</tr>
<tr>
<td>Sharing of research results after project completed</td>
<td></td>
</tr>
<tr>
<td>Project design</td>
<td></td>
</tr>
<tr>
<td>Project implementation</td>
<td></td>
</tr>
<tr>
<td>Monitoring and evaluation</td>
<td></td>
</tr>
<tr>
<td>Sharing of research results after project completed</td>
<td></td>
</tr>
</tbody>
</table>

36. What recommendation do you have for future impact assessment of agricultural research for development projects implemented in your communes?

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

Thank you!
Appendix 3: Guide for In-depth Interview with local leaders
(Used for interview with village, commune leaders)

Research: Assessing agricultural research for development in culturally diverse environments in the Northwest Highlands of Vietnam – Sustainability, participation and communication

Name of Interviewer: ______________________
Date: ______________________

I. GENERAL INFORMATION

Full name of interviewee: ..........................................................................................................
Organisation: ..............................................................................................................................
Position: ....................................................................................................................................
Years of leadership: ....................................................................................................................

II. KEY ISSUES TO EXPLORE IN THE INTERVIEW

1. General social economic and natural situations of the local areas (land, population, economics, agricultural products…)?
2. What are the most significant social economic changes and major socio-economic, cultural or political problems at local areas in recent years?
3. What are major agricultural research projects (government and externally funded) at local (village/commune/and district) in the last 10 years?
4. Major communication approaches (participatory or non-participatory, types of communication, tools and language) have been adopted in these agricultural research projects.
5. How has local government provided supports to local agricultural extension systems, farmers and external research institutions in designing, implementation, monitoring and evaluation of these agricultural research projects?
6. Have impact assessment method been designed or carried out by agricultural research projects in local village/commune/district?
7. If yes, What are the major strengths and weaknesses of existing impact assessment approaches? Why?
8. The role of local government in disseminating results of impact assessment of agricultural research projects to local farmers and extension networks?
9. What recommendation do you have for future impact assessment of agricultural research for development projects?

Thank you very much!
Appendix 4: Guide for in-depth interview with agricultural extension staff

(Used for interview with commune and district agricultural extension staff)

Research: Assessing agricultural research for development in culturally diverse environments in the Northwest Highlands of Vietnam – Sustainability, participation and communication

Date: __________________________

I. GENERAL INFORMATION

Full name of interviewee: .................................................................................................................................
Commune or district: ...........................................................................................................................................
Years of experience: ..............................................................................................................................................

II. KEY QUESTIONS IN THE INTERVIEW

1. Could you give an overview of local agricultural extension system (types of extension services, human resource, and extension actors (GoV, NGOs and private sector)): strengths, weaknesses, and threats and opportunities?
2. What are major AR4D projects you have involved at local communes/district in the last five years?
3. What are your roles in implementation, monitoring and evaluation of the AR4D project (e.g. ACIAR AGB/2008/002 or CIRAD ADAM Project or NOMAFSI Government Funded Project?
4. Major communication approaches (participatory or non-participatory, types of communication, tools, language) have been adopted in this AR4D projects. What are the strengths and weaknesses of these communication approaches? Why?
5. Have impact assessment been designed or carried out by this project? If Yes, What and Why are major strengths and weaknesses of these M&E activities (in terms of objectives, types of communication)?
6. How AR4D projects’ evaluation results (including impact assessment) have been shared with among stakeholders such as local farmers, local government, and extension system?
7. What is the contribution or potential contribution of this AR4D to your capacity, your institution and to the formulation of future development plans and research for development strategies for local areas and regions?
8. What recommendations do you have for future impact assessment of agricultural research for development projects?

Thank you very much!
Appendix 5: Guide for in-depth interview with researchers
(Used for interview with agricultural researchers)

Research: Assessing agricultural research for development in culturally diverse environments in the Northwest Highlands of Vietnam – Sustainability, participation and communication

Date: ....................

I. GENERAL INFORMATION

Full name of interviewee: .................................................................

Organisation/Department: ..................................................................

Years of experience: ...........................................................................

Research Project: ..............................................................................

