Environmental Evaluation of Organic Rice: A Case Study in the Philippines

M.S. Thesis

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Abstract

In this thesis, we discuss the organic rice production and consumption situation in the Philippines. Organic rice production in the Philippines has been expanding since 1986 and has been growing very rapidly especially in the last couple of years. Organic farming benefits small farmers mainly in two ways; first, by lowering the production cost and increasing the product's price, second, by improving the farm environment, farmers' health conditions and fertility of their land. Pricing organic rice is a very critical issue for organic farmers and the Cooperatives and NGOs supporting them since there is no regular marketing channel where one can sell organic rice as organic. Therefore, studies on evaluating the organic market and consumers' willingness to pay are necessary for their further development. We conducted contingent valuation method and conjoint analysis in two cities in the Philippines. One is Metro Manila, the other is Naga city, one of regional cities. We collected samples with sizes 348 and 200 in Naga city and Metro Manila, respectively. The results suggest that marginal willingness to pay for organic rice is around 16 peso in Naga city and 6 peso in Metro Manila. Although the first concern of consumers is health risk, the second concern in Naga city is environmental pollution while it is certification in Metro Manila. These results suggest different needs for different types of cities in different locations. Philippines Certification Program will be launched by 2004. Since the program is explicitly targeting to benefit small and medium organic farmers, we discuss the need for careful cost structure studies.

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Chapter 1

Introduction

Organic rice production in the Philippines started in 1986. There were two main motivations for the promotion of organic rice. One is as a measure of poverty alleviation for small farms. The other is to improve farm environment and farmers' health that had been damaged due to side-effects of the Green Revolution that started in 1961 in the Philippines.

The total area of organic rice fields in 1999 is 17,165, and the total number of organic rice adopters is 18,605. Since there are no official statistics for the situation of entire Philippines, this number is the minimum possible value. Market share of organic and partially organic rice accounts for 0.9 percent of the rice from irrigated land. The number of adopters has been increasing over time and, especially for the last couple of years, it has been increasing dramatically in Luzon, Visayas and Mindanao.

Benefits of organic rice production in the Philippines can be categorized mainly into two. One is that farmers can cut the vicious cycle of poverty since they do not have to depend on the capital provided by local creditors and traders if they switch to organic farming. This is true because in conventional farming, they have to buy expensive inputs for every cropping season at an increasing rate. But in organic farming, their cost of production can be reduced significantly. The other benefit is that farmers can improve

the fertility of their land, environment, biodiversity, soil and water quality and their own health condition. The intensive chemical input use for the conventional farming have made soil very acidic, polluted water and killed beneficial insects and animals over years. Farmers' health have been damaged due to adoption of pesticide in their farm. Organic farming potentially improves those effects from so-called modern technologies with high yielding varieties (HYV).

In this thesis, we focus on one farmers' cooperative, Pecuaria Development Cooperative Inc. (PDCI). Their members adopted organic rice production in 1991. They have been having difficulties with marketing and organic rice pricing in the last a couple of years. They have developed their own marketing channel for organic rice since they cannot trade the organic product through a regular marketing channel where a category for organic rice do not exist. If they want to trade in a regular market, they have to trade the organic product as regular conventional type of rice.

Given such issues about PDCI, we conducted contingent valuation method (CVM) and Conjoint Analysis in order to determine how much consumers are willing to pay for the organic rice and who the possible consumer will be. Since consumers' income and social structure differ in Metro Manila and a local city like Naga city where PDCI supplies its products, we conducted CVM and Conjoint Analysis both in Metro Manila and Naga city.

There is a large amount of previous work on food safety and organic foods estimating consumers' willingness to pay (WTP) by using CVM or conjoint analysis, especially in US. Since organic agriculture is relatively new in developing countries and the background the organic agriculture was introduced is different from the cases in developed countries where consumers' needs with sufficient purchasing power played an important role for the promotion of organic farming, issues related to organic rice have different aspects for the case of organic farming in developing countries. No study has been conducted CVM or Conjoint Analysis on organic agricultural products in developing countries. Therefore,

we expect to capture the consumers' perception towards organic products, environmental issues and organic certification issues in a developing country, in our study, in the Philippines throughout our CVM and conjoint analysis experiments. Furthermore, since PDCI has not conducted a wide-range consumer survey, our experiments will help them analyze the potential consumers, proper pricing, and marketing strategies. The same kind of contribution could be done by this thesis to organic farms that have been working on marketing issues. We also analyze the possible scenarios of organic certification programs in this study. Therefore, we expect this thesis to suggest agents who are working for the establishment of Philippines Organic Certification Program some insights of organic certification and its research needs. Overall, being the first study of CVM and Conjoint Analysis on organic food in a developing country as well as providing information about the potential organic market, proper price to organic rice producers, we believe that our study contributes to the development of organic agriculture in the Philippines and to similar cases in other developing countries.

