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Climate Change-Adapted Tea Value Chain Development in Tuyên Quang, Vietnam

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ABSTRACT

This is the research report of a study that aimed at analyzing the value chain of tea in the province of Tuyên Quang, in the North East mountainous region of Vietnam, in a context of current and future climate change. Tea is Tuyên Quang's main perennial crop and its 4th commodity, in an agricultural sector that employs over 80% of its labor force (Tuyên Quang Statistical YearBook 2014, 2015). As such, significant efforts need to be applied to maintain its place in the provincial economy. The global increase in demand and associated increases in prices can significantly impact on rural incomes and food security in the province. However, the crop is also vulnerable to changes in climate that already significantly affect every stage of the value chain in the province. This report shows that farmers are key in the development of climate-adapted value chains, yet efforts need to be made to increase their capacity to adapt in the short and longer term, as they have the greatest potential to make the chain more resilient by adapting their farming practices in line with market demand and certification standards, which will spillover to other actors along the chain and increase their adaptive capacity to a changing climate. This can be achieved through the introduction of new, climate-specific initiatives, such as the development of new varieties of tea that are heat resistant, the introduction of high trees for shade and micro-drip irrigation schemes to counter droughts, and education on pest identification.

INTRODUCTION

TNSP is a bottom-up, grass-roots, participatory approach based on Public-Private Partnerships. It was implemented in Tuyên Quang, a mountainous province in the Northern part of Viet Nam (see Annex 1), under the Financing Agreement no. 826-VN between the Government of Viet Nam and IFAD. The project's goal is to increase the quality of life of rural populations, with a focus on the most disadvantaged areas of the province, on women, and on ethnic minorities, through the institutional strengthening for implementation of pro-poor initiatives, the promotion of pro-poor value chains, and commune market-oriented socio-economic development planning and implementation. The project beneficiaries include 57.238 rural households, of which the poor account for 35,8% and the ethnic minorities 73,2%, living in 64 communes. With a total cost of USD32 million including USD24 million of IFAD loan, the project started in 2011 and will complete in 2017.

The objective of this study is to assess the social-economic feasibility of selected value chains and their adaptation to current and future Climate Change scenarios with a view to help TNSP stakeholders prepare their action plans accordingly. This was set to be done through an in-depth study on actual implementation of the tea value chains with a special focus on the adaptive and resilient capacity to Climate Change for sustainable development, an overall assessment of the impacts of Climate Change in Tuyên Quang Province during some recent years, and a forecast on its future possible tendency and impacts on agricultural production in general and the development of the tea value chain in particular, case studies on selected value chains for experience/lessons learnt and some success stories for knowledge management, which were done as part of IFAD's

International Youth Day initiative and were published on IFAD's blog, and a proposal of technical packages and policy recommendations for the development of the tea value chain in connection with the planned master project named "Restructuring Tuyên Quang Agricultural Sector towards value added improvement and sustainable development in 2015-2020 period" for Climate Change adaptation.

The main research question addressed in this report is *What is the impact of climate change on Tuyên Quang's tea value chain?* The complimentary questions explored are How does climate change impact on different stages of the tea value chain in the province? What value chain development mechanisms foster climate resilience? How efficient is Tuyên Quang's value chain development approach in supporting the farmers' climate adaptation capacity?

A literature review was conducted before and upon arrival on site, and the main articles are summarized in the first section. The research evolution and methodology is detailed in the next two sections, followed by an overview of early findings in a fourth section. Discussions of the results and of cross-scale and cross-discipline considerations are then outlined, followed by conclusions and recommendations.

Tea is Tuyên Quang's main perennial crop and its 4th commodity, in an agricultural sector that employs over 80% of its labor force (Tuyên Quang Statistical YearBook 2014, 2015). As such, significant efforts need to be applied to maintain its place in the provincial economy, and that in a context of climate change. The global increase in demand and associated increases in prices can significantly positively impact on rural incomes and food security in the province. However, the crop is also vulnerable to changes in climate

that already greatly affect every stage of the value chain in the province. Farmers are key in the development of climate-adapted value chains, yet efforts need to be made to increase their capacity to adapt in the short and longer term. Assisting farmers adapting to climate change will feedback through the greater value chain thanks to added value, increased food safety, and better infrastructure.

LITERATURE REVIEW

There are three pillars to the research topic and question: Climate Change, Value Chain Development, and Tea. Because climate-adapted tea value chains development is an under-researched area, the literature review was conducted alongside these three main sectors, as well as in the research field.

