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Towards a holistic framework for impact assessment of agricultural research for development – understanding complexity in remote, culturally diverse regions of Vietnam

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Abstract

Since the late 1990s, there has been a great deal of investment by both the Vietnamese government and international development agencies in the economic development of the Northwest Highlands of Vietnam, a highly diverse region experiencing variable stages of transition towards more market-oriented development and social change. A shift towards a research for development approach, targeting the immediate use of research outputs for development purposes, became more visible especially since the late 2000s. It is important to understand the contribution of agricultural research toward rural development, not only in terms of knowing the extent and sustainability of the impacts achieved but also for informing appropriate agricultural policies and research for development strategies in the future. However, the impact assessment of existing agricultural research for development (AR4D) initiatives in the highlands of Vietnam remains problematic considering both the formulation of suitable objectives and the selection of appropriate methods that match those objectives. This paper describes the results of a study that aimed to review and analyse the theories and practice of AR4D impact assessment approaches and the merits and limitations of such approaches to AR4D in the Northwest Highlands of Vietnam. The study employed documentary research, focus group discussions with farmers and in-depth interviews with key informants, while thematic analysis was used for data analysis. The study concludes that a holistic approach towards impact assessment is best suited to an economically and culturally diverse region such as the Northwest Highlands of Vietnam, and suggests a framework for impact assessment that is based on a comprehensive livelihoods perspective.

1. Introduction

A holistic approach towards the assessment of impact of agricultural research for development (AR4D) is very important for supporting social change and sustainable development. The results of impact assessment are not only crucial for learning about the impacts of research for development but also for formulating appropriate measures and development strategies towards the sustainable development of target areas in the future (Cramb et al., 2003; Krall et al., 2003, p. 329). However, the impact assessment of AR4D initiatives in the Northwest Highlands of Vietnam remains problematic in terms of both objectives and methods. A short-term and economic focus, a top-down communication approach, overemphasis on direct research outputs and the analysis of cost-effectiveness for donors, a gap in researchers' understanding of local culture and languages, and poor feedback mechanisms are identified as the main weaknesses of most existing impact assessment initiatives in the highlands. These have led

to unconvincing evidence about the contribution of past and current impact assessment approaches to the development of the highlands. Although the impact assessment of AR4D projects has played an important role in the development of the Northwest Highlands, few attempts have been made to assess existing impact assessment approaches for AR4D in the region. Local governments, development agencies and research institutes all have limited understanding about the contribution of impact assessment to development. Local people are also passive in research for development processes.

In this study, existing impact assessment approaches to agricultural research projects including AR4D in the Northwest Highlands of Vietnam are reviewed and their limitations are discussed. A suggestion is made for developing a holistic framework for impact assessment of AR4D projects that is approached from the comprehensive livelihood perspective developed by the UK Department for International Development (DFID) (1999), in a region experiencing variable stages of transition towards market-oriented agricultural development and social change.

2. Method

Documentary research was used in combination with some participatory techniques for data collection. The documentary research included a review of the literature on existing development theories and practices such as the sustainable livelihoods framework and participatory impact assessment approaches and their fit with AR4D. It also examined sources that evaluate the limitations of past and current impact assessment approaches to AR4D initiatives, implemented by various national research institutions. The Vietnamese research institutes active in the Northwest of Vietnam, and included in this study, are the Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI), Plant Protection Research Institute of Vietnam (PPRI), Center for Agricultural System Research and Development (CASRAD), Vietnam National University of Agriculture (VNUA), Tay Bac University (TBU), Australian Centre for International Agricultural Research (ACIAR) and French Agricultural Research Centre for International Development (CIRAD).

The primary data was collected by using some participatory data collection techniques such as focus group discussions (FGDs) and in-depth interviews with key informants. The purposive sampling method was used for the selection of participants of both the FGDs and in-depth interviews in order to include the major participating researchers, extension staff and farmers in three selected AR4D projects in Son La province that formed the focus of the study. These projects were the ACIAR Northwest project[1], the CIRAD ADAM project[2] and the NOMAFSI Maize/2011 project[3]. Three FGDs with five farmers in each group and five in-depth interviews with local village and communal leaders were conducted in Phieng Luong, La Nga and Chieng Hac communes, Moc Chau district, Son La province. In-depth interviews with five local agricultural extension staff and five agricultural researchers from NOMAFSI, CIRAD and TBU who had been involved actively in AR4D projects in the Northwest Highlands in recent years were also carried out in Son La province and in Hanoi. Two field trips to Son La were made in December 2012 and September 2013. Initial findings were reported back to participants for the purpose of getting their feedback and for data validity. 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.

