RISK ANALYSIS: CASE STUDY FOR COFFEE GROWERS IN THE CENTRAL HIGH LAND AREA (TAY NGUYEN), VIETNAM

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Abstract

In the Central Highlands area (Tay Nguyen) of Vietnam, growing coffee has been considered as the main livelihood for most of farmers, of whom around ninety percent are smallholders with the operation capacity of less than 2 hectares. Due to the current practice in production along with variables of external factors such as price, weather, and other social economic conditions, coffee farmers in Tay Nguyen are likely exposed to various types of risks. Those risks, especially yield risk and price risk, are identified and analyzed in this research through the utilization of value chain approach and the combination of quantitative and qualitative methods. The results show that the farmers are facing a variety of risks among which drought, yield and price risks are the most important. The analysis of yield risk and price can provide farmers, the government and other actors in coffee industry of Vietnam with clear understandings about the risks in terms of the chance of occurrence and level of severity. This understanding could be considered as prerequisite for making any particular policies and strategies in farm risk management.

Keywords: Vietnam Coffee, Central Highland, Price Risk, Yield Risk, Agribusiness Risk

INTRODUCTION

Coffee can be considered as an important industry for the development of agriculture and rural areas of Vietnam. During the last several decades, with the contribution of around 43 % of total Robusta coffee traded in the globe (Tran, 2007), Vietnam has been recognized as the second largest country in exporting coffee in the world (D'haeze, Deckers, Raes, Phong, & Loi, 2004), and the industry account for around 10% of exporting turn-over of the nation. The industry has been considered as the major source of earnings for around 500,000 rural households (ipsard, 2011), employing approximately 800,000 workers during the harvest time (WB, 2004), of which around 100,000 are migrants (ipsard, 2011). In the central highlands (Tay Nguyen) area of Vietnam, growing coffee could be seen as the main likelihood for most of farmers as this area contribute to around 80% national coffee production (Dang Thanh & Shively, 2008).

Vietnam has been promulgating supportive policies for coffee growers such as free trade policy in the industry, preferred credit policy (Tran, 2007), and coffee farmers have been benefited from those reforms. However, within the current practices in production and the changes of domestic and global economy, especially price crisis, coffee growers in Tay Nguyen are in conditions of being exposed to various types of risks and uncertainties. Although such risks are mentioned in a lot of the industry reports and newspapers, there has been insufficiently systematic analysis on different types of risks borne by the farmers. There could be the need for research on risk identification and analysis incurred by coffee farmers in order to establish the scientific basis for managing risk policy suggestions in the coffee industry, particularly for farmers.

The research aims at analysing risks borne by coffee growers in Tay Nguyen area of Vietnam. Particularly, the research is expected to achieve the following objectives:

- To review literature on risk identification and analysis in agribusiness sector.
- To identify and analyse risks borne by coffee growers in the central high land area in Vietnam

Given the limitation of data access the research will focus mainly on analysing price risk and production risks. In contrast, other types of risks will be identified and analysed less insightfully.

LITERATURE REVIEW

Concepts of Risk

There is a variety of definitions of risk given by scholars from different perspectives although most of them defined risks as probabilities of events causing any negative impacts or variability on living and business performance. According to Culp (2002), *"risk can be defined as any*

source of randomness that may have an adverse impact on the market value of a corporation's assets, net of liabilities, on its earnings, and/or on its raw cash flows". The author indicated several types of risks including financial risk, peril, accident and hazard.

Williams and Schroder (1999c) suggested that there should be understanding on both sides of risk equation. Accordingly, risks should be understood, on the one hand, as both the chance of losing or of the potential failure. On the other hand, risks can be perceived as the opportunities to gain profits or future desirable outcomes. As the consequence, risk management should be considered as common way of life.

Risk in Agriculture

Agribusiness Risk

The terminology of agribusiness risk can be created from the combination of the definition of risk as given above and the perception of agribusiness that is *"the sum total of all operations involved in the production and distribution of food and fiber"* (Cook & Chaddad, 2000). Therefore, agribusiness risk can be inferred to risks occurring in all agribusiness activities within a particular agricultural industry or supply chain such as coffee or rice industry or supply chain. This perception makes it reasonably thoughtful to argue that agribusiness risks are the best classified as accordance with the position of actors in agricultural supply chain, meaning that a particular actor in a certain supply chain will likely incur some particular types of risks. The argument could be strongly supported by the ideas of Williams and Schroder (1999b) about position risk that "relates to the risk taken in the market from the time of the initial decision to produce or buy (or contract to supply) to the time when final cash settlement is concluded. As soon as a producer is committed to planting or producing, a position in the market has been taken that will be at risk until the time of final cash settlement" (Williams & Schroder, 1999a). According to these authors, the components of position risk were given as price risk, risk in production and storage, trading margin risk, basis risk, time risk, exchange rate risk, credit risk, quality risk, financial risk, and product specific risk.

Farm Risk

Like risk which was given a variety of definitions, mostly regarding probabilities of events leading to adverse effects on business and lives, farm risk can be understood as possibility of circumstances causing variability in farming business performance. "*Risk comes into all aspects of farm management, and all risk involved an unavoidable cost in adverse outcomes or in costs incurred to reduce or avert the consequences of risky outcomes*" (Makeham & Malcolm, 1993). Within the position of farmers who are mainly producers in the agricultural value chain, it could

be arguably to agree with the state that*"the main sources of risk in farming include production, marketing, institutional, personal, and financial risks"* (Nguyen et al., 2007 and Krause, 1995). According to Harwood (1999) these risks can be considered as most important in farming. Also, as stated by OECD (2009), risks in agriculture are linked one with another and a system including particular instruments, strategies is needed to manage them. In the following paragraphs, these different types of risks will be discussed in more details.

Production Risk

Production risk can be understood as the chances at which the variation in production performance outcome, such as yield and total production occurs. The cause of the risk could be that *"agricultural production is determined by biological factors such as climate and weather, insects, diseases, rodents, etc. which are often outside the influence of the producer"* (Williams & Schroder, 1999a). With the same ideas, Krause (1995) suggested that farm business performance and yield can be affected by seasonal rainfall. Also, the author indicated that production system could be threatened by other factors such as disease, mechanical breakdowns and disasters.