Research

This study closely followed three papers on field research: Banerjee and Duflo (2008) “The Experimental Approach to Development Economics”, Duflo, Gennerster and Kremer (2007) “Using Randomization in Development Economics Research: a Toolkit”, and Kelley, Clark, Brown and Sitzia (2003) “Good Practice in the Conduct and Reporting of Survey Research”. These papers dictated many decisions regarding the research methods used, randomization, and the design of the questionnaires throughout the duration of the field practicum. The literature review for the research project also included four project-specific documents: the Tam Nong Support Project Design Completion Report (IFAD 2010), the TNSP Tuyên Quang Progress Report for 2014 (IFAD 2015), the Performance and Progress Report of TNSP Tuyên Quang from 05/2011 to 12/2015 (IFAD 2016a) and the TNSP Tuyên Quang Supervising Mission Report 2016 (IFAD 2016b),

none of which are publicly available. These reports helped understand the project and the tea value chain development program implemented by TNSP.

Climate Change

A key report on climate change is the “Viet Nam Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation” developed by the Vietnam Institute of Meteorology, Hydrology, and Environment (IMHEN) and the United Nations Development Program (UNDP) (2015). Alongside IFAD’s “Viet Nam Environmental and Climate Assessment” (2010) and the “High Resolution Climate Projections for Vietnam: North East Regional Summary” (IMHEN 2014), these reports provide detailed current and future climate change predictions at the national, regional, and provincial level of Vietnam. Important findings for Tuyên Quang, which is often either said to be situated in the North Central or North East region of Vietnam, are as follows:

- Annual temperatures will increase by +1.3°C to +6.1°C by the end of the century.
- Increase in the frequency and severity of heatwaves and droughts throughout the region.
- Sudden weather and seasonal changes will occur more often.
- Extreme rainfall events will increase.
- The length of the monsoon is expected not to change, although it will be more intense by the end of the century.
- The number of tropical cyclones will decrease.
- There will be an increase in the number of hot days with a decrease in the number of cold nights.

Tea

K. Chang of the Food and Agricultural Organization of the United Nations (FAO) published a report on “World Tea Production and Trade: Current and Future Development” (Chang 2015). This report is key to this research as it provides an overview of global tea markets. Tea is, after water, the world’s most popular beverage (Potts et al 2014, p.297). In 2013, Vietnam ranked 6th in global tea production, and 5th in global tea exports. According to FAO projections, Vietnam is expected to be the world’s 2nd exporter of green tea and 4th exporter of black tea by 2023. Currently, demand for tea exceeds the supply globally, which is contributing to a rise in prices. This trend is expected to last until at least 2023. Additionally, as awareness of the health benefits of tea consumption is expanding, market demand for tea is shifting towards safer and cleaner products of higher quality, because of consumers’ greater concern for health and safety (Chang 2015). The report also briefly describes the optimal tea growing conditions, which are further detailed on the Encyclopedia Britannica (2015), and FAO EcoCrop (2007) web-pages. Tea, or *Camelia Sinensis*, is a highly adaptable plant that can grow in a large range of conditions. It needs a hot and moist climate, with temperatures of 10°C to 30°C, minimum annual rainfall of 1250mm, acidic soils with a pH of 5.8 to 5.4 or less, 0.5 to 10° slopes, and elevations up to 2000 meters (Chang 2015, Britannica 2015). The plant dies in temperatures ranging of 0°to -5°C, and above 35°C (FAO 2007).

A number of disease can affect tea plantations. Hamasaki, Shimabuku, and Nakamoto’s paper “Guide to Insect and Mite Pests of Tea (*Camellia sinensis*) in Hawaii” (2008) is an insightful account of a variety of pests and diseases that can affect tea plantations. It includes thorough descriptions and photographs of pests observed in

Hawaii, which was useful alongside Plant Village's (n.d.) web-page on Tea to understand the farmers' description of the disease environment of their plantation.

Tea and Climate Change

In their paper "Coping with Changes in Cropping Systems: Plant Pests and Seeds", Allara, Kugbei, Dusunceli and Gbehounou demonstrate the correlation between changes in the climate and changes in pests on agricultural plantations, saying it negatively impacts on crop productivity and rural livelihoods. Key findings for tea plantations as a result of the increase in temperatures are the increase of the quantity of arthropods and the increasingly favorable conditions for the spread of virulent pathogens. Their main recommendations are the need for the development of a diverse portfolio of crop varieties, which are heat-resistant, training farmers to achieve greater climate change awareness and more accurate pest identification, and the introduction of Integrated Pest Management practices (IMP), in order "to make decisions that respect ecological balance among populations of pests and their natural enemies, and to enhance system resilience" (p.101).