3. Overview of the Northwest Highlands

The Northwest Highlands are characterised by high ethnic diversity and typical topography conditions. The topography is highest and most rugged in the Northwest, and lower down to the Southeast area along the border with China to the plateau region. The highlands include six provinces: Son La, Lai Chau, Dien Bien, Hoa Binh, Yen Bai and Lao Cai. The highlands have a natural area of 5.073 million ha, which accounts for 15.32 per cent of the whole country (NOMAFSI, 2012, p. 1). These provinces are 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). According to the latest general census by Vietnam's Ministry of Labour, Invalids and Social Affairs (MoLISA) (2011) , the poverty rate of the highlands stands at around 40 per cent, compared to 14.2 per cent for the whole country(MoLISA,

[1] Improved market engagement for sustainable upland production systems in the Northwest Highlands of Vietnam.

[2] Support to extension of the agro-ecology approach for improving cropping systems efficiency and durability in the North-Western mountainous areas of Vietnam.

[3] Integrated measures for sustainable maize production on sloping lands of the Northern mountainous regions of Vietnam.

2011). A harsh natural setting, increasing population pressure, low economic conditions and the limited education of local people are also seen as major causes of unsustainable management of the agro-ecosystem in the highlands (Van de Fliert, 2008).

Before *doi moi*[4] in 1986, ethnic minority groups in the Northwest Highlands were mainly engaged in shifting cultivation practice which involves burning a section of forest and then growing cash crops such as upland rice or maize in the rich soil, causing quick degradation of soil (Castella et al., 2006). At present, the livelihoods of most rural people living in the Northwest Highlands still depend mainly on agriculture (Clement & Amezaga, 2008). Agricultural production is a primary source of income for the majority of households in these highlands (Minot et al., 2006; Tran et al., 2006).

In spite of the difficulties of an extreme climate, sloping terrain, lack of water for agricultural production in dry seasons and distance from markets, the Northwest Highlands have the potential for growing many agricultural products such as maize, rice, high-value temperate fruits, flowers and vegetables, livestock, and forestry products. In the last decade, better access to markets through upgraded road systems, the implementation of various agricultural and rural development projects and programs, and the development of market-oriented and concentrated agricultural production areas have been experienced in the Northwest Highlands (Nguyen et al., 2013; Van de Fliert, 2008). The area used for 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 increased approximately 1.5 times and the adoption of hybrid maize has been considered as the most important agricultural innovation of the twentieth century for the Northwest Highlands, helping to increase significantly farm income (Friederichsen & Neef, 2010, p. 575).

However, in the context of a rapid transition to market-oriented agriculture, the agricultural and rural development of the Northwest Highlands faces many social, economic and emerging environmental issues. Although the rapid growth of the market economy has pushed the socio-economic development of the highlands, it has also generated social, economic and environmental challenges including poverty, widened economic gaps between regions and ethnic groups, barriers to market integration, and environmental problems such as soil erosion and degradation, a loss of biodiversity, and deforestation (Castella, 2012). A top-down approach in agricultural extension and rural development is another encountered problem.

4. Limitations of existing impact assessment in agricultural research for development

Recognising the problems of the Northwest Highlands, since the late 1990s, various agricultural research projects including AR4D projects have been conducted in the Northwest Highlands by both national research institutions and international development agencies. The most active national and international research institutions and development agencies in the regions are NOMAFSI, PPRI, CASRAD, VNUA, TBU, ACIAR, CIRAD and the Upland Program coordinated by the University of Hohenheim (Nguyen et al., 2013). The major development objectives of these existing agricultural initiatives focus on increasing agricultural productivity and farm income through transfer and adoption of new technologies, improving the environment (sustainable use of soil, and bio-diversification and conservation), enhancing market engagement and integration for local producers, and utilising good indigenous knowledge and practice for sustainable agricultural development.

However, the impact assessment of these AR4D projects remains a weakness in regard to both the impact assessment objectives and methods. First, most AR4D initiatives only undertake the end-evaluation or short-term impact assessment rather than long-term impact assessment. Through the in-depth interviews with agricultural researchers from NOMAFSI, CASRAD, TBU and VNUA, we know that most existing AR4D projects have not conducted an impact assessment. The results of the FGDs with farmers in Phieng Luong and La Nga communes also showed that local people had only been given the opportunity to participate in some short-term impact assessment processes rather than long-term impact assessment processes.