Marketing Risk

Marketing risk includes *"commodity price fluctuation, exchange rate variations, cost variations due to inflation – affecting input costs such as fuel and chemicals, the long-term trend of declining terms of trade – which can erode farm profits"*(Krause, 1995). Also, price risk, which *"results from unfavorable movements in price occurring between when the initial position is established and the conclusion of the commodity transaction"*(Williams & Schroder, 1999a), is an important part of marketing risk. In addition, Williams and Schroder (1999a) said that commodity demand and then sales can be affected by the changes in exchange rate.

Institutional Risk

This risk is referred to as the changes in government regulations and laws (Harwood, 1999). In this research, risks occurring from the relationship between farmers and their counterparts, namely "counterpart risk" (ipsard, 2011) could be also listed in this category of farm risk.

Personal Risk

According to Krause (1995), there several main factors associated with personal risk. The first is the physical and mental health problem of both manager and stuff, which can be the results of stress from the work. The second factor is support from family and harmony, which can affect

both the supply of labor and capacity of decision making. In addition, the property's productivity can be influenced by community support, especially in the circumstances of personal crisis and disasters. Lastly, farming business can suffer difficulties resulted from business succession, which in turn depend upon family circumstances such as marriage breakdown and the retirement of older generation.

Financial Risk

Several types of financial risk in farming should be mentioned, including credit risk and the risk of change in interest rate, declining equity and land value fluctuation. *"The risk of non-payment or default by the buyer occurs whenever title (or control) is relinquished before payment is received"*(Williams & Schroder, 1999a). According to Krause (1995), debt payment is obviously affected by the interest rate and decrease in equity could result in difficulties for firms to deal with detrimental seasons.

RESEARCH METHODOLOGY

Theories Guiding the Research

This descriptvie research was mainly driven by several theories by Williams and Schroder (1999a), Makeham and Malcolm (1993), Harwood (1999) and Tangermann (2011). These theories are about risks and risk management on farms. Key concepts on different types of risks borne by farmers, approaches and methods to measure risks were found in these theories.

Data Collection

Secondary data including quantitative and qualitative information related to field of study was used in the research. Quantitative data is the numeral information about the production and prices of coffee, whereas qualitative data "are the form of text, written words or symbols..." (Neuman, 2006) related to the field of study. By browsing the Internet and using some search engine tools, such as Google, Search Discovery and other search tools, the data was obtained from governmental and nongovernmental organizations and other academic sources.

Data Analysis

The research employed both quantitative and qualitative analysis methods to achieve the objectives. The combination of document analysis and coding was used to analyse the qualitative data. According to Clive (2004) the method of coding enable the researcher to classify the qualitative information into different categories of research phenomena. This could help researcher effectively manage the time schedule and quickly achieve the research

objectives. For example, some categories of risk definition and classification, methods of risk measurement, strategies of risk management was labelled while the relevant qualitative information is scanned. The results of this task can bring about justification of research arguments, supporting ideas, and evidence to the findings of the research.

The mixed method was used in analysis of some statistical information about coffee production, yield and price risk, and will likely be expected, as suggested byLund (2012), to bring about more insightful results for the research. For example, while price risk and yield risk can be identified by qualitative method they can be described and analyzed in large extent by the use of quantitative approach. This approach can enable the research in answering not only the question of what the risk borne by coffee farmers is, but also the question of how much severe the risk is.

Measuring Risks

Framework for Identification and Analysis of Farm Risks

There could be various types of risks confronting coffee growers in Tay Nguyen and the risks was listed in the risk map adapted from Leppälä, Murtonen, and Kauranen (2012). The employment of the framework likely helped to visualize the process through which farm risks were emerged and coped with. These included environments likely creating various types of risks to farmers and reasonable impacts of farm risks to outside farm environment.

Measuring yield risk and price risk

The methods of measuring yield risk and price risk were adapted from that used by USDA (1999a). Accordingly, the estimation of probabilities of future occurrences was the involvement of the measurement. Particularly, the utilization of the methods aimed at answering the question of to what extent the coffee yield or price will likely fall under a certain level in the particular point of time in the near future. The criteria used in the measurement were the range of variation, standard deviation, coefficient of variation, deviation from the trend of yield and price, probability of deviation from the trend and accumulative probability of deviation from the trend.

RESULTS

Coffee Areas and Production in Vietnam and Tay Nguyen

The coffee industry of Vietnam was indicated to begin from the early of the twentieth century, initially managed by state-owned farms with moderate development pace. Since around 1980s, due to the cooperation on coffee growing and export made between Eastern countries and Vietnam, the participants in the coffee sector was strongly supported by Vietnamese

government in terms of land and finance access, leading to considerable spread of small farmers in production of coffee (ipsard, 2011). Consequently, as can be seen in the Figure 1, there has been significant increase in production areas and total production, from 119,300 ha and around 100,000 tons coffee in the year 1900 to around 539,000 ha and 1,110,000 tons in 2011, indicating the increase of approximate 3.52 times in area and ten times in total production.

Figure 1: Coffee Areas and Production of Vietnam (1990-2011)
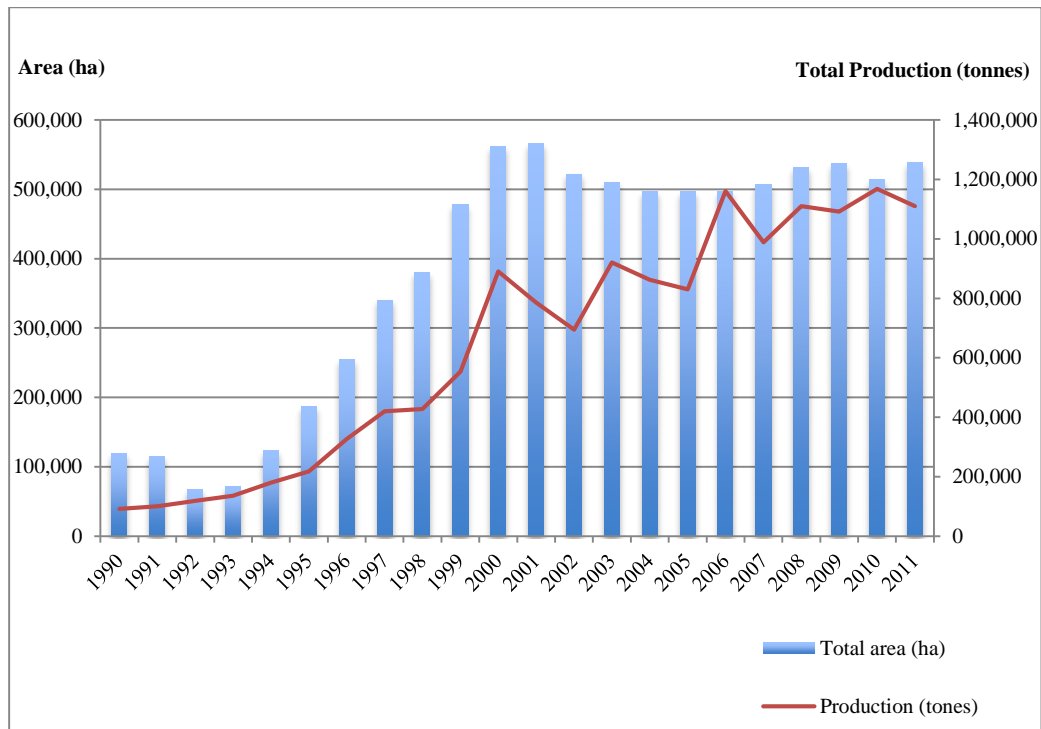
Source: MARD (2010), ICO (2012) and Author's calculation