Climate Resilient Value Chains

Burnett (2015) wrote a paper entitled "Supporting Climate Resilient Value Chains" in which he analyzed the value chains of Tea and Coffee in Bangladesh and Kenya under current and predicted climate change scenarios. His analysis includes the identification of factors linked to climate change that impact on tea, such as increases in temperatures, in the frequency and severity of droughts, and decreased rainfall. He then outlines low, medium, and high-range climate scenarios and presents a number of policy

recommendations such as the importance of training to farmers, of climate-smart agricultural practices, such as intercropping tea with high trees for shade and investing in renewable energies and heat-resistant varieties. He also recommends the shortening of the value chain for greater climate resilience, which is one of the approaches taken by IFAD to strengthen rural communities' adaptation capacity, alongside income diversification, production support, and infrastructure development (IFAD n.d.).

EVOLUTION OF THE RESEARCH

The research has slightly evolved from the initial proposal submitted by the host-partner, as TNSP is a very complex project with a great variety of actors involved. Three months was a very short time to understand in depth the way the project operates. As such, it was agreed with the IFAD partner that two of the three case studies would be dropped, and that the focus of the research would solely be on tea, in order to allow for a more in-depth analysis of one commodity. The research question to be answered was set by the project director and the deliverables remained the same.

METHODOLOGY

The main method utilized in this project was survey research, in the form of structured interview at the household level, and semi-structured interviews with the heads of CGs, cooperatives, and large-scale businesses. Survey research enabled for the collection of empirical, real-world observational data, to conduct a randomized evaluation of the impact of climate change on the value chain of tea. After having access to tea production, socio-economic, and basic weather data at the provincial level through the Tuyên Quang Department of Statistics, I developed the survey questionnaires based on

the secondary data obtained, in order to gather information necessary to answer the research question: local market and production data, climate perception data, and tea farming practices. Part of the questionnaire was designed using the IFAD Results and Impact Management System (RIMS) questionnaires for Tuyên Quang, which are regularly used by the Monitoring and Evaluation Department of TNSP, while the remaining of it targeted gaps in secondary data and specific questions related to the value chain.

In order to allow for variation in geographic location, type of support received, and ethnicity in the dataset, primary data was collected from the 4 main tea producing districts of the province, which accounted for 92% of Tuyên Quang's total tea production in 2014. According to the 2014 Statistical Yearbook of Tuyên Quang, Yen Son (to the East) produced 39% of Tuyên Quang's total tea production, while Ham Yen (to the West) produced 25%, Son Duong (at the South) produced 20%, and Na Hang (at the North) produced 8%. The remaining 8% is shared between Tuyên Quang city and the remaining 2 districts of the province, Lam Binh and Chiem Hoa. While Ham Yen, Yen Son, and Son Duong are mainly low-land areas, Na Hang is characterized by mid- to high-land landscapes.

Accounting for travel distances and a maximum questionnaire duration of 30 minutes, the optimal number of respondents for this study was six households per CG. Two CGs were selected at random from each district, with the exception of Yen Son, in which three CGs were selected – 2 CGs in one commune with 3 households per CG to represent one group – because the size of the CGs was too small to select 6 households. Households were selected at random within each CG from excel-based lists of the CG-member households per districts. In order to obtain a simple random sample and ensure

variation in income, gender, ethnic group, and tea variety within the CGs, equal probability was assigned to each household using the <https://www.randomizer.org/> web-based research tool. Additionally, 12 households were interviewed from 2 non-project beneficiary communes, one in Son Duon district, and the other in Yen Son district, so as to have some counterfactual information. Non-project communes were difficult to reach because of lack of existing relationships with the project. The resulting simple random sample includes 48 project households from 9 CGs, and 12 non-project households.

Out of the 48 project households, two households' answers could not be used in this study, because tea is a perennial crop that takes 3 to 4 years to mature before the first harvest. These two households had planted their tea too recently to have the relevant experience necessary to answer the questionnaire. Additionally, one of the CGs selected at random from Yen Son district, the Lang Quan district, was a tea-processing CG only, reducing the sample size for some aspects of the research such as tea production, farming practices, and crop-specific climate perception by 6 households. Two other CGs distinguish themselves in the sample: Na Hang's Son Phu CG, located over 60km North of Na Hang city in the high-lands of the districts, produced Organic Shan Tea, and Ham Yen's Tan Thanh CG is the only CG from the sample whose farmers and production are certified by VietGap – the Vietnamese Good Agricultural Practices standard for clean and safe products (QUACERT 2013).

To analyze the value chain of tea implied interviewing other actors along the chain. As such, two cooperatives, and two large-scale businesses, both project-beneficiaries. The cooperatives were located in Tan Thanh commune, Yen Son district, and in Ngau Son commune, Son Duong district. The first large-scale business was the Thanh Long

tea company, a private company that ranks itself 4th of Tuyên Quang and is located in Son Duong city, Son Duong district. The other large-scale business was the Son Lo tea company, a joint-stock company that ranks itself 1st of Tuyên Quang in terms of output, and 1st or 2nd in Vietnam in terms of product quality, and is located in the Kim Phu commune of Yen Son district. The provincial Department of Agriculture and Rural Development (DARD) of Tuyên Quang was also interviewed as it participates in the implementation of TNSP in the province. All were interviewed through semi-structured interviews. The cooperatives and large-scale businesses were contacted through TNSP, while the issuance of official notes was necessary to meet with the provincial department.