Second, the impact assessment of these AR4D projects pays more attention to the interests of researchers and donor agencies than local communities (Nguyen et al., 2013). The result is an intense focus on economic and direct research outputs that ignores other important livelihood capital such as the

[4] The term "*doi moi"* means reform, renovation or transformation.

human, social and natural capital. The review of monitoring and evaluation reports and project documents of various agricultural research projects implemented in the Northwest Highlands, such as works by Dao et al. (2006), Fisher and Gordon (2008), Lindner et al. (2008), Ha et al. (2010), Lindner and McLeod (2008), Beattie et al. (2010), Lane and Vu (2010) and Hoang and Degrande (2011), and the results of the in-depth interviews with agricultural researchers involved in some of these AR4D projects also led to the observation that the existing impact assessment heavily emphasised the quantitative analysis of the research results, with a focus on local economic improvement, direct research outputs such as research performance indicators, and the number of publications.

In addition, limited evidence has been associated with how AR4D initiatives have contributed (or may have contributed) to the improvement of local livelihoods and development policies and strategies. The social diversity of the region and non-linear nature of impact pathways are often ignored by conventional impact assessments. Evaluation reports aim to show the scientific conclusions of researchers rather than showing the conclusions of farmers involved in the research processes and measuring the contribution or potential impacts of the participatory approaches of the program to sustainable livelihoods development in local communities (Nguyen et al., 2013; Ruane, 2014).

Third, despite the fact that most agricultural research projects claim to apply a participatory approach, top-down planning and implementation approaches still seem dominant, especially in most government-funded agricultural research projects, leading to low levels of empowerment of local communities (Nguyen et al., 2013). Participants of FGDs in Phieng Luong and Chieng Hac communes and local agricultural extension staff of Moc Chau district said that they usually are only asked to provide information for the final evaluations of the Vietnamese government- and international agency-funded AR4D projects implemented in their local communities. The agricultural researchers interviewed in the present study also had different understandings about the meaning of participation in research processes and in the impact assessment of AR4D projects. They saw participation "as a means" to increase the effectiveness of externally introduced research for development programs via the involvement of local stakeholders rather than "as an end" to empower people to change their situations.

Fourth, there is a gap in researchers' understanding of the diverse local cultures and languages that sometimes leads to limited communication and unreliable impact findings. For example, the Northwest Highlands region is the least developed region in Vietnam and its population comprises many ethnic minority communities but the impact assessment of past and present agricultural research projects has been conducted mainly in a majority language. From the discussion with farmers in the research areas, it was also found that external evaluators tended to impose their own evaluation methods without considering local cultural diversity. Local farmers and community leaders also reported that external evaluators often carried out group interviews or individual surveys with well-structured questionnaires rather than participatory discussions and in-depth interviews with individual farmers and leaders in evaluation activities. A lack of visual techniques to support the active engagement of local communities in impact assessment processes could be identified as another constraint. As a consequence, discussions were often dominated by "village elites"[5] or better-off farmers and local community leaders rather than the target vulnerable groups.

Finally, the impact indicators and feedback mechanisms currently used for impact assessment are aimed at measuring the return on investment or cost-effectiveness for donor organisations, rather than fostering the sustainability of local communities (Nguyen et al., 2013). The mechanisms used to report research results and obtain feedback from the local community are not clear. Local farmers, extension staff and leaders from Moc Chau said that impact assessment results were not shared with them by most agricultural research projects when completed. They also had limited understanding about how the impacts of AR4D projects in their local communes could be measured and sustained.

By reviewing the documents of existing AR4D projects and conducting in-depth interviews with agricultural researchers and local leaders, the major dimensions of the impact assessment of existing government-funded and international agency-funded agricultural research projects in the Northwest Highlands were identified, as summarised in Table 1. Compared to the Vietnamese government-funded projects, international donor-funded AR4D projects in the Northwest Highlands have had a stronger participatory orientation and a broader scope of impact consideration. However, there is still no clear strategy for assessing the long-term social, economic, human, physical and natural impacts on the

[5] Farmers who have comparative advantage in terms of livelihood resources and opportunities than others in their community.

sustainable livelihoods of local communities. The impact assessments of both Vietnamese government- and international agency-funded research projects are very weak in terms of the sharing of impact findings and getting feedback from key stakeholders, especially local beneficiaries (Nguyen et al., 2013).