Besides the general upward trend of coffee area and production, the figure 1 also illustrates significant variations in these two items, showing that the changes in production, and therefore coffee yield, could be the big concern of coffee growers in Vietnam. According to ipsard (2011), in the near future the rapid pace of growth in coffee production will likely to moderate because most of coffee trees will arrive at the age of replacement.

According to *VICOFA (2009)*, coffee is grown across six main areas in Vietnam, including Tay Nguyen, the South-East, the South Central Coast, the North Central, the Mild-land North, and the Red River Delta. Tay Nguyen contributes to over 90% of coffee production area and around 93 % total production in Vietnam with the highest yield of 2.13 tons per ha.

Vietnam Coffee Supply Chain

The supply chain map of Vietnam coffee is depicted in the Figure 2, indicating two main chains through which coffee is flown from producers to the markets. As shown in the diagram, Vietnam coffee industry can be argued to rely on exporting market, accounting for around 95% of total coffee production of Vietnam. In contrast, the amount of coffee consumed in the domestic market accounts for about five percent of total production, although, as said by Do (2011), there has been the tendency to increase of domestic coffee consumption in Vietnam recently.

As illustrated in the figure 2, the international supply chain differs from that in domestic chain. While the exporting market is provided with coffee from both state-owned enterprise (SOE) farms and small farmers, coffee consumed in the domestic market is produced only by small growers. According to ipsard (2011), the major roles in the supply chain were played by producers, processors and exporters who are mainly Joint-Stock Companies and State-Owned Enterprises (SOE's). However, the competition within the industry has increased due to the participation of foreign-linked companies.

Figure 2: Vietnam coffee supply chain map
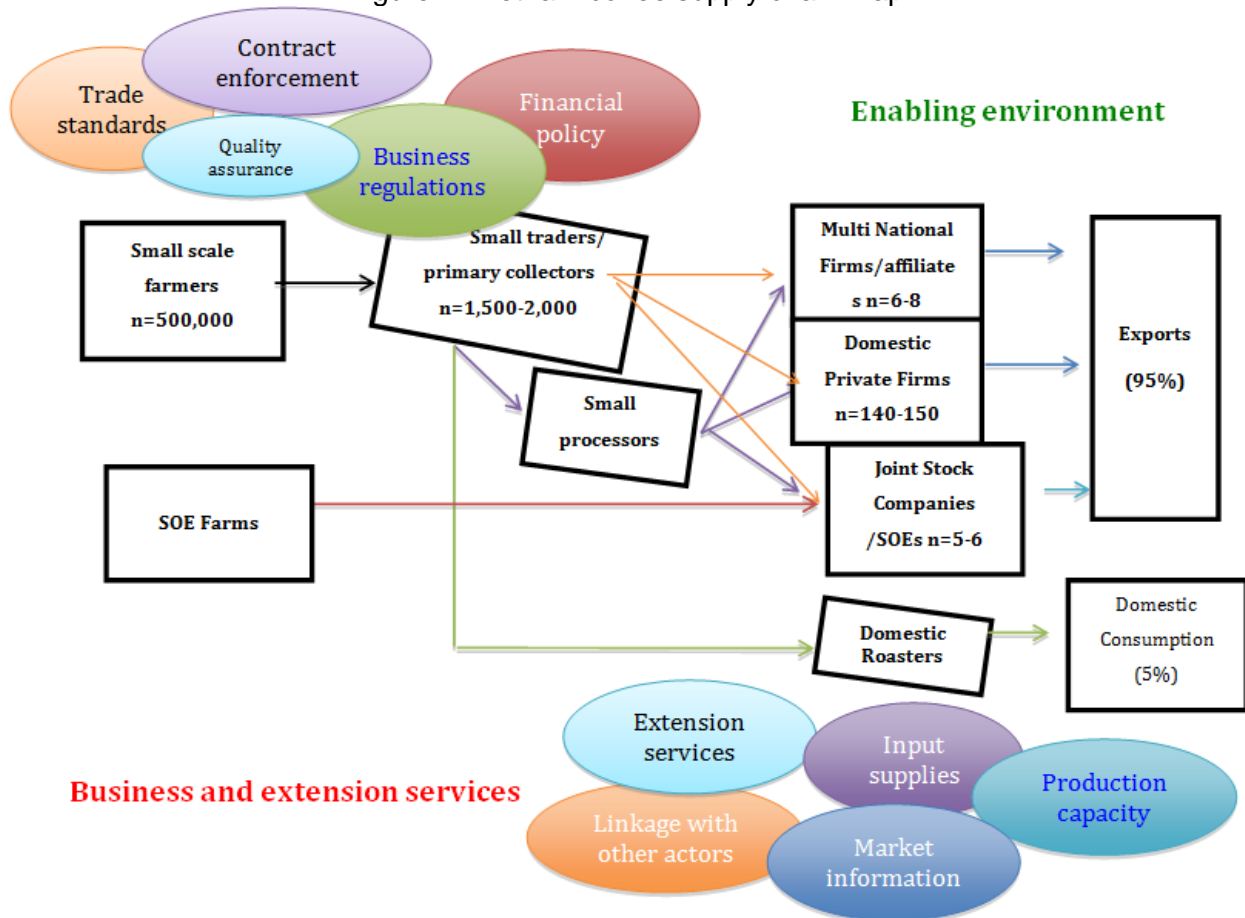
Source: Adapted from ipsard (2011) and Hellin and Meijer (2006)

In the current state of production system and position in the supply chain, small coffee growers can be exposed to various disadvantages. According to WB (2004), in 500,000 small households growing coffee in Vietnam, the number of them with area of above five hectares accounts for only around one percent, and farms with area less than two hectares make up over 85 percent. With small scale of production, farmers not only lack of ability to change to advanced production practice, but also likely to face weak market power in the supply chain. As stated by ipsard (2011), although coffee produced by farmers is not often rejected by other traders, the quality and price of coffee is usually set by those brokers, indicating the vulnerable position of small farmers to be exposed to risks resulted from weak market power.