While the research topic was sized-down to a single case study, the research method employed for data collection and analysis also changed, on the one hand because of existing local conditions, and on the other hand because of the lack of available data.

Based on the research topic and question, I had initially aimed at doing analytical research through a quantitative assessment of the impact(s) of climate change on tea production and value chains in the province over the last several decades. However, the lack of available weather and production time-series data prompted a shift towards a descriptive account of current climate impacts on the tea value chain.

As for data collection, two decisions were made to adjust for local geographic and linguistic conditions. While focus groups could have been a useful method to gather the farmers' experience with a changing climate in each district of the province, it proved not to be feasible due to the geographic constraints and potential language barriers. As tea grows on hillsides, tea farmers tend to be spread out geographically throughout the

province, as well as within their commune, and at times, village, so village-based focus groups would have incurred the need for potentially lengthy commute distances for the farmers. Additionally, Tuyên Quang is a region of Vietnam where 22 different ethnic minority groups live, many of which still commonly use their own language today. Different ethnic groups sometimes live in the same village and commune while primarily using their own ethnic language. During the pilot surveys, it became clear that the language barrier could hamper translation efforts at the household level, and as such group discussions would be difficult. This factor greatly influenced my decision to focus on household questionnaires as opposed to focus groups. So as to not exclude anyone without access to transportation, I travelled to each household to conduct the surveys, and when the interviewee's first language was not Vietnamese, the head of the collaborative group, a local official, or a fellow farmer helped with translation.

Another factor that influenced the methodology and research development was specific to the project. Under TNSP, tea-cultivating households operate as Collaborative Groups (CGs), and each group operates differently based on the proposal they submitted to their commune to obtain TNSP support, which can be provided through training, infrastructure development funds, or production development funds. As such, the most efficient way to obtain a dataset from a sample that could represent the greater population despite the structural differences that exist between CGs was the use of structured interviews through questionnaires. The semi-structured interviews conducted with the heads of the CGs complement the household questionnaires. The heads of the CGs were then interviewed before the member households so as to have sufficient background information to understand the respondent's answers.

Once the questionnaires were ready, two pilot household surveys and one head of CG interview were conducted in Duc Uy village of Trung Son commune, in the district of Yen Son on June 17, 2016. Additional adjustments were made following the pilot surveys. On top of language difficulties, some questions needed to be simplified or rephrased, and some needed to be added to the questionnaire to facilitate the understanding of the questions and focus on the outcomes. As for household selection, heads of CGs have a list of their member households, and based on that, the initial plan was to blindly select the respondents from that list upon arrival in the village. However, this implied the direct involvement of the CG head to contact the farmers without previous notice, and also to, indirectly, influence the decision made as to who was to participate in the study. This highlighted the need for randomized household selection prior to arrival in order to get around this issue.

After adjustments were made to the questionnaires and the households were selected, data collection took place over 10 days from June 28 to July 15, 2016. The early findings from the study are presented in the following section.

EARLY FINDINGS

In this section, the early findings from the research project are presented based on the interviews. As described above, while quantitative analysis through the use of secondary data was initially intended, it proved not to be possible given the type of data available. Thus the results of the research should be considered as descriptive, qualitative information that was derived from the observations collected through a relatively small

sample of structured and semi-structured interviews. The summary of the key findings and policy recommendations are presented in Annex 2 – the Policy Brief.

Tea Farmers

Tea farmers appear to be increasingly frequently impacted by changes in the weather and pests and diseases on their plantation.

Regarding the weather, 85% of respondents identified a change, with over 75% of respondents said had a high impact on their plantation. The factor that impacts tea farmers the most are droughts, with over 90% of respondents saying it occurred often, over 82% of which saying had a high impact on their plantation. Some identified an associated loss of 20% to 45% of the harvest and most said droughts and warmer weather led to lower output quality and quantity due to the damage it causes to the tea leaves. A majority of farmers identify droughts as being more severe and more frequent than when they started planting tea – regardless of whether they have inherited from the plantation or not. They describe the change in weather as being characterized by overall warmer temperatures, more and longer sunny hours, longer summers, and shorter winters with less yet colder days. Some of the farmers also mentioned heavier although less frequent rainfall, which they say results in slower growth of the tea buds.