In conclusion, a top-down approach with limited attention paid to the cultural diversity and complexity of the Northwest Highlands was used in both the Vietnamese government-funded and international agency-funded AR4D projects. The past and present impact assessments of most AR4D projects in the region had a short-term and economic focus. More efforts have been placed on measuring direct research outputs, reporting scientific findings and analysing cost-effectiveness in order to report to donors and funding agencies rather than targeting the sustainable livelihoods of local communities. A lack of mechanisms for sharing impact assessment results with and getting feedback from stakeholders, especially local communities, has resulted in low levels of contribution of impacts to sustainable social change and development. These weaknesses have also led to weak evidence showing how AR4D projects have contributed to – or rather, failed to deliver – sustainable impacts, particularly in the Northwest Highlands.

Table 1: Comparison of impact assessment of AR4D projects in the Northwest Highlands

Dimension	Vietnamese government-funded projects	International development agency-funded projects
Impact assessment approaches and methods	○ Top-down approach; ○ No impact assessment, or sometimes the impact assessment is implemented at the end of a project; ○ Mainly quantitative methods are used for data collection and analysis.	○ Top-down approach but bottom-up approach in some recent AR4D projects; ○ Impact assessment is often implemented at the end of a project; ○ Both quantitative and qualitative methods are used for data collection and analysis.
Impact assessment indicators	○ Mainly short-term and economic-focused indicators (change in production outputs and income); ○ Aimed at direct scientific outputs (capacity building and publications) and project performance rather than local sustainability.	○ Mainly short-term and economic-focused indicators (change in production outputs and income); ○ Aimed at direct scientific outputs (capacity building and publications) and cost-effectiveness for donors rather than local sustainability.
Stakeholders' participation in impact assessment processes	○ Project implementers are evaluators who define impact assessment indicators; ○ Local communities, extension staff and government staff are information givers; ○ No participation of private sector (private companies and traders) or NGOs in impact assessment process.	○ External specialists or researchers are evaluators who define impact assessment indicators; ○ Local communities, extension staff and government staff are information givers; ○ Limited participation of private sector (private companies and traders) and NGOs in impact assessment process.
Dissemination of impact assessment results	○ No mechanism for sharing impact results with and getting feedback from local communities; ○ The sharing of impact assessment results among research partners (research institution, development agencies and local governments) is very weak.	○ Limited or no mechanism for sharing impact assessment results with and getting feedback from local communities; ○ Efforts made to share impact assessment results among research partners (research institution, development agencies and local governments) but mostly through publication and media.

5. Sustainable livelihood framework as a lens for impact analysis

Reflecting the need to put people at the centre of development processes, the concepts of sustainable livelihoods and sustainable livelihood frameworks have been developed and modified by various international research and development organisations and NGOs such as the Institute of Development Studies, International Food Policy Research Institute and DFID. Existing livelihood framework initiatives have a common root in the original definition of sustainable livelihoods whereby a livelihood is considered sustainable if it can be resilient to external shocks and stresses, independent from external supports, and maintaining long-term productivity but not undermining the livelihood options of others (Chambers & Cornway, 1992; DFID, 1999).

The most frequently cited sustainable livelihoods framework was developed by DFID and is seen as a visualisation tool that provides an analytical structure for a broad and systematic understanding of the main factors that affect people's livelihoods. In this sustainable livelihoods framework, people are seen as actors in a particular context of vulnerability, in which they have access to a wide range of livelihood assets (e.g., human, social, economic, physical and natural assets or capitals) through the prevailing social, institutional and organisational environment and that they use these assets to make different livelihood strategies in the pursuit of livelihood outcomes (DFID, 1999).