It should be worth mentioning the medium in which the coffee supply chain map was formed, including enabling environment, and business and extension services, as shown in the figure 2. The likely remarkable idea is that small farmers are considered to incur disadvantages within these environments. Quality management is one example where almost no real standard is applied in the production system, leading to inconsistent of quality of coffee produced by farmers.

Also, while contract enforcement is likely well ensured in the circumstances farmers are customers of services, such as finance, input supply, the contracts between farmers and traders to sell coffee are not usually working under any regulation. Another example is about extension service which was, as asserted by ipsard (2011), considered as weak in terms of both frequency and quality. Additionally, AgroInfo (2007) stated that because each stakeholder in the supply chain considers their own benefits, there is almost no link and collaboration among actors during the chain of coffee.

Exporting Market

Vietnam coffee industry, as indicated in the supply chain map, is rely on exporting market. Do (2011) indicated that coffee of Vietnam is being exported to 90 countries in the world, among which, as depicted in the figure 3, Europe is the largest importer, accounting for nearly 60 percent of total export quantity, followed by the United States. In the Asia, China is being considered as the main exporting market of Vietnam coffee, in general. However, in the last several years, the export quantity has not been as expected. Also, while Indonesia and Brazil are the third and second largest exporters, these countries are importing coffee from Vietnam (ipsard, 2011).

Figure 3: Vietnam Coffee Exporting Markets
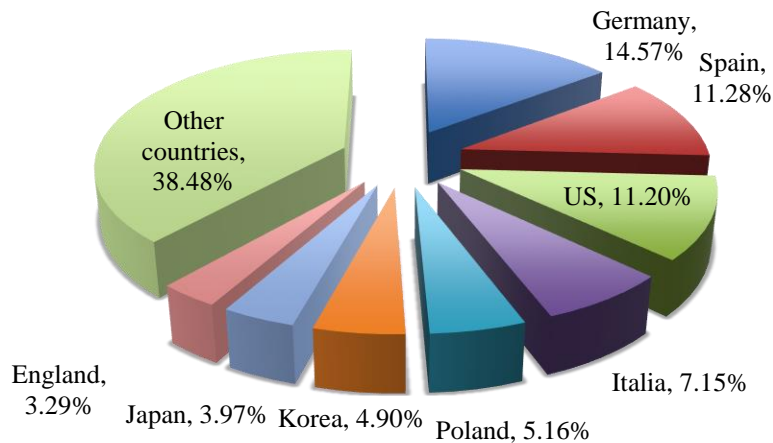
Source: Trieu (2006) and Do (2011)

Risk Identification and Analysis for Coffee Growers in Tay Nguyen, Vietnam

Map of Risks Faced by Coffee Growers in Tay Nguyen

Different risks faced by coffee farmers in Tay Nguyen is drawn in the table 1, which is partly the detail of the ideas about supply chain map discussed above. The ideas of the map is adapted from Leppälä et al. (2012), recommending that risks in farming should be identified and analysed in combination of factors both inside and outside the farms that have effects on farming businesses. Additionally, as depicted in the table 1, the map not only shows the effects of farm risks on farming system, but also indicates the likely impact on the related parts outside the farms.

As revealed in the table 1, there are various types of risks facing coffee farmers in Tay Nguyen. The most important risk to the farmers that has been recognized is price risk, pointing out significant impact on business of farmers with high probability of occurrence. The second important risk likely incurred by farmers in Tay Nguyen is the variation of coffee yield, drought and rainfall. These risks are seen as having probable occurrence with considerable impact on farming businesses. Yield risk and price risk will be discussed in depth in following section of this paper.

Table 1: Farm Risk Map for Coffee Growers in Tay Nguyen

Outside impacts to the farms	Risks inside the farms					Impacts from the farms
Finance and markets	**Production risks**	**Marketing risks**	**Institutional risks**	**Personal risks**	**Financial risks**	
Financial policies	Drought, rainfall: highly probably and considerable impacts	Price risk: Highly probable and significant impacts	Government laws and regulation: Remote and moderate impacts	Safety and Healthy: Occasionally and moderate impacts	Credit risk: Occasionally and moderate impacts	Inadequate supply amount. Inconsistence of quality.
Financial markets						
Market power	Insect and disease: probably and moderate impacts					
Product prices		Exchange rate risk: Highly probable and moderate impacts			Debt: Occasionally and moderate impacts	
Networks						
Trade						
Suppliers	Yield risk: Probable and considerable impacts					
Authorities						
Research and education						
Extension		Input price risk: Highly probable and moderate impacts	Counterpart defaults: probable and moderate impacts		Interest rate: Remotely and moderate impacts	
Association and cooperation						
Mechanical breakdowns						
Others						
Natural disasters						

Source: Adapted from Leppälä et al. (2012), ipsard (2011) and the Author

Yield risk

As discussed in the literature review about farm risks, yield risk can be understood as the variability of crop yield over a time period. In this section, yield risk incurred by coffee farmers in Tay Nguyen will be quantitatively examined. General variability of coffee yield in the area is depicted in the figure 4 as follows:

Figure 4: Actual and Trend-Adjusted Coffee Yields in Vietnam, 1990-2011
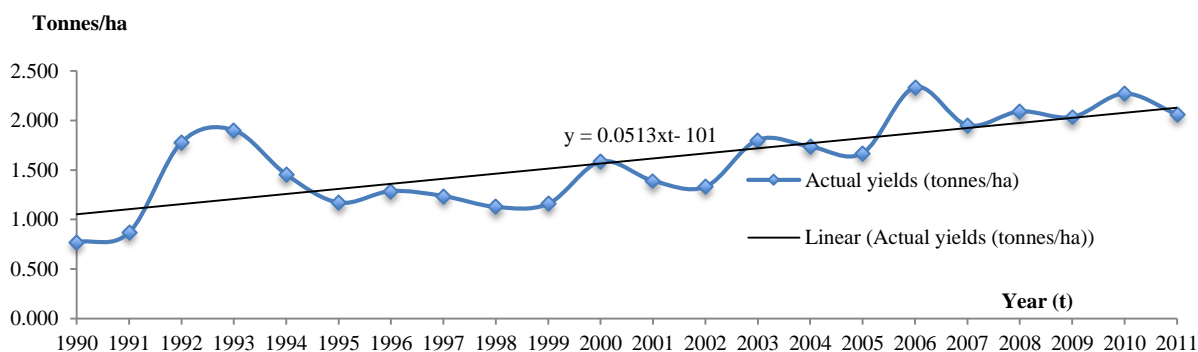
Source: MARD (2010), ICO (2012) and Author's calculation