II. KEY QUESTIONS IN THE IN-DEPTH INTERVIEW

1. What are your roles in the AR4D project (e.g. ACIAR Northwest Project or CIRAD ADAM Project or NOMAFSI Project)?

2. What is the collaboration between your research institution with local farmers, local government, local agricultural extension and other research institutions in implementing this AR4D project;

3. What are major communication approaches (types of communication, tools and language), which have been adopted in this AR4D project and what are strengths and weaknesses of these communication approaches?

4. How monitoring and evaluation (M&E) activities have been carried out by the project (e.g. pre-project, in-phase; end-evaluation) and what and why are major strengths and weaknesses of these M&E activities (in terms of objectives, types of communication)?

5. How AR4D projects’ evaluation results (including impact assessment) have been shared with key stakeholders (local farmers, local government and extension system and other research institutions)?

6. What is the contribution or potential contribution of this AR4D to your capacity, your institution and to the formulation of future development plans and research for development strategies for local areas and regions;

7. What recommendations do you have for future impact assessment of agricultural research for development projects?

Thank you very much!
Appendix 6: Guide for Focus Group Discussion with farmers

(Used for farmer groups)

**Research**: Assessing agricultural research for development in culturally diverse environments in the Northwest Highlands of Vietnam – Sustainability, participation and communication

**General Instruction**: To hold eight separate participatory focus group discussions (FGDs), including government funded project group; externally funded project group and the mixed group. Each group consist of 4 – 6 participants

I. BACKGROUND

No. of participants for this FGD (fill in the exact number): ..........................................................

- FGDs of: ........................................................................................................................................

Name of village and commune: ........................................................................................................

II. KEY ISSUES TO EXPLORE IN THE FGD

<table>
<thead>
<tr>
<th>INFORMATION NEEDED</th>
<th>KEY PARTICIPATORY TOOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. General socio-economic and natural characteristics of the local village</td>
<td></td>
</tr>
<tr>
<td>- Major socio-economic and cultural events happened at the village in the last 10 years.</td>
<td>Open Dialogue;</td>
</tr>
<tr>
<td>- Development projects and programs, especially agricultural research projects (government and externally funded) implemented at the villages in the last 10 years.</td>
<td></td>
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<tr>
<td>- Access to natural resource, markets and basic services (healthcare, education and extension).</td>
<td>Open-Dialogue;</td>
</tr>
<tr>
<td>5. Major agricultural research projects at the local village in the last five years</td>
<td></td>
</tr>
<tr>
<td>- Types of agricultural research (government and externally funded); Key activities</td>
<td>Open-Dialogue;</td>
</tr>
<tr>
<td>- Types of communication used by agricultural research projects</td>
<td>Open-Dialogue;</td>
</tr>
<tr>
<td>- Strengths and weaknesses of existing communication approaches (participatory or non-participatory)?Why?</td>
<td>Open-Dialogue;</td>
</tr>
<tr>
<td>6. Involvement of local villagers the Project …………(e.g. the ACIAR Northwest Project, the CIRAD ADAM or the NOMAFSI Project)?(concentrate on only one project)?</td>
<td></td>
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<tr>
<td>- The participation of people, especially women and the poor in planning and decision making processes</td>
<td>Radar diagram</td>
</tr>
<tr>
<td>- The participation of people, especially women and the poor in the monitoring and evaluation of the project’s activities</td>
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</tr>
<tr>
<td>INFORMATION NEEDED</td>
<td>KEY PARTICIPATORY TOOLS</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>- What are main benefits of conventional evaluation of impacts?</td>
<td></td>
</tr>
<tr>
<td>- Collaboration between local communities and local government, local agricultural extension network and agricultural researchers in implementation of the project?;</td>
<td>Venn-Diagram;</td>
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<tr>
<td><strong>7. Did the project carry out impact assessment activities? If Yes, what are the strengths and weaknesses of impact assessment of this project, Why?</strong></td>
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<tr>
<td>- Impact focus and activities</td>
<td>Open-Dialogue;</td>
</tr>
<tr>
<td>- What do you think about the strengths and weaknesses (e.g. scope and impact indicators, feedback mechanism) of existing impact assessment practice</td>
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<tr>
<td><strong>8. Impacts or potential impacts of this agricultural research for development project on local communities?</strong></td>
<td></td>
</tr>
<tr>
<td>- How livelihood capitals have been improved:</td>
<td>Open-Dialogue;</td>
</tr>
<tr>
<td>+ Economics: changes in production and farm net income and savings</td>
<td>Seasonal calendar</td>
</tr>
<tr>
<td>+ Social: community reciprocity, relationship with local leaders and traders, formation of farmer groups, and membership in organisations</td>
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</tr>
<tr>
<td>+ Human: changes in awareness about of soil protection, access to market; skills and production knowledge</td>
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</tr>
<tr>
<td>+ Natural: soil erosion protection, forest improvement</td>
<td></td>
</tr>
<tr>
<td>+ Physical: improvement in transportation, roads, buildings, communication system…</td>
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<tr>
<td>- How livelihood development strategies have been improved?</td>
<td></td>
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<tr>
<td>+ change in land use and crop selection?</td>
<td></td>
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<td>+ change in capital investment for production?</td>
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<tr>
<td>+ migration</td>
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<tr>
<td>- How livelihood outcomes have been improved</td>
<td></td>
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<tr>
<td>+ Food supply and household income?</td>
<td></td>
</tr>
<tr>
<td>+ Self-esteem?</td>
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<tr>
<td>+ Sustainable land use?</td>
<td></td>
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<td>+ Long-term production plan?</td>
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<tr>
<td>- How impacts have been on coping with vulnerability contexts?:</td>
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</tr>
<tr>
<td>+ Human or animal health, natural disasters;</td>
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</tr>
<tr>
<td>+ seasonality in price, agricultural production and employment;</td>
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<tr>
<td><strong>9. How results of project evaluation (including impact assessment) were shared with local people?</strong></td>
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</tr>
<tr>
<td>- Sharing results of short-term evaluation (e.g. project activity completion evaluation, mid-term review and final review)</td>
<td>Open-Dialogue;</td>
</tr>
<tr>
<td>INFORMATION NEEDED</td>
<td>KEY PARTICIPATORY TOOLS</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------------</td>
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<tr>
<td>- Sharing impact assessment’s results</td>
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<td><strong>10</strong> Sustainability of innovations made by the agricultural research for development project</td>
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<tr>
<td>- Scale-up potential</td>
<td>Open-dialogue;</td>
</tr>
<tr>
<td>- Local development strategies or policies</td>
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<tr>
<td><strong>11</strong> Recommendation or suggestions for improvement of impact assessment of agricultural research for development in the future</td>
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Appendix 7: List of coded participants, locations and research projects