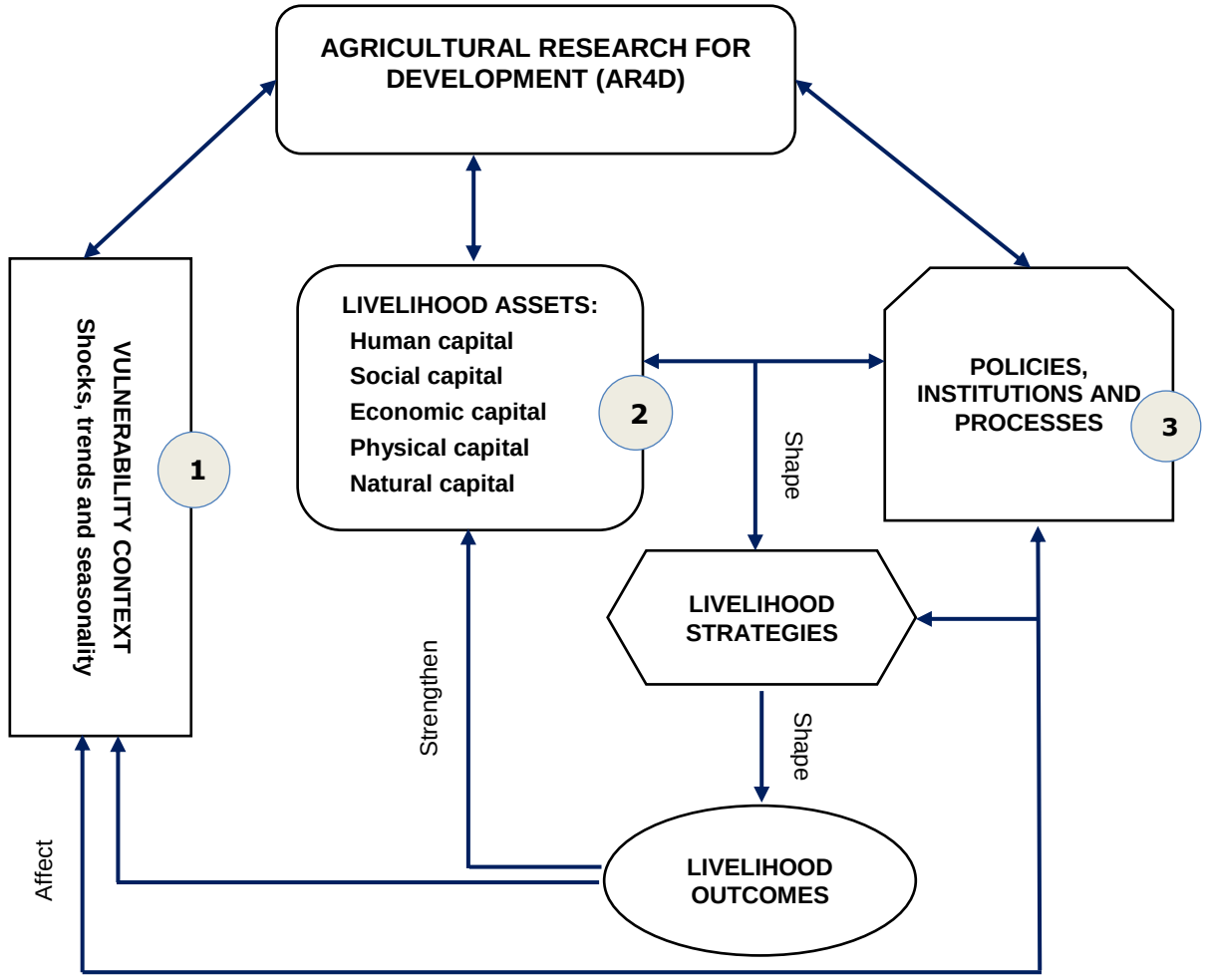
It has been argued that the impact assessment of AR4D projects should not only focus on obtaining proof of impact as a return on investment, but also on exploring the plausible links between the observed impacts and the research investment (Krall et al., 2003, p. 333). The sustainable livelihoods framework 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 happen in the complex realities of individuals, households, communities, and at regional and national levels (Scoones, 1998).

Several scholars have identified that analysis of AR4D processes and impacts is compatible with the principles of sustainable livelihoods frameworks because of the mutual interactions between AR4D and livelihood assets, development policies and institutions, and a context in which livelihood strategies are combined for better outcomes and impacts (Adato & Meinzen-Dick, 2002; Carpenter & McGillivray, 2012). By using a sustainable livelihoods framework, both direct change (e.g., improved income, health or food) and indirect change (assets, activities, and the ability to cope with and to recover from vulnerability) can be assessed in a more systematic way (Ashley & Hussein, 2000, p. 15).

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) indicated that agricultural technology development is suitable for dealing with the complexity of livelihood strategies if the full livelihoods picture is understood. They explained 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 being a part of 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 appropriate impact indicators for AR4D in a particular social context.

In this study, the sustainable livelihoods framework is utilised as a lens for identifying what types of impacts AR4D projects could have on people's livelihoods. However, the impact assessment framework for AR4D focuses not only on making a comprehensive causal analysis of the interactions between AR4D and components of a sustainable livelihoods framework but also on considering critical assumptions about how changes or impacts could occur as a result of these interactions. In this holistic framework, we identify three main groups of impacts of AR4D: i) changes or impacts in the vulnerability context, ii) changes or impacts in policies, institutions and processes, and iii) changes or impacts in the livelihood asset base. These interactions are represented visually in Figure 1.