In order to evaluate WTP for organic rice, we employ CVM and Conjoint Analysis. We use both methods because each method evaluates things from different aspects and also because each method allows different types of further evaluations. For example, CVM result can be used for a Scope Test and also for computing Value of Statistical Life (VSL) while conjoint analysis can be used for Cluster Analysis although this is not covered in this thesis.

Questionnaires used for CVM and Conjoint Analysis were collected by interviewers employed in each city. We gathered a total of 348 questionnaires in Naga city and 200 questionnaires in Metro Manila region. Nine and four interviewers were involved in the experiments in Naga and Manila, respectively. They went from house to house to ask questionnaires. They wrote respondents' answers by themselves. Questionnaires used were three-page long, with one double-dichotomous choice CVM question and conjoint analysis questions with six profiles for each person. Contingent situation was explained

with three panels.

Organic farming in the Philippines has been growing very rapidly, especially in late 90s. As we will confirm later, income analysis of organic farms shows very good performance mainly due to significantly reduced production cost and, for some farmers, better selling price. On the other hand, PDCI earns a negative gross margin by managing organic rice due to the very high buying price of organic rice from its members. They set the price at a very high level in order to enhance farmers to shift their production from conventional to organic without enough marketing studies. Therefore, understanding proper pricing of organic rice and possible markets are critical issues for PDCI.

Our survey questions asked together with CVM and conjoint analysis questions revealed that about 50 percent of people in Naga city perceive the risk from pesticide residues as either serious or very serious risks while 46 percent of Manila respondents think the risk is acceptable. Organic rice is known better in Manila where 49 percent of respondents have heard at least the word before our study. In Naga city, it was 33 percent. Respondents in both cities are aware of water pollution issues quite well possibly due to the river water problem in both regions. More than 70 percent of respondents are willing to try organic rice if it is available in markets.

We found that marginal willingness to pay (MWTP, which is the difference between the price of the regular rice people usually buy and the amount, WTP, people are willing to pay for organic rice) was 20.57 for the whole Naga sample. Since we observed that the low income group overreacts to small risk changes, we also estimated with data from only Middle and High income groups. The MWTP was 16.15 peso per kilo for this case. In the market today, organic rice produced by PDCI is available at 26 peso per kilo. As for the Manila case, we found that MWTP for the whole sample was 6 to 6.5 peso per kilo. MWTP for low and high income groups were 7.92 peso and 13.28 peso, respectively. Given original price, WTP for organic rice was 30 peso for the whole sample in Manila while it was 42 peso for the high income group.

Conjoint analysis was conducted with five different attributes, such as health risk, eating quality, environmental quality, certification and fair trade. We found that consumers in both cities are willing to pay more for a reduced health risk. Naga sample showed that improving environmental pollution in farms is the second main concern of consumers followed by eating quality, certification and fair trade. As for Manila sample, the second main concern was certification followed by environmental quality, eating quality and fair trade. Respondents in Manila showed the characteristics of being satisfied with current rice quality while they react very much if the quality would be going worse although their MWTP for improving eating quality was not high.

Philippines Organic Certification Program will be launched by 2004. The movement of the establishment of the program has been led by different agencies such as governmental agencies, NGOs, farmers, and academia. In order to benefit small organic farms, it is very important to create proper cost structure of the certification program since it is possible that the program makes small farmers leave organic farming.

The rest of the thesis is organized as follows. In Chapter 2, we give an overview of the background and the history of organic farming in the Philippines, followed by Chapter 3 that discusses about the income condition of small organic farmers and cooperatives together with organic marketing issues. In Chapter 4, we discuss the CVM study conducted in Naga city and Metro Manila area. We start with the theory of CVM, describe respondents' characteristics and facts, followed by the discussion of the estimation results for each city. Scope test has also been conducted for both cases. In Chapter 5, we discuss conjoint analysis. The theory is given first, followed by estimation results and further analysis. In Chapter 6, we explain the situation of the organic certification program in the Philippines, possible problems, scenarios and implications. The thesis concludes with Chapter 7 where conclusions of the study are reported together with future work.

Chapter 2

Organic Farming in the Philippines

In this chapter, we will discuss about the major backgrounds of organic rice production in the Philippines. Why has organic rice production started spreading over the country after a couple of decades of the adoption of the "modern technology" promising high yields? We analyze two main factors as an answer to this question, one is an environmental factor and the other is a farmers' economic factor. We also take a look at current situations of the existing organic rice farmers and its problems.