I. FOCUS GROUP DISCUSSION

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<th>Name Code</th>
<th>Locations</th>
<th>Ethnic</th>
<th>Gender</th>
<th>Date</th>
<th>Target groups</th>
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<td>FGD 1.1</td>
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<td>Kinh</td>
<td>Female</td>
<td>30-31/01/13</td>
<td>ACIAR Northwest Project farmers</td>
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<td>2</td>
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<td>30-31/01/13</td>
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<td></td>
</tr>
<tr>
<td>Ord</td>
<td>Name Code</td>
<td>Locations</td>
<td>Ethnic</td>
<td>Gender</td>
<td>Date</td>
<td>Target groups</td>
</tr>
<tr>
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**Group 7**

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<th>Date</th>
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**Group 8**

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**II. SEMI-STRUCTURED INTERVIEW WITH INDIVIDUAL FARMERS**

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<td>20/07/14</td>
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</tr>
<tr>
<td>12</td>
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<td>Sinhmun</td>
<td>Male</td>
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<tr>
<td>Ord</td>
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<td>Location</td>
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<td>Gender</td>
<td>Date</td>
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<td>14</td>
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<tr>
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<tr>
<td>17</td>
<td>SMI 17</td>
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<td>18</td>
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<tr>
<td>20</td>
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<td>Male</td>
<td>20/07/14</td>
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</tr>
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<td>21</td>
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<tr>
<td>22</td>
<td>SMI 21</td>
<td>Pieng Sang Village, Phieng Luong commune, Moc Chau</td>
<td>Dao</td>
<td>Male</td>
<td>30-31/01/13</td>
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<tr>
<td>23</td>
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<td>Female</td>
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<td>SMI 24</td>
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<td>Dao</td>
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<td>26</td>
<td>SMI 26</td>
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<tr>
<td>27</td>
<td>SMI 27</td>
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<td>Thai</td>
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<td>22/07/2014</td>
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<tr>
<td>28</td>
<td>SMI 28</td>
<td>Chum Village, Chieng Dong commune</td>
<td>Thai</td>
<td>Male</td>
<td>22/07/2014</td>
<td>Non - project farmers</td>
</tr>
<tr>
<td>29</td>
<td>SMI 29</td>
<td>Chum Village, Chieng Dong commune</td>
<td>Thai</td>
<td>Male</td>
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<td>Non - project farmers</td>
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**III. IN DEPTH INTERVIEW WITH LOCAL LEADERS**