As can be seen from figure 4, there is a tendency to increase of coffee yield during the time period between the year 1990 to the year 2011, indicating the growth of 167% from 0.771 tons/ha to 2.059 tons/ha. In addition, there are two main peaks at which highest yield of coffee in Tay Nguyen were presented in the graph. According to Chi (2007), the peak occurred around the year 1992 to 1994 as the result of Vietnames government policy during early the years of 1990s giving motivation to farmers to practice intensive coffee production.

Comparing the actual yield with the trend-adjusted yield line, it could be argued that there has been significant fluctuation in the actual yield over the examined time period. As can be perceived from the graph, although actual yields in the last five years have been higher the average trend, over half of actual yield figures in examined years felt under the trend line. It indicates that there might be a lot of chance at which farmers in Tay Nguyen have to incur risk of coffee yield falling under the expected trend. The chance of yield risk will be analysed in more details in following tables and figures.

The general information about characteristics of coffee yield in Tay Nguyen can be seen also in the table 2. Similarly to the statement that can be drawn from the figure 4, there is a huge range between the maximum and minimum value of the yield (1.564 tons/ha). The coefficient of variation number suggests that there is around 27 percent of coffee yield falling above or below the average value.

Table 2: Some Statistical Information of Actual Coffee Yields in Tay Nguyen (1990-2011)

| Criteria	Values
Mean (tonnes/ha)	1.591
Maximum (tonnes/ha)	2.335
Minimum (tonnes/ha)	0.771
Range (tonnes/ha)	1.564
Variance (tonnes/ha)	0.188
Standard Dev (tonnes/ha)	0.434
Coefficient of Variation	27.25%

Source: Author's calculation

However, the significance of risk analysis is not only showing the chance at which the event will like occur under or over average outcome, as the meaning the coefficient of variation. More importantly, the analysis should indicate the chance at which the outcome will likely fall below a

particular level, such as expected value in the next crop. The significance will be achieved by observing diagrams in the figure 5 and figure 6.

In the figure 5, the frequencies of coffee yield falling below a particular level are depicted. For example, there were 15 times in 22 years the yield fall in the range of from 0.09 tons to 0.391 tons under the expected trend. This indicates that more than half of the actual yield was bellow the expected trend.

Figure 5: Frequency Distribution of Coffee Yield Deviations from Trend, Vietnam, 1990-2011
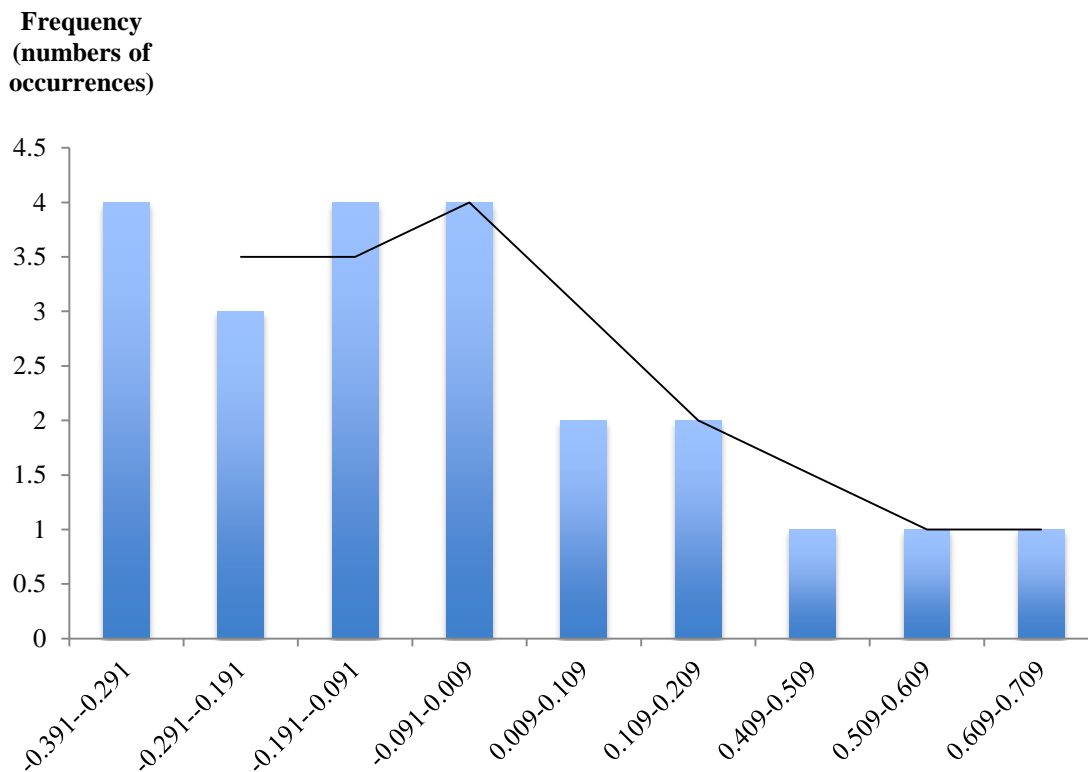
Considering the same problem, that is the variation of coffee yield, the chances at which the yield risk occurs are illustrated as probability in the figure 6. For example, around 68% of yield in 22 years examined felt in the range of from 0.091 tons to 0.391 tons under the expected trend. This could raise a considerable issue relating to yield risk that farmers seem to be familiar with expectation that the yield of coffee in the next crop will be likely low compared to what they desire.