2.1 Background - Environmental Factor

What were the incentives for the movement of organic farming adoption? Although there are several reasons, we can categorize those into two main factors: the environmental factor and the economic effect factor. In this section we discuss about the former point and the latter follows in the next section.

The impacts on the farm environment caused by the so-called Green Revolution introduced in the Philippines in 1965 were significant especially in terms of biodiversity, soil erosion, farm ecosystem and farmers' health. This is because of the feature of the Green Revolution which involves High Yielding Varieties(HYV) and intensive usage of chemical inputs, pesticide and chemical fertilizer. Before 1965, there was no farm using

IRRI HYV in irrigated lowlands outside International Rice Research Institute (IRRI) experiment station in the Philippines. Since 1965, the year Green Revolution launched in the Philippines, HYV have been adopted very rapidly in a wide range of farms and by 1982, 93% of the irrigated lowlands of the Philippines were already converted to HYV. In 1997, 60% of paddy fields in the country were devoted to the use of only one HYV variety [26]. Prior to 1965, over 4,000 traditional varieties of rice were cultivated [13], and farmers were using several varieties in order to stabilize their production. By using multiple varieties, they could minimize the crop losses from pests invasion and various weather conditions. Replacement of the traditional variables by HYV caused losses of genetic diversity. HYV farms have experienced outbreaks of pests which damaged their entire production since they plant only one or a few varieties. Those events damaged small farms's economic situation significantly since most of them did not have other sources of income.

Intensive use of chemical fertilizers has also caused high acidity in paddy field. According to farmers we interviewed, they had to increase the amount of chemical fertilizer for each cropping season in order to secure certain yield. They experienced reductions in the yield when they did not apply increasing amount of chemical fertilizer in the following cropping season. Thus the input of chemical fertilizers have increased over time and it causes further acidity of soil and soil erosion.

Pesticide affects farm environment with many different aspects. Starting from pests, beneficial insects, large animals including fishes, snails, frogs etc., microorganisms, the effects stretch to well water, downstream water as well as plants themselves. Let us first talk about pesticide residues on grain which we focus on our survey. Magallona [21] reports no pesticide residues are observed in grains as a result of normal application of carbofuran, lindane, endosulfan, BPMC and carbosulfan. On the other hand, production of vegetables are more pesticide intensive, residues taken up by the plant could be a health hazard. He also mentions that it is not known what levels could be considered

safe or hazardous to health.

A study conducted in farms located in Calauna, Calamba, Cabuyao and Binan, Laguna showed no detectable levels of chlorpyrifos, BPMC, methyl parathion, diazinon, monocrotophos and endosulfan. Since pesticide degrades rapidly due to compounds' low vapor pressure and exposure to solar radiation, adequate time between last pesticide application and harvest allowed pesticide degradation [20]. Monitoring studies conducted in 18 National Grain Authority warehouses in the Philippines showed considerable amounts of residues in stored grains due to pesticide used for postharvest although the residues were within the limits of FAO/WHO standards [24]. Therefore, according to these studies, there are no pesticide residues above the WHO standards observed in grains.

According to a study about pesticide effects on microorganisms, pesticides used with appropriate amounts, timing and intervals do not have effects on soil microorganisms and their activities [28]. However Magallona [21] recommends further investigation in a realistic ricefield not in laboratory in a long term. Pesticide use also induces a change in the ecosystem in the farm land. Application of pesticide causes outbursts of certain kind of biomass such as algae. Repeated pesticide application results in loss of biodiversity in the field due to predominant diatoms.

Filipinos consume quite a lot of fish everyday. Some portion of the fish consumed is grown in rice farms because of the introduction of fish incorporation during the growing season for rice. Farmers who accepted fish incorporation into their farms make trenches across the paddy fields. When farmers spray pesticides, fish is placed into the trenches in order not to be exposed to pesticides. After four to seven days of application of pesticides, the paddy field is flooded and fish is released to the field again. During this period, pesticides are expected to be degraded, bound to the soil or evaporated off [21]. If one applies almost any kind of insecticides into the rice field while fish stays there without being place in trenches, it causes fish mortality. Although herbicides have low toxicity to fish, some insecticides used currently are extremely toxic to tilapia (one of the most

popular fish consumed in the Philippines). Carbofuran, which is used in the Philippines, has toxicity especially to birds and also causes underground water pollution in Japan. Its hazardous effects on human body are also detected. Most residues of Carbofuran in fish are in the entails, fillet and head [21]. BPMC is also up taken by fish and is concentrated mostly in entails.