<table>
<thead>
<tr>
<th>Ord</th>
<th>Full names</th>
<th>Location</th>
<th>Ethnic</th>
<th>Gender</th>
<th>Date</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LEADR 1</td>
<td>Pieng Sang Village, Phieng Luong commune, Moc Chau</td>
<td>Dao</td>
<td>Male</td>
<td>30-31/01/13</td>
<td>Head of Village’s Farmers Association</td>
</tr>
<tr>
<td>2</td>
<td>LEADR 2</td>
<td>Pieng Sang Village, Phieng Luong commune, Moc Chau</td>
<td>Dao</td>
<td>Male</td>
<td>30-31/01/13</td>
<td>Head of village</td>
</tr>
<tr>
<td>3</td>
<td>LEADR 3</td>
<td>Suoi Khem Village, Phieng Luong commune, Moc Chau</td>
<td>Dao</td>
<td>Male</td>
<td>18/07/14</td>
<td>Head of village</td>
</tr>
<tr>
<td>4</td>
<td>LEADR 4</td>
<td>La Nga, Muong Sang commune, Moc Chau</td>
<td>Thai</td>
<td>Male</td>
<td>19/07/14</td>
<td>Head of village</td>
</tr>
<tr>
<td>Ord</td>
<td>Full names</td>
<td>Location</td>
<td>Ethnic</td>
<td>Gender</td>
<td>Date</td>
<td>Position</td>
</tr>
<tr>
<td>-----</td>
<td>------------</td>
<td>----------</td>
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<td>---------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>5</td>
<td>LEADR 5</td>
<td>Tong Han village, Chieng Hac</td>
<td>Sinh Mun</td>
<td>Male</td>
<td>20/07/14</td>
<td>Head of village</td>
</tr>
<tr>
<td>6</td>
<td>LEADR 6</td>
<td>Tong Han village, Chieng Hac</td>
<td>Sinh Mun</td>
<td>Female</td>
<td>20/07/14</td>
<td>Head of Village’s Farmers Association</td>
</tr>
<tr>
<td>7</td>
<td>LEADR 7</td>
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<td>Thai</td>
<td>Male</td>
<td>22/07/17</td>
<td>Commune’s agricultural staff</td>
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<tr>
<td>8</td>
<td>LEADR 8</td>
<td>Chum village, Chieng Dong commune, Yen Chau district</td>
<td>Thai</td>
<td>Female</td>
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**IV. IN DEPTH INTERVIEW WITH AGRICULTURAL EXTENSION OFFICERS**

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<thead>
<tr>
<th>Ord</th>
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<th>Organisation/Address</th>
<th>Gender</th>
<th>Date</th>
<th>Notes</th>
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<tbody>
<tr>
<td>1</td>
<td>EXT 1</td>
<td>Extension staff of Phieng Luong commune, Moc Chau, Son La</td>
<td>Male</td>
<td>18/07/2014</td>
<td>Moc Chau extension station</td>
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<tr>
<td>2</td>
<td>EXT 2</td>
<td>Moc Chau extension station, Son La</td>
<td>Male</td>
<td>18/07/2014</td>
<td>Moved to Van Ho district</td>
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<tr>
<td>3</td>
<td>EXT 3</td>
<td>Extension staff of Muong Sang commune, Moc Chau, Son La</td>
<td>Male</td>
<td>20/07/2014</td>
<td>Moc Chau extension station</td>
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<tr>
<td>4</td>
<td>EXT 4</td>
<td>Agricultural staff of Chieng Dong commune, Yen Chau, Son La</td>
<td>Male</td>
<td>22/07/2014</td>
<td>Yen Chau Extension station</td>
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<tr>
<td>5</td>
<td>EXT 5</td>
<td>Vice Director of Son La extension centre</td>
<td>Female</td>
<td>11/01/2014</td>
<td>Son La city</td>
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<td>6</td>
<td>EXT 6</td>
<td>Extension staff of Son La extension centre</td>
<td>Female</td>
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<td>Son La city</td>
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**V. IN-DEPTH INTERVIEW WITH AGRICULTURAL RESEARCHERS**