Figure 6: Cumulative Probability of Coffee Yield Deviations from Trend, Tay Nguyen, 1990-2011
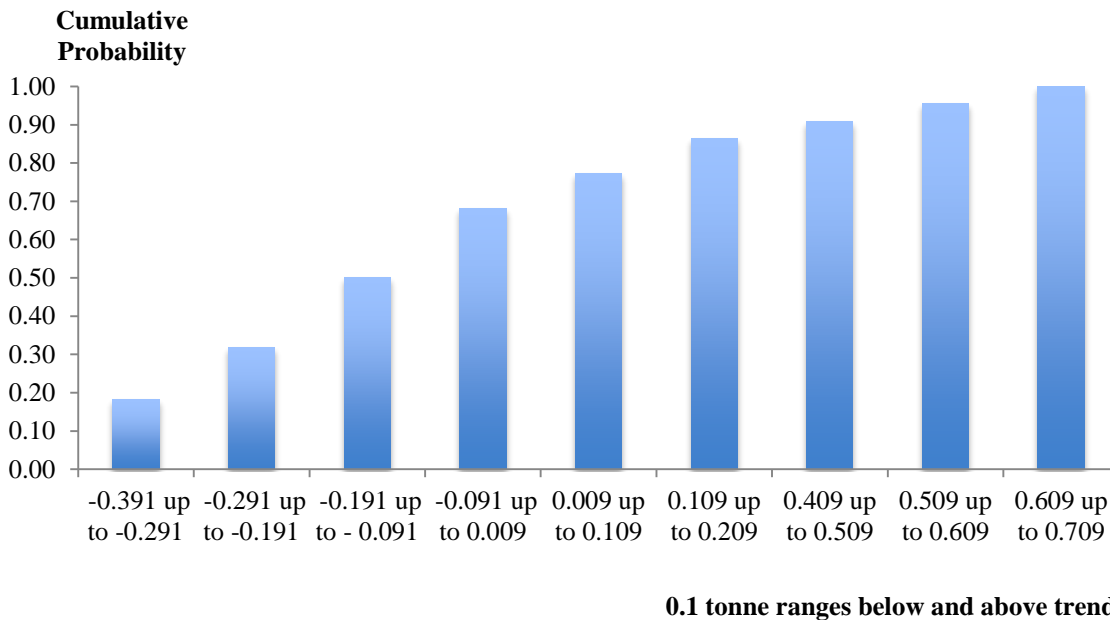

The implication of analysis of yield risk could be regarded as important for yield risk management strategies and policies of farmers and other actors including the government and insurance agencies. The information generated from the analysis likely provides those actors with relatively accurate prediction of coffee yield risk in the future. The anticipation will be used as the guidance for the actors to make strategies and policies dealing with the risk.

Price Risk

In this section, the same techniques and calculations employed to examine yield risk is used to analyze price risk. All the outputs of the analysis for coffee price risk are depicted in the figure 7, table 3, the figure 8, and the figure 9.

In general, the variability of coffee price from 2006 to 2011 faced by coffee growers in Tay Nguyen was plotted in the figure 7, indicating the upward trend and significant fluctuations. According to Do (2011), the changes in coffee price in Tay Nguyen and in domestic market of Vietnam likely follow the changes in coffee price in global market that is mainly influenced by supply capacity from large exporting countries such as Brazil, Colombia and Indonesia. Consequently, there were price spikes for coffee in Vietnam during the years 2007, 2008 and 2011 when there was shortage in supply in Brazil due to adverse weather conditions and drought.

Figure 7: Vietnam Coffee Domestic Price (2006-2012) - Monthly average

Price VND/kg

$y = 9.7962x - 360975$
$R^2 = 0.5192$
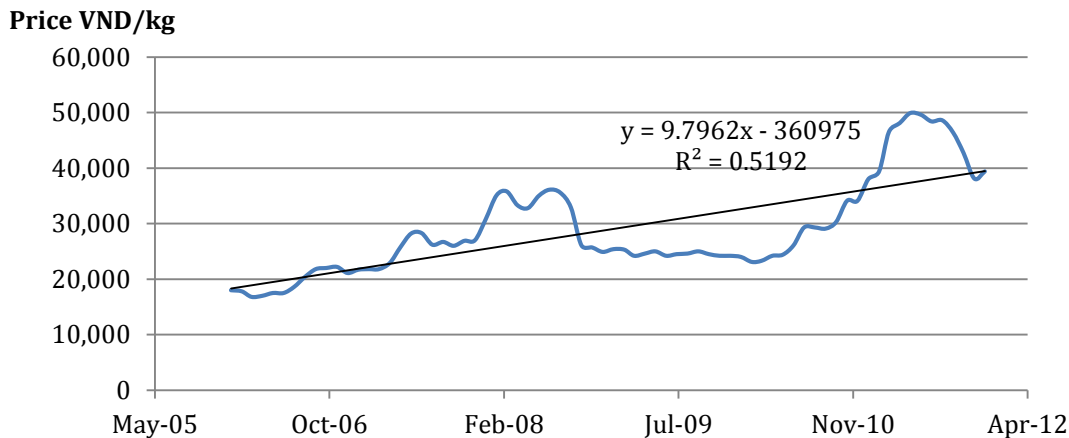
Source: VICOFA (2012) and Author's calculation

In table 3, changes in coffee price depicted in the figure 7 is summarized, indicating the huge range of around 33,000 VND/kg between the maximum price (49,900 VND/kg) and minimum price (16,800 VND/kg). Also, the value of standard deviation suggests that on average, the coffee price can fluctuate around the mean value (28,980 VND/kg) by the amount of 8,599.37 VND. The coefficient of variation value indicates that the changes in monthly price of coffee could be around 30% above or under the mean value.

Table 3: Some Statistical Information about Coffee Price in Tay Nguyen

(Monthly average, 2006-2011)

Criteria	Values
Mean (VND/kg)	28,890
Maximum (VND/kg)	49,900
Minimum (VND/kg)	16,800
Range (VND/kg)	33,100
Variance	74,990,749.22
Standard Deviation (VND/kg)	8,599.37
Coefficient of Variance	29.77%

Source: Author's calculation

In figure 8, the frequency distribution of coffee price deviation is examined. As can be perceived from the graph, price risk can be exactly clarified both in terms of level understood as specific value of price, and chance of occurrence known as frequency. For example, as can be seen in

the graph, there were up to 41 times out of 72 times in which coffee price felt in the range of from 1,904.5 VND/kg to 9,904.5 VND/kg under the expected trend of coffee price.