Regarding the change in the disease environment, 87% of respondents said they noticed a change. The reported changes are an increase in the quantity of insects present of the plantation, which are also increasingly resistant to pesticides. The farmers have identified an increase in the amount of red spiders and ‘green bugs’, as well as of insects or diseases that make the tea leaves roll, turn red, or turn yellow, without being able to name the potential cause(s). A significant number of respondents identified the tea leaves

burning as a new disease instead of as a weather-related factor, which may imply wrongful use of pesticides on their plantation as a result. The associated loss caused by diseases and pests tends to be slightly lower than that of weather-related shocks, with an impact more often categorized as medium, because they could treat the diseases in a timely manner by observing their plantations more frequently to catch diseases and insects early and prevent widespread damage.

A few observations are important to note. The 15% who do not notice a change in diseases are not always the ones who do not notice a change in weather patterns, and vice-versa, except for one occurrence. Additionally, some farmers pointed out to the fact that the change in weather patterns was correlated to the change in the disease environment, and that warmer weather was the cause of the increase in the quantity and frequency of pests and diseases on their plantation. Moreover, while these results are biased towards the majority of CGs which do not follow any certification or production standards, both the VietGap-certified and the Organic CGs distinguished themselves. VietGap-certified producers, who follow strict guidelines in pesticides use and type, appear better equipped to manage pests and diseases despite the change, which they describe as being similar to the one observed by other farmers. A majority of them said the change had a low impact on their plantation. Organic tea farmers suffer severe losses from the change in the disease environment because they can only fight diseases by prawning all of the affected tree(s). An increase in the occurrence of diseases and pests leads to more frequent significant yield losses for them. Finally, these findings are an aggregation of tea farmers that produce either or both fresh and dry tea, which they process thanks to their own equipment or through their CG's facility.

TNSP beneficiaries are better able to identify a change in diseases and in seasons than non-TNSP households. They benefit from more stable prices, although the prices still vary greatly based on the unstable market, yet there is less variation in prices amongst communes than there is in non-project communes. However, the prices still vary significantly at the provincial level.

Tea Processors

The households that do not cultivate but only process tea suffer from supply losses due to adverse conditions only when the quantities are so low that they cannot profitably run their processing facilities, which they say happens during the most severe droughts. In such conditions, they lose all of the income generated through processing.

Cooperatives

The processing cooperatives did not mention this happening. The main concern of the cooperatives was the quality of the tea they processed. According to one of the cooperatives, more farmers should cultivate hybrid varieties - such as NDP1 - as opposed to Trung Du tea because of its higher yield and higher quality. Interestingly, NDP1 is the variety planted by the VietGap-certified CG. Both cooperatives attended tea tradeshows in Thai Nguyen, a neighboring province that is more competitive than Tuyên Quang on the national market, and reported learning a lot from fellow farmers, including the importance of irrigation and shade for the trees to counter increasingly adverse weather conditions, such as droughts, warmer weather, and longer sunny hours which lower the quality of the tea produced. Additionally, the use of pesticides lowers the quality and safety of the tea, which negatively impacts the value of the processed product as well as

marketing and branding efforts. Both cooperatives would want more of the farmers to be certified, but recognize that it is a lengthy and costly process. Their inability to control the farming practices of small and medium scale farmers hinders their position in the market and their ability to compete.

Large Scale Businesses

Large-scale businesses offered similar observations as the cooperatives. Both stressed the need to align interests between farmers and businesses to produce safer tea of higher quality, and emphasize the need to learn from models that work elsewhere, such as in Thai Nguyen but also in India and Sri Lanka. Cooperatives and large-scale businesses strongly emphasized the importance of certification at every step of the value chain to guarantee a tea of high quality for greater safety for consumer while raising the income of the farmers. The challenges outlined by both the large-scale businesses, the cooperatives, and the processors are climate change and the knowledge gap. They all referred to an increased frequency of more severe droughts, which lower the quantity and quality of the tea produced and as a result lowers their supply. One cooperative and both businesses said planting high trees for shade and investing in irrigation schemes should be prioritized. They all emphasized the need for greater training of the farmers, especially in terms of food safety and hygiene to increase the value of the tea produced.

Policy-makers

According to DARD, the main challenges when it comes to climate change and the tea value chain are the fact that most tea farmers in the province are small and medium-scale farmers, because it is difficult to gather evidence to demonstrate the quality of the

tea produced. Climate change impacts on all of the value chain of tea, and most severely at the farmers level, because the quality and quantity of tea is reduced, and the change in the disease environment leads farmers to over-use toxic pesticides that are unsafe for farmers and consumers. DARD openly supports initiatives that encourage farmers to become certified, and have funded a few training sessions and subsidies to help farmers and CGs follow and pay for certification. Many farmers said the cost to be certified was one of the reasons they did not follow VietGap standards.