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<tr>
<th>Ord</th>
<th>Full name</th>
<th>Organisations</th>
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<th>Date</th>
<th>Project involved</th>
<th>Location of interviews</th>
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<tbody>
<tr>
<td>1</td>
<td>RESR 1</td>
<td>Department of Science and International Cooperation, NOMAFSI</td>
<td>Female</td>
<td>02/2012</td>
<td>The ACIAR Northwest Project The CIRAD ADAM Project</td>
<td>Hanoi</td>
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<tr>
<td>2</td>
<td>RESR 2</td>
<td>Save Children UK Vietnam</td>
<td>Female</td>
<td>02/2012</td>
<td>Other NGOs</td>
<td>Hanoi</td>
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<tr>
<td>3</td>
<td>RESR 3</td>
<td>The ADAM project, CIRAD, UPR SIA, F-34398 Montpellier, France</td>
<td>Male</td>
<td>02/2012</td>
<td>The CIRAD ADAM Project</td>
<td>Hanoi</td>
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<tr>
<td>4</td>
<td>RESR 4</td>
<td>Department of Soil Science and Upland Ecology, NOMAFSI</td>
<td>Male</td>
<td>18/02/2014</td>
<td>The NOMAFSI Project</td>
<td>Phu Ho, PhuTho</td>
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<tr>
<td>5</td>
<td>RESR 5</td>
<td>Department of Soil Science and Upland Ecology, NOMAFSI</td>
<td>Male</td>
<td>18/02/2014</td>
<td>The NOMAFSI Project</td>
<td>Phu Ho, PhuTho</td>
</tr>
<tr>
<td>Ord</td>
<td>Full name</td>
<td>Organisations</td>
<td>Gender</td>
<td>Date</td>
<td>Project involved</td>
<td>Location of interviews</td>
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<tr>
<td>6</td>
<td>RESR 6</td>
<td>Department of Science and International Cooperation, NOMAFSI</td>
<td>Male</td>
<td>18/02/2014</td>
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<td>Phu Ho, PhuTho</td>
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<tr>
<td>7</td>
<td>RESR 7</td>
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<td>Male</td>
<td>18/02/2014</td>
<td>The NOMAFSI Project</td>
<td>Phu Ho, PhuTho</td>
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<tr>
<td>8</td>
<td>RESR 8</td>
<td>NOMAFSI’s the Northwest Agriculture Forestry Research and Development Center</td>
<td>Male</td>
<td>19/08/2014</td>
<td>The CIRAD ADAM Project</td>
<td>Moc Chau, Son La</td>
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<tr>
<td>9</td>
<td>RESR 9</td>
<td>Faculty of Agronomy, Tay Bac University</td>
<td>Male</td>
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<td>12</td>
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<td>Centre for Agrarian System Research and Development (CASRAD), Vietnam Academy of Agricultural Sciences (VAAS),</td>
<td>Male</td>
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<td>Female</td>
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Appendix 8: Participant consent form

PARTICIPANTS CONSENT FORM

Name of Research Project:
Assessing agricultural research for development in culturally diverse environments in the Northwest Highlands of Vietnam – Sustainability, participation and communication

Investigator:
Huu Nhuan Nguyen
PhD Student, School of Journalism and Communication
University of Queensland, Australia
Email: huunhuan.nguyen@uqconnect.edu.au

Consent agreement
1. I have read the Project Information Sheet and confirm that I am willing to participate in this research and that I understand the nature of the research and my role in it
2. I understand that I am free to withdraw from the project at any time and to withdraw any data I have contributed that has not already been processed.
3. I understand that while information gained during the study will be published, my personal information will remain confidential.

Should you need to obtain permission to record interviews, as possible additions would be:
4. I give my permission for my responses in interviews to be recorded.
   □ Yes   □ No

I hereby agree to be involved in the above research project as a respondent. I have read the research information sheet pertaining to this research project and understand the nature of the research and my role in it.