Figure 8: Frequency Distribution of Coffee Price Deviations from Trend, Tay Nguyen, 1990-2011
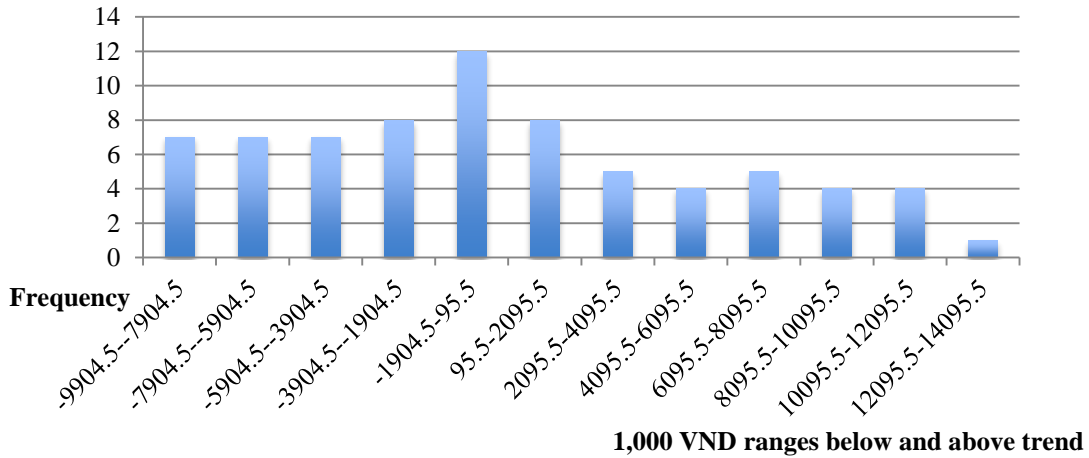
Source: Author's Calculation

With the same implication drawn from the examination of figure 8, in figure 9 chance of price risk is understood as probability. For example, the chance for coffee price falling into the range of from 1,904.5 VND/kg to 9,904.5 VND/kg under the expected trend of coffee price is about 57 %.

Figure 9: Cumulative Probability of Monthly Coffee Price Deviations rom Trend, Tay Nguyen, 2006-2011
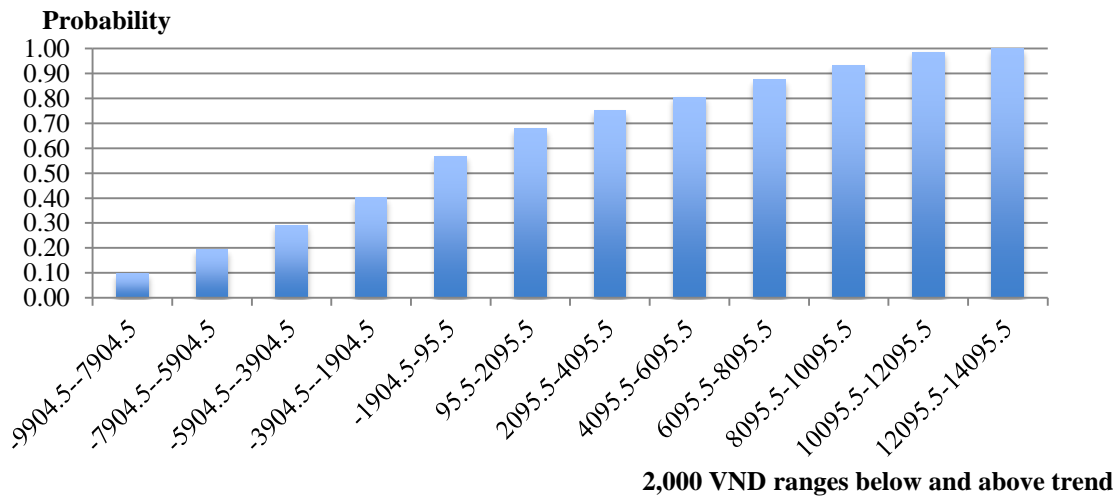
Source: Author's calculation

The above analysis of price risk can be considered as important for price risk management for coffee growers, the government, organizations and agencies whose activities are to deal with coffee price risk management. The significant importance of the analysis is that it provides those actors with clear information about expected risk based on historical data of prices. For example, the exploitation of figure 9 can help farmers or price insurance company to predict relatively accurate coffee price in the next year. Consequently, the conclusion resulted from the analysis can be used as the guidance for making strategies and policies regarding price risk management of those actors.

CONCLUSION AND DISCUSSION

There are several important conclusions and discussions that should be drawn after this research on risk identification and analysis is completed. The ideas are as follows: Firstly, the best way of identifying farm risk is examining the medium in which peasants are practicing their farming businesses. The examination should indicate the relationship between the business activities and the environment, pointing out circumstances and mechanisms creating risks and uncertainties faced by farmers in their efforts to achieve farming business efficiency. In this study, the approach of Hellin and Meijer (2006) about the value chain analysis was adapted to examine the map of coffee supply chain in Tay Nguyen and Vietnam (as depicted in the figure 2). Additionally, the approach of Leppälä et al. (2012) about the farm risk map was employed to conduct this examination.

The benefit resulted from the utilization of these approaches is that the objective of identifying farm risks for coffee farmers in Tay Nguyen was successfully achieved. The meaning of the achievement indicates that the risks are occurring to farmers in the relationship with both actors inside the supply chain and with factors from the outside environment affecting farming businesses, including enabling environment and business and extension services. For example, yield risk can be arguably caused by both natural disaster faced by coffee farmers, such as drought and heavy rainfall, and the state of weak extension services. Also, an assertion could be made for the case of price risk could be that the risk has been happening not only because of the movement in coffee price both in domestic and international markets, but also because of the lack of ability of Vietnam coffee industry, including government, farmers and other actors in the supply chain, in using price risk management tools.

Secondly, the objective of farm risk analysis for coffee farmers in Tay Nguyen was also successfully accomplished through the use of risk analysis criteria and quantitative methods suggested by USDA (1999b). This utilization was clearly employed in the sections namely yield risk and price risk of this research, showing the quantification of coffee yield and price risks.

These results can significantly strengthen the creditability of judgment made on the importance of risks faced by coffee farmers in Tay Nguyen given in the table 1 of this report. Therefore, the achievement of combining qualitative and quantitative methods was well arrived in this research. The analysis can provide farmers; the government and other actors in coffee industry of Vietnam clear a look on yield and price risk in terms of chance of occurrence and level of risk. This should be considered as important achievement before any policies and strategies dealing with coffee yield and price risk are made.