Figure 1: Interactions between AR4D and a sustainable livelihoods framework



Source: Adapted from Scoones (1998), DFID (1999) and Adato and Meinzen-Dick (2002)

As described in Figure 1, AR4D could affect people's livelihoods in both direct and indirect ways by generating institutional or long-term livelihood impacts in three main ways:

1) *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;

2) *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 and saving and credit opportunities), physical capital (e.g., road, transportation, sanitation, healthcare system) and natural capital (e.g., soil fertility, water conservation and biodiversity);

3) *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 livelihood strategies towards achieving livelihood outcomes and impacts.

Utilising a sustainable livelihoods framework to set the parameters for assessing the impacts of AR4D initiatives in Vietnam's Northwest Highlands is found to be appropriate, as it helps to identify and measure both actual and potential outcomes and impacts. First, AR4D and technology development could 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 inputs 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. Changes in the vulnerability context could be seen as intermediate or institutional impacts of agricultural research interventions.

Second, AR4D could affect the livelihood of people by making changes in the 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, 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, new production technologies generated by AR4D can be applied by farmers to increase crop productivity and farm income. This improved economic capital is very important for the improvement of poor households who 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 to achieve their 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.

A research process, especially a participatory research process which aims to make research outcomes adaptable to farmer conditions, could also help to strengthen human and social capital. Through involvement in a research process, local people not only again 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 through an 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.

Third, AR4D projects not only affect the livelihood asset base but also facilitate or constrain enabling environments (policies, institutions and processes) in which people have accesses to different levels and combinations of assets and pursue different livelihood strategies. For example, institutional structures and processes (e.g., local extension development strategies, the formation of farmers groups, relationships between local people and authorities, the government's investment schemes, and market information networks) could play important roles in influencing the impacts of AR4D because they shape the ways in which people adapt to their vulnerability contexts, access basic livelihood assets, and make their own choices of livelihood strategies to achieve better livelihood outcomes and impacts. In addition, as stated by Adato and Meinzen-Dick (2002), agricultural research and technologies could be seen as a part of policies, institutions and processes because they allow people to have a wider choice in pursuing livelihood strategies, leading to changes in the asset base within and between households. Suitable innovative research approaches that are the result of AR4D projects could be utilised for the effective implementation of future research for development strategies.

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 in applying these frameworks. First, the notion of power and politics and empowerment is often missing when making attempts to put them into the categories of a livelihood (Adato & Meinzen-Dick, 2002; Ashley & Hussein, 2000). To ensure the effective impact assessment of A4RD, the top-down power and politics 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. However, a narrow focus on households and local complexity could result in less attention being paid to larger scale and external policy decisions or institutions (Allison & Horemans, 2006; Ashley & Hussein, 2000). Defining and quantifying the indicators for assessing impacts on livelihood 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, the endowment of initial livelihood assets or capital (e.g., agricultural inputs, credit and livestock) for technology adoption sometimes helps to accumulate livelihood assets in research areas. Failing to separate these investments could result in weak evidence of the impacts of AR4D projects on local livelihood development and social change.

6. Participatory impact assessment approach for empowerment

Impact assessment has been used for development planning since the 1950s. It aims to measure changes due to the interventions of a project or a program in order to provide important inputs for decision makers in approving or adjusting the direction of a development project (Khandker et al., 2010; Mayoux & Chambers, 2005). It also provides lessons learnt for better programs in the future (Krall et al., 2003). Impact assessment could be understood as an analysis of both the intended and unintended change made by a project or program during and after its implementation. The ex-post impact assessment and ex-ante impact assessment are identified as the two main perspectives for assessing the impact of agricultural research projects (Douthwaite et al., 2007; Marasas et al., 2001; 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). The impact indicators are mainly defined by outsiders or professionals at the start of a project (Ashley & Hussein, 2000). Owen (2006) indicated 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.

However, recommendations have been made to change from top-down to bottom-up approaches and from defined project outputs to a livelihoods focus (Ashley & Carney, 1999; Catley et al., 2008). Krall and colleagues (2003) argue that impact assessments should consider the complex and indirect relationships between agricultural technology or innovations and sustainable development. Marasas et al. (2001) propose the division of agricultural research impacts into three groups: intermediate impacts (e.g., institutional change and change in the enabling environment), people-level impacts (e.g., social, social-cultural and environmental change), and direct research outputs.