Full name of participant: ..............................................................................................................................................
Signature of participant: ..............................................................................................................................................
Date:    /   /
Researcher’s signature and date: ...................................................................................................................................
### Appendix 9: Key research components and expected outputs of the ACIAR Northwest Project

<table>
<thead>
<tr>
<th>ACTIVITY COMPONENTS</th>
<th>KEY EXPECTED OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective 1:</strong> To establish an understanding of constraints in maize and temperate fruit based farming systems that limit smallholder engagement in profitable markets and identify opportunities to overcome these constraints</td>
<td>• Profiling of market mechanisms, constraints and opportunities for more profitable farming systems for smallholders</td>
</tr>
<tr>
<td></td>
<td>➢ Documentation: current market information and outcomes of previous value chain studies ➢ Methodology development: diagnostic studies, RVCA ➢ Profile of target communities (needs and opportunities) ➢ RVCA for selected products such as maize and plum</td>
</tr>
<tr>
<td></td>
<td>• Identification of current resource constraints and opportunities to improve management practices</td>
</tr>
<tr>
<td><strong>Objective 2:</strong> To develop improved farm and value chain management practices to optimise sustainability and profitability in smallholder maize and fruit-based farming systems</td>
<td>• Identification and prioritisation of market opportunities for improved smallholder profitability with associated market information requirements</td>
</tr>
<tr>
<td></td>
<td>• Evaluation of different management practices best suited to local</td>
</tr>
<tr>
<td>ACTIVITY COMPONENTS</td>
<td>KEY EXPECTED OUTPUTS</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>conditions for increasing production and sustaining resource base</td>
<td>➢ Comprehensive report on promising cropping systems related to market opportunities and smallholder biophysical key constraints</td>
</tr>
</tbody>
</table>

**Objective 3:** To build competitive value chain models which engage smallholders with more profitable markets that support improved land and crop management

- Development of competitive value chains through implementation of intervention strategies that effectively engage smallholders in the fruit and maize-based systems and overcome current value chain constraints
  - Team members competent in value chain building processes.
  - RVCA workbook revised and updated;
  - A series of workshops with smallholders on plum and pumpkin value chains;
  - Evaluation and review cycle for each demonstration value chain

- Identification of appropriate management practices and design of associated communication methods and materials in maize and temperate fruit based farming systems that engage the market
  - Report on evaluation of identified best bet management options to improve systems adaptability to manage risk;
  - Draft modules for FF&BS manual
  - Materials for dissemination of research outputs
  - Pilot scheme documented

**Objective 4:** Evaluation of value chain interventions and improved land and crop management techniques to support scale out of successful technologies into government and non-government development strategies

- Identification, design and piloting of effective mechanisms of value chain engagement that improve stakeholder profitability
  - Impact analysis and mapping of value chain potential
  - Communication pathways between project research partners and between research partners and local authorities and farmers
  - FF&BS curriculum delivery and training outputs documented
  - Conference and publications (participatory videos, awareness raising training modules, laminated leaflets for farmers)

- Evaluation of effectiveness and impacts of collaborative mechanisms for improved farming systems and value chain development on smallholders’ livelihood
  - Knowledge, attitude, skills and practice (KASP) analysis documented
  - Scientific paper
  - Impact analysis and mapping of value chain potential
Appendix 10: Key research components and expected outputs of the CIRAD ADAM Project