Cooperatives and large-scale businesses were satisfied with the government policies towards unfair competition, and appreciated that they could both import and export tea products without taxes. However, they emphasized the need for greater attention to food safety and agricultural practices, as the current laws and oversight of unsafe practices are not being enforced adequately. The current policy environment does not prevent wrong-doing and negatively impacts the tea sector and exports.

UTILIZATION AND DISCUSSION OF RESULTS

The early findings of this research show that the experience of all actors along the value chain of tea in Tuyên Quang are accurately aligned with the reports of current climate observations in the region as well as to the experience of tea value chain actors in other countries, including Bangladesh and Kenya. As such, recommendations can be based on predicted future scenarios and on the experience of other countries, without disregarding the importance of learning from neighboring provinces such as Thai Nguyen, as emphasized by medium and large scale businesses of Tuyên Quang.

While all possible efforts to randomize were made, the households interviewed were not always the ones selected at random prior to arrival on-site, because the CG lists

were not up to date. On rare occasions the household had dropped out of the CG and could not be contacted, while another factor was the change of the poverty line applied in Vietnam in January 2016, and as a result, some households had changed income group based on the new poverty line. This should not have impacted on the variation of income within each CG as randomization was not stratified based on any criteria.

An important factor in the interpretation and use of the results above are that the most geographically distant households could not be reached due to logistical and weather constraints. In some cases, half or full day hikes would have been necessary to reach villages, and the high summer temperatures and unavailability of alternative transportation meant that these villages had to be excluded from the randomized CG selection. As such, the findings may not fully capture the experience of the most remote communities in the province.

CROSS-SCALE AND CROSS-DISCIPLINE CONSIDERATIONS

When it comes to cross-scale consideration, this research project was specific to the host organization and host location, and may not be externally valid. TNSP is a project that was also implemented in two other provinces, Gia Lai and Ninh Thuan, situated in the south-central and southern regions of Vietnam. These provinces face different climate change-related challenges, such as rising sea levels and soil salinization, which were not addressed in this report as Tuyên Quang is a mountainous inland region of Vietnam. However, the main findings correspond to the experience of value chain actors of other countries and as such may be used in different locations, without omitting crucial background information.

As for cross-discipline considerations, this research encompasses a number of fields ranging from economics, development studies, policy-making, agronomics, and the environment, and the early findings are descriptive accounts that may not fully capture each aspect of the research in depth, in part because the complexity of the project meant a number of actors at the policy-making level were not included in this small-scale study, and also because of the lack of precise meteorology, geographic, and soil structure data. Furthermore, the recommendations were made regardless of budgets and capacity of the various official departments in charge of the project within TNSP as well as at the provincial governmental level, and as such should be used as broad guidance.

CONCLUSIONS

As per their own description of current climate change and on the observations of other actors along the chain, the tea farmers at the bottom of the value chain are and will be the most vulnerable to a changing climate. They also have the greatest potential to make the chain more resilient by adapting their farming practices in line with market demand and certification standards, which will help other actors along the chain increase their adaptive capacity to a changing climate. This can be achieved through the introduction of new, climate-specific initiatives, such as the development of new varieties of tea that are heat resistant, the introduction of high trees for shade and micro-drip irrigation schemes to counter droughts, and education on pest identification.

The datasets compiled from the questionnaires contain a wealth of information that may be analyzed through future work, including the use of quantitative tools to make inferences about the wider population. This report presented the early, descriptive

findings of a research project which has the potential to be taken much further, for example through the use of quantitative tools to make inferences for deeper analysis at the farmers' level. Interesting analysis may look at whether the different observed weather factors and their severity impact on the quantity of tea produced by the households, and whether the results change with added variables such as tea variety, geographic location, type of support received through TNSP, other types of financial and technical support, as well as the ethnic group, gender, and income group of the respondent, whether the household processes its production or not, and whether it sells its tea through the CG or directly to traders, consumers, or processors.