Participatory impact assessment (PIA), which is seen as an extension of PRA and was initially practised in South Asia and East Africa by international agencies and NGOs, is an alternative approach (Robinson, 2002). 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 into 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 five key features of participatory approaches for impact assessment: 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.

A holistic impact assessment framework aims to both measure fully the impacts of an AR4D project and empower local stakeholders in the impact assessment processes. 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 considered as an effective way to collect qualitative and quantitative data about the impacts of AR4D projects. Using participatory techniques and tools for data collection not only helps to get rapidly 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.

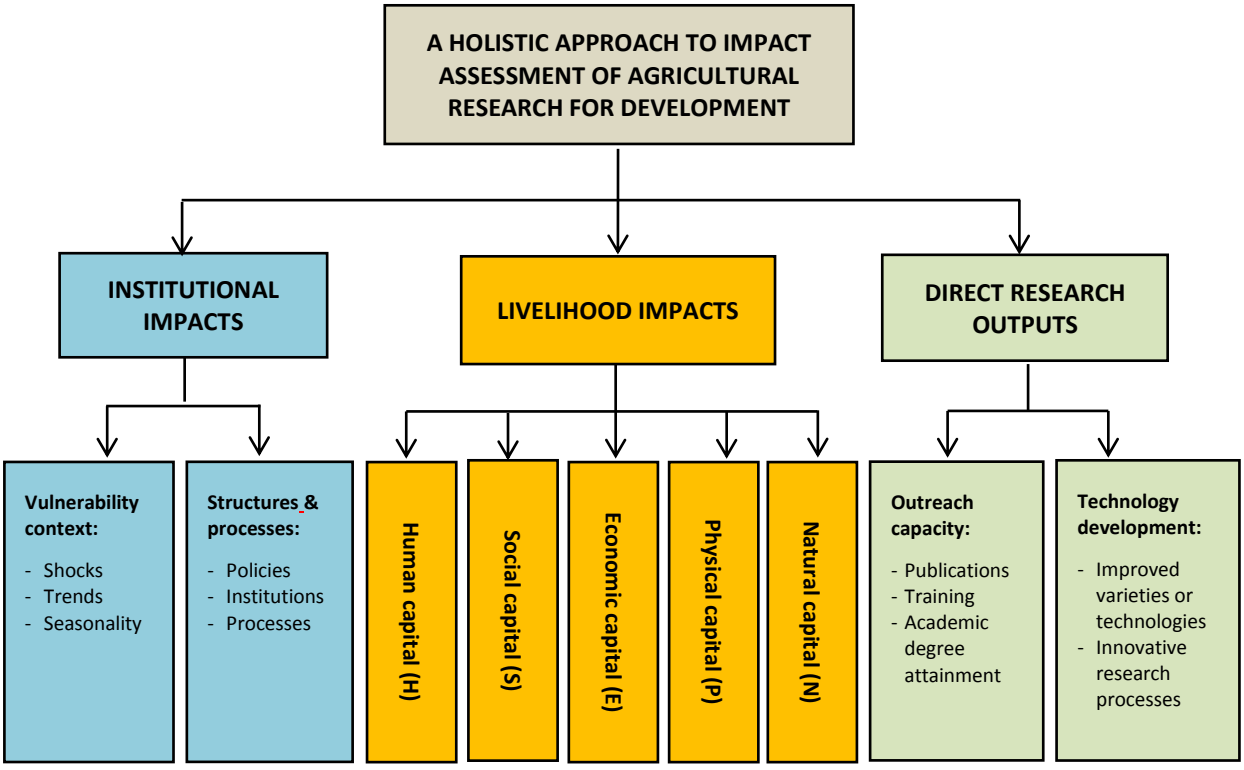
The PIA approach also provides opportunities to obtain feedback and share findings on impacts among stakeholders at different levels. Because of limited education and economic conditions, language

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.

7. Towards a holistic framework for impact assessment of agricultural research for development

The weaknesses in both impact assessment objectives and methodologies of past and present impact assessment strategies clearly demonstrate the need for a holistic impact assessment framework. From the above discussions about the major social economic and natural characteristics of the Northwest Highlands, the limitations of existing impact assessment approaches to AR4D in the highlands and the available theories and practices related to the impact assessment of AR4D, we propose the development of a holistic framework for impact assessment of AR4D in the Northwest Highlands. A holistic impact assessment framework that is guided by sustainable livelihood frameworks and the PIA approach could help to measure fully the outcomes and impacts attributed to an AR4D in order to support sustainable social change and development for this remote and culturally diverse region. The major components of this holistic impact assessment framework are described in Figure 2.