<table>
<thead>
<tr>
<th>ACTIVITY COMPONENTS</th>
<th>KEY EXPECTED OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research Component 1: Design and evaluate conservation agriculture systems</strong></td>
<td></td>
</tr>
<tr>
<td>• Assessing collection of cover crops for use in developing sustainable cultivating systems</td>
<td>➢ Conservation of a collection of cover crops for use in developing sustainable cultivating systems</td>
</tr>
<tr>
<td>• Research for developing DMC systems as alternatives to unsustainable monocropping system of two maize crops per year in sloping lands in Yen Bai province</td>
<td>➢ Developing DMC systems as alternatives to unsustainable monocropping system of two maize crops per year</td>
</tr>
<tr>
<td>• Research for developing DMC systems as alternatives to unsustainable monocropping system of maize in flat lands in Son La province (in NOMAFSI experimental area in Son La)</td>
<td>➢ Developing DMC systems as alternatives to unsustainable monocropping system of maize in flat lands</td>
</tr>
<tr>
<td>• Research for developing DMC systems as alternatives to unsustainable monocropping system of maize in flat lands in Son La province (in NOMAFSI experimental area and in Chieng Hac, Son La)</td>
<td>➢ Developing DMC cropping systems as alternatives to unsustainable maize-monocropping system (1 crop per year) in sloping lands</td>
</tr>
<tr>
<td>• Tea-based agronomic experiments such as intercropping, cover cropping, mulching and shading plants in tea based farming systems</td>
<td>➢ To test and define appropriate production techniques for tea production in sloping lands</td>
</tr>
<tr>
<td><strong>Research Component 2: On-farm (with participation of farmers) validation of potential sustainable cultivating practices and systems</strong></td>
<td></td>
</tr>
<tr>
<td>• Setting up a network of farmer households in Van Chan district (Suoi Giang and Son Thinh communes) to test several alternatives to conventional mono-maize cropping systems since 2011</td>
<td>➢ Validating several alternatives to conventional mono-maize cropping systems</td>
</tr>
<tr>
<td>• Establishing a network of farmer households in Moc Chau district (Pieng Lan and Tong Han villages) to assess potential to scale-up some DMC systems</td>
<td>➢ Validating potential to scale-up some DMC systems for maize production in sloping lands</td>
</tr>
<tr>
<td><strong>Research Component 3: Supporting local farmers and extension with trainings and inputs to scale-up appropriate conservation agriculture practices and DMC systems in the three provinces</strong></td>
<td></td>
</tr>
<tr>
<td>• Training farmer households on sustainable practices for management of maize-based systems</td>
<td>➢ Building capacity for local farmers to scale-up research outputs</td>
</tr>
<tr>
<td>ACTIVITY COMPONENTS</td>
<td>KEY EXPECTED OUTPUTS</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Training extension staff on conservation agriculture and in different DMC systems</td>
<td>➢ Building capacity for local extension staff to scale-up research outputs</td>
</tr>
<tr>
<td><strong>Research component 4: Capacity building and awareness raising</strong></td>
<td></td>
</tr>
<tr>
<td>Training in conservation agriculture and in some concrete DMC systems were organised for farmers and local extension workers and NOMAFSI staff</td>
<td>➢ Building capacity for local farmers and extension staff to scale-up appropriate conservation agriculture techniques</td>
</tr>
<tr>
<td>Training in English for NOMAFSI staff by a native language teacher</td>
<td>➢ Building capacity for NOMAFSI</td>
</tr>
<tr>
<td>Capacity building for researchers partners</td>
<td>➢ Master’s students to be involved in research activities</td>
</tr>
<tr>
<td>Training materials was compiled, printed and distributed.</td>
<td>➢ Distributing training materials, videos, newsletters and brochures to relevant stakeholders</td>
</tr>
<tr>
<td>Exhibition of conservation agriculture</td>
<td>➢ Introducing sustainable farming and raising awareness and need to develop sustainable agriculture to a wider audience</td>
</tr>
<tr>
<td>Field workshops and cross-field visits for farmers, extension workers and local officers</td>
<td>➢ Sharing information and raising awareness among for farmers, extension workers and local officers on ecological agriculture and conservation farming.</td>
</tr>
</tbody>
</table>
### Appendix 11: Key research components and expected outputs of the NOMAFSI Project