Well water contamination is also big issue in the Philippines since people use well water in their daily life including drinking water from their well. Medina et al. conducted a study of artesian wells in farmer's field in Laguna and detected traces of several insecticides including endosulfan in wet season although he did not found them in dry season. It is possible for pesticide left on farmland at the time of draining the paddy to be transported to organisms live in river, ponds and lakes where left-over pesticides could be taken up by animals and plants. It can also stay in mud of bottom of the water. As we mentioned earlier, many farmers grow fishes in or next to their rice field. Besides those fishes, those pesticides tend to be accumulated in the bodies of fishes and other animals in downstream water. Furthermore, birds which mainly eat fishes are also polluted by concentrated pesticide as a result of food chain.

Overall, significant impacts of pesticide, mostly insecticides, are found in fish grown in paddy fields, birds as a result of food chain, together with well water contamination and loss in biodiversity in microorganisms. There are no pesticide residue detected above the standard level. The study conducted with IRRI cooperators' farm concludes that no detectable pesticide residues in rice grains are found and it is safe from the consumer's standpoint. Studies done by IRRI do not detect any residues on small animals like snails and frogs [20].

Then, can we conclude that rice produced with pesticides is safe and no significant results are observed in ecosystem in farm land even if farmers apply pesticides? Farmers in PDCI and also MASIPAG members stated that small animals, beneficial insects came back to their farms after switching their production from conventional HYV production to

organic farming. What does this mean? It implies that those organisms had disappeared from their farms after many years of pesticide applications. Those were fish, shrimps, crabs, shells, frogs, turtles and snails. Since most of the studies cited earlier are short run studies in either laboratory experiments or studies in farms near IRRI and UPLB under "appropriate level of pesticide application", further long-term investigations are necessary to conclude those impacts from pesticide use. Furthermore, there are several aspects that we should be aware of regarding the situation of safe level standard, the condition in the Philippines, and shortcomings of the experiments we mentioned above.

Organophosphate is one of the insecticides widely used in the Philippines. However, in 1996, US government passed the Food Quality Protection Act, which requires the government to take into account the cumulative exposure which then set the "safe" dose standard. Before the Act, organophosphate insecticides were regulated according to each dose level, not cumulative. Once they evaluate the safe level at cumulative organophosphate level by summing up individual dose levels, the safe dose level set by the Environmental Protection Agency excesses far beyond the safe level. A report by the Environmental Working Group in US states that "Organophosphate insecticides have the potential to cause long term damage to the brain and the nervous system, which are rapidly growing and extremely vulnerable to injury during fetal development, infancy and early childhood" [32]. Although the adverse effects are reported in the case of fruits, this report and the 1996 Food Quality Protection Act imply possible adverse effects from these insecticides even though the residue level is below the WHO standard.

One study determining what kinds of pesticides are used and whether those are recommended methods or not was conducted in Leyte, Philippines in 1991 [20]. This survey was based on interviews of 300 farmers in Leyte. Interviewees were chosen randomly from eight different municipalities in the region. Many farmers believed that pests are the major constraints to high yields and tend to use pesticides to remove pests from their farm to keep their high yield. But such behavior would lead to pesticide misuse. The

survey results showed that they have applied five kinds of insecticides: endosulfan (21 percent), methyl parathion (21 percent), cypermethrin (17 percent), monocrotophos (13 percent), and chlorpyrifos (11 percent) [20]. These chemicals are extremely toxic both to pests and to human body. According to hazard classifications of the World Health Organization (WHO), 17 percent of the chemicals adopted by the farmers in Leyte were in category I.a (extremely hazardous), 20 percent in category I.b (highly hazardous), and 59 percent in category II (moderately hazardous). Organophosphates such as methyl parathion, monocrotophos, and chlorpyrifos, carbamates such as BPMC, carbaryl and carbofuran, and pyrethroids such as cypermethrin and deltamithrin are pesticides widely used in the Philippines, and all of them are classifies as category I or II [20].