SCOPE FOR FURTHER RESEARCH

The accomplishment of the research can suggest further research in risk management for coffee farmers in Tay Nguyen and for coffee industry of Vietnam. Firstly the focus of future research can be the clarification and quantification of risks faced by the farmers that were caused by the institutional and operational mechanism of enabling environment and business and extension services mentioned in this research. Secondly, the future research can aim at examining risk layers for each type of risks currently borne by the farmers with regard to risk tolerance and risk capacity of farmers. The achievement of the further research can be invaluable in supporting the research on willingness to pay for coffee insurance products and on determining risk premium for those products.

REFERENCES

AgroInfo. (2007). Report on coffee production in Dac Lac province Retrieved 25/8, 2012, from http://agro.gov.vn/news/chitiet_nghiencuu.aspx?id=696

Ahsan, D. A. (2011). Farmers' motivations, risk perceptions and risk management strategies in a developing economy: Bangladesh experience. [Article]. *Journal of Risk Research, 14*(3), 325-349. doi: 10.1080/13669877.2010.541558

Chi, T. T. Q. (2007). Profile of Vietnam coffee industry Retrieved 25/10, 2012, from ipsard.gov.vn/OUTLOOK2009/.../Coffee%20profile.new.doc

Clive, S. (2004). *Social Research MethodsA Reader*. LondonNew York: Routledge.

Cook, M. L., & Chaddad, F. R. (2000). Agroindustrialization of the Global Agrifood Economy: Bridging Development Economics and Agribusiness Research. *Agricultural Economics, 23*(3), 207-218.

Culp, C. L. (2002). A vocabulary of Risk *The Art of Risk Management: Alternative Risk Transfer, Capital Structure, and the Convergence of Insurance and Capital Markets* (pp. 185). Canada: John Wiley & Sons, Inc.

D'haeze, D., Deckers, J., Raes, D., Phong, T. A., & Loi, H. V. (2004). Environmental and socio-economic impacts of institutional reforms on the agricultural sector of Vietnam. Land suitability assessment for Robusta coffee in the Dak Gan region. [Article]. *Agriculture, Ecosystems and Environment, 105*, 59-76. doi: 10.1016/j.agee.2004.05.009

Dang Thanh, H., & Shively, G. (2008). Coffee Boom, Coffee Bust and Smallholder Response in Vietnam's Central Highlands. [Article]. *Review of Development Economics, 12*(2), 312-326. doi: 10.1111/j.1467-9361.2007.00391.x

Do, N. T. (2011). Overviews of coffee market Retrieved 1/8, 2012, from http://www.vinacafe.com.vn

Harwood, J. L. (1999). *Managing risk in farming [microform] : concepts, research, and analysis / Joy Harwood ... [et al.]*: Washington, DC (1800 M. St., NW, Washington 20036-5831) : U.S. Dept. of Agriculture, Economic Research Service, [1999].

Hellin, J., & Meijer, M. (2006). Guidelines for value chain analysis Retrieved 1/10, 2012, from http://www.fao.org/fileadmin/templates/esa/LISFAME/Documents/Ecuador/value_chain_methodology_EN.pdf

ICO. (2012). ALL EXPORTING COUNTRIES TOTAL PRODUCTION CROP YEARS 2000/01 TO 2011/12 Retrieved 20/8, 2012, from http://www.ico.org/new_historical.asp?section=Statistics

ipsard. (2011). *VIETNAM COFFEE SUPPLY CHAIN RISK ASSESSMENT*.

Krause, M. A. (1995). *Rural property planning: risk management*. Adelaide Institute of TAFE: Reed International Books Australia.

Leppälä, J., Murtonen, M., & Kauranen, I. (2012). Farm Risk Map: A contextual tool for risk identification and sustainable management on farms. [Article]. *Risk Management (14603799), 14*(1), 42-59. doi: 10.1057/rm.2011.14

Lund, T. (2012). Combining Qualitative and Quantitative Approaches: Some Arguments for Mixed Methods Research. [Article]. *Scandinavian Journal of Educational Research, 56*(2), 155-165. doi: 10.1080/00313831.2011.568674

Makeham, J. P., & Malcolm, L. R. (1993). *Who Bets? Risk, The Farming Game Now*: Cambridge University Press.

MARD. (2010, 26th-28th February). *Vietnam Sustainalbe Coffee Development.* Paper presented at the Worl Coffee Conference, Guatemala.

Neuman, W. L. (2006). *Social Research Methods: Qualitative and Quantitative Approaches (6th Edn).* Boston, Pearson Education Inc.

Nguyen, N. C., Wegener, M., Russell, I., Cameron, D., Coventry, D., & Cooper, I. (2007). Risk Management Strategies by Australian Farmers: Two Case Studies. *Australian Farm Business Management Journal, 4*(1/2), 23.

Tangermann, S. (2011). Risk Management in Agriculture and the Future of the EU's Common Agricultural Policy Retrieved 25/10, 2012, from http://ictsd.org/i/publications/108961/

Tran, T. Q. C. (2007). Lessons on price risk management, applications for Vietnam Retrieved 10/8, 2012, from http://agro.gov.vn/news/chitiet_nghiencuu.aspx?id=691

Trieu, N. D. (2006). Vietnamese coffee reality and potential Retrieved 20/8, 2012, from http://agro.gov.vn/news/chitiet_nghiencuu.aspx?id=597

USDA. (1999a). Appendix 1: Techniques forMeasuring Risk (pp. 107-112): USDA.

USDA. (1999b). Managing Risk in Farming: Concepts, Research, and Analysis. Retrieved 31/10, 2012

VICOFA. (2009). Coffee growing regions in Vietnam Retrieved 25/8, 2012, from http://vicofa.org.vn/

VICOFA. (2012). Coffee yields and prices in Tay Nguyen Retrieved 20/9, 2012, from http://vicofa.org.vn/

WB. (2004). The Socialist Republic of Vietnam Coffee Sector Report World Bank Vietnam.

Williams, J., & Schroder, W. (1999a). *Agricultural Price Risk Management The principle of commudity trading*. United Kingdom: Oxford University Press.

Williams, J., & Schroder, W. (1999b). Introducing risk *Agricultural Price Risk Management The principle of commudity trading* (pp. 8-13). United Kingdom: Oxford University Press.

Williams, J., & Schroder, W. (1999c). Introducing risk *Agricultural Price Risk Management The principle of commudity trading*. United Kingdom: Oxford University Press.