<table>
<thead>
<tr>
<th>ACTIVITY COMPONENTS</th>
<th>KEY EXPECTED OUTPUTS</th>
</tr>
</thead>
</table>
| **Research Component 1:** *Survey and evaluate the situation of maize production in the northern mountainous regions* | ➢ Overall assessment of the situation of maize production on sloping lands of the northern mountainous regions  
➢ Selecting research sites |
| Desk-based review | |
| Household surveys and PRA on maize production practices (e.g. varieties, density, changes in production methods and market) | |
| **Research Component 2:** *Identify appropriate maize varieties and planting density for sustainable maize production on sloping lands in the northern mountainous regions* | ➢ Selected maize variety collection of 1-2 varieties with productivity of 6-7 tons/ha  
➢ Identified appropriate planting density for each variety in each sub-ecological region |
<p>| Experiments on maize varieties (6 hybrid varieties of three variety collections): short, medium and long duration on sub-ecological regions | |
| Experiments on maize planting density | |
| <strong>Research Component 3:</strong> <em>On-farm experiments on sustainable techniques for maize production on sloping lands in the northern mountainous regions</em> | ➢ 3 ha in Son La, Yen Bai and Cao Bang |
| Intercropping with legume experiments | |
| Mulching experiments | ➢ 4 ha in Son La, Yen Bai and Cao Bang |
| Mini-terrace farming experiments (land slope &gt; 20°) | ➢ 4 ha in three provinces |
| <strong>Research Component 4:</strong> <em>Study the capacity for applying advanced techniques of maize farmers in the northern mountainous regions</em> | ➢ Recommendations for improving the access of farmers to advanced techniques for maize production on sloping lands in the northern mountainous regions |
| Socio-economic survey with farm households | |
| Comparison of sustainable and conventional techniques for maize production in sloping lands | |
| <strong>Research Component 5:</strong> <em>Establish on-farm demonstration models that apply developed integrative measures for maize production on sloping lands that meet both economic efficiency and environmental sustainability</em> | ➢ 6 ha in Son La, Yen Bai and Cao Bang |
| Maize intercropped with legumes in combination with other integrative | |</p>
<table>
<thead>
<tr>
<th>ACTIVITY COMPONENTS</th>
<th>KEY EXPECTED OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>measures such as appropriate varieties, density and fertilisers</td>
<td></td>
</tr>
<tr>
<td>• Using cover plants in combination with other integrative measures such as appropriate varieties, density and fertilisers</td>
<td>9 ha in Son La, Yen Bai and Cao Bang</td>
</tr>
<tr>
<td>• Mini-terrace and mulching in combination with other integrative measures such as appropriate varieties, density and fertilisers</td>
<td>4 ha in Son La and Yen Bai</td>
</tr>
</tbody>
</table>

Research Component 6: *On-farm evaluation workshops*

- Organising multi-stakeholder workshop
  - 50 participants from MARD, research institutions, local authorities and farmers

Research Component 7: *Mid-term review and the final evaluation*

- Mid-term review and final project evaluation
  - Mid-term review and final project evaluation reports
### Appendix 12: Results of Pearson Chi-square statistical tests

<table>
<thead>
<tr>
<th>Participation or No participation in a research project</th>
<th>APP1_Application of sustainable agricultural techniques (Mulching)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Participation or No participation in a research project</td>
<td>Count</td>
</tr>
<tr>
<td>No</td>
<td>11</td>
</tr>
<tr>
<td>Expected Count</td>
<td>6.1</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
</tr>
<tr>
<td>Expected Count</td>
<td>9.9</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
</tr>
<tr>
<td>Expected Count</td>
<td>16.0</td>
</tr>
</tbody>
</table>

#### Chi-Square Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
<th>Exact Sig. (2-sided)</th>
<th>Exact Sig. (1-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>14.399a</td>
<td>1</td>
<td>.000148</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuity Correction b</td>
<td>11.627</td>
<td>1</td>
<td>.000650</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>18.621</td>
<td>1</td>
<td>.000016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fisher's Exact Test</td>
<td></td>
<td></td>
<td></td>
<td>.00013</td>
<td>.000</td>
</tr>
<tr>
<td>Linear-by-Linear Association</td>
<td>13.903</td>
<td>1</td>
<td>.000193</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **a.** 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.93.
- **b.** Computed only for a 2x2 table

#### Symmetric Measures

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Asymp. Std. Error a</th>
<th>Approx. T b</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal by Nominal</td>
<td>Phi</td>
<td>.705</td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Cramer's V</td>
<td>.705</td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td>Interval by Interval</td>
<td>Pearson's R</td>
<td>.705</td>
<td>.102</td>
<td>5.160</td>
</tr>
<tr>
<td>Ordinal by Ordinal</td>
<td>Spearman Correlation</td>
<td>.705</td>
<td>.102</td>
<td>5.160</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **a.** Not assuming the null hypothesis.
- **b.** Using the asymptotic standard error assuming the null hypothesis.
- **c.** Based on normal approximation.