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APPENDICES

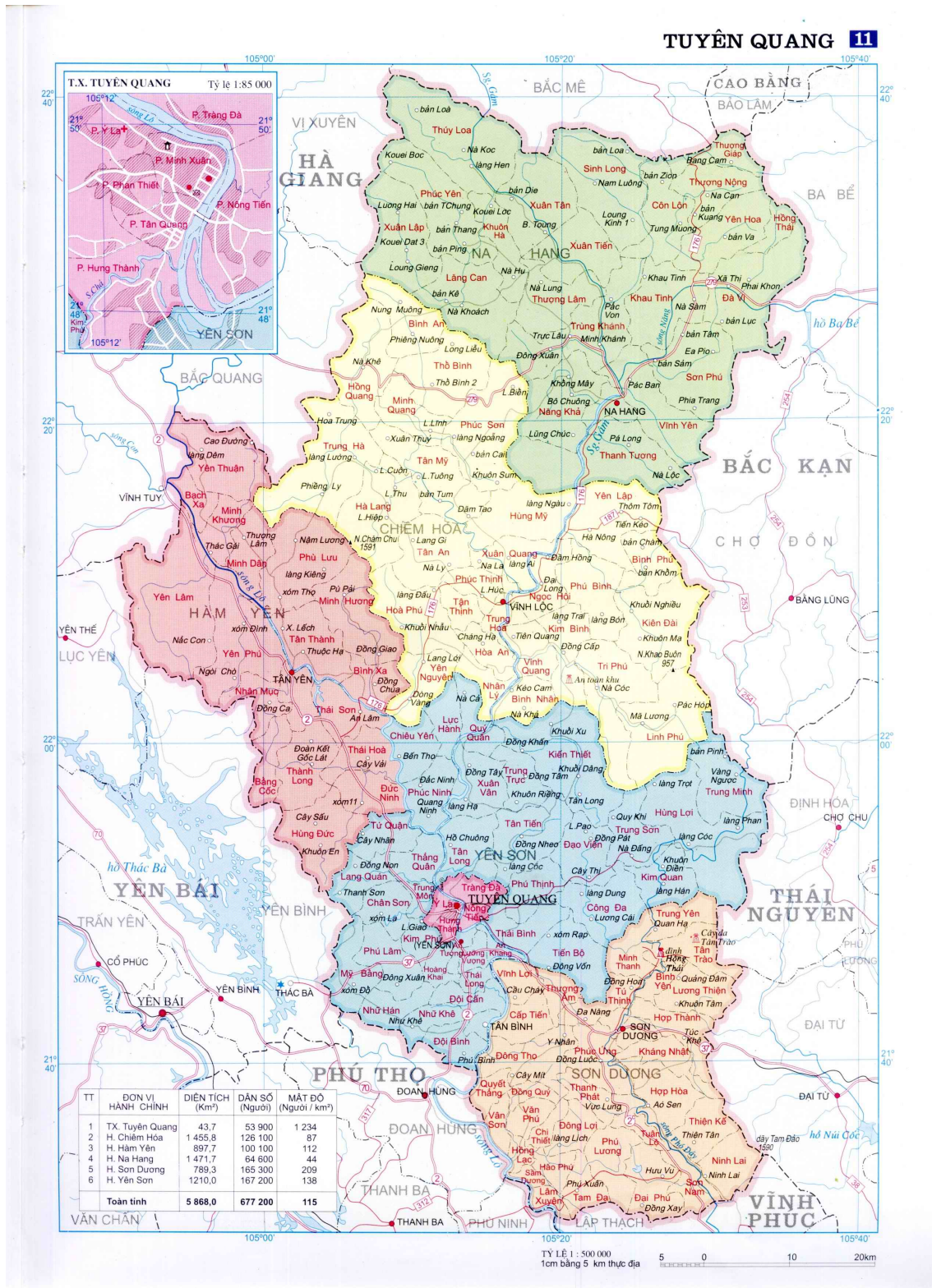
Appendix 1 – Useful Maps

Map 1: Location of Tuyên Quang province in Vietnam



Source: Wikipedia.org

Map 2: Map of Tuyên Quang Province with Districts



Source: lib.UNHRE.vn (2010)

Appendix 2 - Main Deliverable

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**Climate Change-Adapted Tea Value Chain Development in Tuyên Quang, Vietnam****Policy Brief**

The research was completed in fulfilment of the Field Practicum experience required as a candidate for the MSc. in Development Practice (MDP) of Trinity College, the University of Dublin, and University College Dublin. The host organization of this project was The Agriculture, Farmers and Rural Areas Support Project (TNSP). The opportunity to conduct research for TNSP was enabled by the United Nations (UN) International Fund for Agricultural Development (IFAD), in partnership with the Global MDP.

Project Overview

TNSP is a bottom-up, grass-root participatory approach based on Public-Private Partnerships. It was implemented in Tuyên Quang, a mountainous province in the Northern part of Viet Nam, under the Financing Agreement no. 826-VN between the Government of Viet Nam and IFAD. The project's goal is to increase the quality of life of rural populations, with a focus on the most disadvantaged areas of the province, on women, and on ethnic minorities, through (1) the institutional strengthening for implementation of pro-poor initiatives, (2) the promotion of pro-poor value chains, and (3) commune market-oriented socio-economic development planning and implementation. The project beneficiaries include 57.238 rural households, of which the poor account for 35,8% and the ethnic minorities 73,2%, living in 64 communes. With a total cost of USD32 million including USD24 million of IFAD loan, the project started in 2011 and will complete in 2017.