Figure 2: Holistic impact assessment framework for AR4D in the Northwest Highlands of Vietnam



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

In the proposed impact assessment framework, the sustainable livelihoods framework is adapted to function as a lens for identifying key impact indicators, which are divided into three major groups: 1) livelihood impacts, 2) institutional impacts, and 3) direct research outputs. This helps to understand both the short-term and long-term actual or potential contributions of an AR4D project. These impact indicator groups could be measured by using both qualitative and quantitative data using the participatory approach. The key methods and tools are summarised in Table 2.

Table 2: Impact types, key indicators and methods used in impact assessment for AR4D in the Northwest Highlands of Vietnam

Impact Type	Key Impact Indicator	Key Methods and Tools
I. Direct research outputs		
➢ Technology development	Achieved scientific products compared to expected outputs: *improved agricultural technology and innovative research process.*	❖ Documentary research; ❖ In-depth interviews with key researchers from research institutions and with local agricultural extension staff.
➢ Capacity building	Changes in capacity of research organisations: *publications, training and academic degree attainment.*	❖ Observation; ❖ Documentary research; ❖ In-depth interviews with researchers and local agricultural extension staff.
II. Institutional impacts		
➢ Vulnerability context	Changes in: Shocks (*human or animal health, natural disasters, and sudden economic changes*); Trends (*migration, resource use, and other indicators such as prices, governance and technologies*); Seasonality (*production, price, employment and health*).	❖ Observations; ❖ Documentary research; ❖ In-depth interviews with key informants (local leaders, extension staff and researchers). ❖ FGDs with farmers using visual participatory tools (Venn-diagram, seasonal calendar, resource mapping);
➢ Policies, institutions and processes	Changes in policies, institutions and processes (formal and informal): *development policies and development strategies, culture, scaling-up opportunities, research organisational capacity, research collaboration, and research for development strategies.*	❖ Semi-structured interviews with farmers.
III. Livelihood impacts		
➢ Livelihoods capital: - Human - Social - Economic - Physical - Natural	Changes in livelihood capital: Human (*knowledge and skill, health*); Social (*trust, membership, informal safety net, communication*); Economics (*income and savings, credit*); Physical (*roads, transportation, sanitation, healthcare*); Natural (*soil protection, biodiversity*).	❖ Observations ❖ Documentary research; ❖ In-depth interviews with key informants (local leaders, extension staff and agricultural researchers); ❖ FGDs with farmers using visual participatory tools (Venn-diagram, ranking, radar diagram, ten-seed techniques); ❖ Semi-structured interviews with farmers.

A comprehensive impact assessment framework such as the one briefly proposed in this study may not work well if there is a lack of good facilitation skills or a lack of deep understanding of the local culture and the complexity of the research context. Because social, human, economic and environmental

impacts may not be achieved if AR4D projects are not designed in ways that could deliver measurable impacts, the impact pathway and causal links between outcome and impact should be therefore well integrated in the impact assessment. Ex-post impact evaluation is needed for any AR4D initiative but may be insufficient to measure the full contribution of an AR4D project to local changes.

The application of participatory approaches in the Northwest Highlands is also challenged by the dominance of conventional top-down approaches and local political power. In addition, it should be pointed out that no standard sets of participatory communication techniques could be developed to fit different communities and locations. Time allocation and the location for each participatory activity should also be flexibly applied. Moreover, impacts could only be sustained if the direct or indirect social, human, economic and environmental impacts are shared among different groups of interests and at different levels. The indirect technology and knowledge-related spill-over outcomes and impacts of AR4D projects should also be considered in impact assessment.

8. Conclusion

A holistic impact assessment approach is crucial for understanding and sustaining the contribution of AR4D projects to sustainable livelihood development in the Northwest Highlands of Vietnam. The proposed holistic framework for impact assessment of AR4D blends the sustainable livelihoods framework and the PIA approach, to not only help measure a more complete set of impacts of AR4D but also to empower local people to more actively engage in social change and sustainable development in their communities. Understanding the complexity of the social, cultural, institutional and environmental settings of target areas is necessary for developing and applying a holistic impact assessment framework for AR4D projects in culturally diverse regions such as the Northwest Highlands of Vietnam.

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