Research Aim

The research aimed at determining the impact of climate change on Tuyên Quang's tea value-chain. The objective was to assess the social-economic feasibility of the tea value chain and its adaptation to current and future climate change scenarios with a view to help TNSP stakeholders prepare their action plans accordingly.

Findings

Farmers who have benefitted from TNSP identified having a better quality of life and higher income as compared with before the start of the initiative, and felt more capable to tend their plantations thanks to the technical training they received. Their prices were more stable than non-project communes.

The climate change factor that impacts tea farmers the most is the increased frequency of droughts. 82% of respondents said droughts had a high negative impact on their plantation, with an associated loss ranging from 20% to 45% of the total harvest.

87% of respondents identified a change in the disease environment, with an associated medium impact on their tea plantation. The change observed by farmers varied within villages and across districts. The farmers frequently identified an increase in the presence of insects, citing red spiders and “bugs”, as well as the tea leaves turning red, yellow, and rolling. However, VietGap-certified tea farmers are better able to manage their use of pesticides and the diseases on their plantation thanks to VietGap guidelines, often describing the impact on their plantation as low.

85% of respondents also identified a change in climate, 75% of which associated a high impact on their plantation. Most indicated that the weather got hotter in recent years, with longer sunny hours, shorter colder winters, and sudden changes in weather, making it difficult for the farmers to work on tend their plantation and to foresee the change in seasons. Some farmers linked the change in weather patterns to the change in diseases. A slight majority said the weather was burning tea leaves and causing a slower growth.

Droughts, the increase in the presence of insects, and the inappropriate changes in weather led to a decrease in both the quality and the quantity of the tea produced.

Both TNSP beneficiaries and non-project households had similar difficulties in differentiating impacts from diseases and impacts from weather-related events on their plantations. Project households were better able to identify weather-related events than non-project households. However, both project and non-project tea producers often specified that the tea leaves were burning as a disease.

Tea processors have a greater capacity to cope with lower yields as long as they can buy enough tea from surrounding farmers to profitably run their processing facility. When the farmers’ losses are too high, they cannot operate the facility and lose significant income.

Both tea cooperative and large-scale businesses identify climate change as a major threat to their activity, because of its impact on the quantity of tea, and on the quality of the output. They also emphasize the need for safer tea products to meet the demand, and that aspect is difficult to control when buying tea from numerous small-holder farmers.

Recommendations

Investing in micro-irrigation schemes and promoting the inter-cropping of tea plantations with high trees for shade in order to address the issue of more frequent droughts and higher temperatures and adapt to these adverse effects of climate change.

Training farmers in disease identification and climate-change to increase awareness of the potential changes that may cause yield and quality losses on their plantations and help the farmers to identify diseases on their crops to ensure appropriate pesticides use. This training will feedback into a reduction in the use of pesticides, and will contribute to the production of safer tea of higher quality and value that will be closer to current and future market demand.

Promoting safer and cleaner production practices, at the cultivation and processing stages, to add value to the tea and bring farmers closer to certification, which helps them be more resilient to climate change. While increasing the value of the tea, raising food safety standards will lead to increases in income and ease market access for farmers and processors at the domestic and international level.

Cooperatives and large-scale businesses, as well as DARD emphasized the need for better marketing practices of Tuyên Quang's tea. An increased focus on sustainable farming practices and health and safety must be achieved before being able to efficiently market the tea.

36% of Tuyên Quang's farmers cultivate Trung Du tea, which is a traditional crop of low yield and lower quality than other available hybrid varieties, such as NDP1, while over half of the respondents said they would like to expand their plantation in the future. Encouraging the plantation of alternative varieties that demonstrate greater resistance to droughts, higher yields, and higher quality, and investing in research efforts to develop new varieties that will help farmers face climate change will benefit the entire value chain in the future.

Developing and enforcing tighter food safety regulations in the tea sector will increase the value of the crop, and help farmers and processors achieve greater quality standards, simplifying certification efforts and raising the competitive capacity of Tuyên Quang's tea sector.

Limitations and Conclusions

A number of considerations need to be taken into account when using the recommendations presented in this document. First, although an Organic and a VietGap CG were interviewed, the results are biased towards the farmers that do not follow any standards. Second, the most remote households could not be reached. These households' experience with climate change and TNSP may differ from that of more accessible CGs, and as such, caution needs to be taken when using these recommendations for this particular group. Finally, these findings could be refined through greater crop-specific research, such as soil acidity, soil fertility, and pests and diseases.

Adapting the value chain of tea in Tuyên Quang should start at the bottom of the chain, through initiatives that increase the farmers' adaptive capacity while ensuring higher quality and value. These efforts will feedback into the entire chain, improving both livelihoods and adaptation capacity.