Farmers even try to get rid of bugs which do not damage their crops. For example, ladybugs are predators and pollen feeders in paddy fields. But farmers spray insecticides to them. Depending on kinds of insects and stages of crop growth, certain kinds of insecticides do not have any impact for crop protection. Therefore, these misuse is considered as one way of damaging ecosystem in the farm by killing even beneficial insects. Damaging the ecosystem by killing beneficial insects most likely bring about outbreaks of pests at later stages of the production. Endosulfan is a commonly used chemical in the region, but it has adverse effects on aquatic fauna, too. According to the survey, only 23 percent of total sprays applied in one cropping season among the interviewees can be considered to be used at the appropriate timing for the intended targets. Out of those, only 19 percent worked well to prevent yield loss. Therefore, more than 80 percent of the sprays used in the region in 1991 were actually cases of misuse of pesticides [20]. The survey also shows that 45 percent of the farmers sprayed pesticides two or three times a season and 33 percent of them applied more than three times. These results show that even though the results of pesticide residues in grain and environmental damages from farms under IRRI's supervision do not prove the damage from pesticide use, there are possibilities that there may be more hazardous effects from pesticides in grains, environment and human body due to misuse or overuse of pesticides in farms.

In fact, in the Philippines, agricultural experiments are mainly conducted by IRRI and UPLB, both located in Los Banos, Laguna. Therefore, most of the experiments have been conducted in rice fields of farmer cooperators of IRRI. Available research we found on impacts of pesticides are implemented in the towns Binan, Cabuyao, Calamba and Calauan, every town located in Laguna. Naturally we expect those farms to have more access to information and education on agricultural production provided by IRRI and UPLB and to manage their farm more properly than the ones in other regions like Leyte as the previous case. Although we assume that since 1991, the survey in Leyte was conducted, programs on farmers' education have been opened to wider range of farmers in the country and improved farmers' knowledge on proper application of pesticides, too, it is very difficult to monitor all farms in the Philippines and conclude the "absolute safety" of the product, and little damage to environment and human health in general. Magallona's research on pesticide residues [21] concluded that there is no hazardous level of pesticide residues observed with "normal" application of several insecticides, but no report on a result from "inappropriate" level of pesticide application exists. Of course we know that pesticide industry have conducted long-run research on their products and ensure their safety. But by thinking together with the fact that hazardous pesticides are still used in the Philippines, we should be aware of the possible "risk" from pesticide to the products, farm environment, sustainability of agriculture and human health although we do not have to be in panic right away.

2.2 Background - Economic Factor

There is one more critical point which enhances the organic farming movement. That is farmers' economic factors that are related to rice production and trading system in the Philippines. Traditionally, most of the small farmers who own three to five hectares of land were under the control of traders who have big network, marketing power and capital. Because of the Green Revolution launched in the Philippines 1965, farmers

started converting their traditional farming to modern farming which involve high yielding variety and intensive chemical input use such as chemical fertilizer and pesticides. Since small farmers did not have enough cash for purchasing those expensive inputs, they had to borrow money from local creditors. In many cases, those creditors are rice traders themselves. They offered capital with high interest rate. In order to pay debts back, farmers were forced to sell their products at a low price. Since they sell their products only at low price and also have to pay back their debts, their income stayed at minimum or lower than poverty line. But in order to produce in the following cropping season, they had to get capital from local capitalists again. Such vicious cycle was widely observed in the Philippines.

The motivation of adoption of organic farming came from the movement of mainly NGOs that have tried to cut such a cycle and set small farmers free from the dependence on expensive chemical inputs and from indebtedness from local creditors [9]. NGOs are also concerned about farmers' health condition seemingly damaged from pesticide use. Even when groves and masks are provided, farmers tend not to use them mainly because of uncomfortableness of wearing such protections in tropical climate. Many of pesticides are very hazardous to human body if farmers are exposed directly. In general, pesticides can possibly cause eye problems such as chronic irritation of the eye and the formation of pterygium which can diminish vision, dermal problems like eczema and nail destruction, respiratory problems such as bronchial asthma, neurologic problems characterized by paralysis or weakness of muscles of arms and legs and kidney problems. A health study conducted by Antle and Pingali [20] reports that farmers and agricultural workers face chronic health effects due to prolonged exposure to pesticides. Eye, dermal, pulmonary, neurologic, and kidney problems were found to be significantly associated with long-term pesticide exposure. They collected samples randomly from two different regions, Southern Laguna and Nueva Ecija, 25 pesticide applicators out of 31 farmers and 14 applicators out of 42 farmers were examined in each region. They found that 25 percent and 67 percent of Laguna and Nueva Ecija samples were diagnosed the symptoms of

pterygium, 15 percent and 46 percent of each sample were suffering from chronic dermal disorders, five percent and 11 percent of each sample were diagnosed with symptoms of polyneuropathy and 43 percent and 26 percent of Laguna farmers and Nueva Ecija farmers suffer from kidney abnormalities, respectively. According to the interviews we conducted, these symptoms were very common in PDCI, too. Usually for small farmers, medical costs are very expensive, and loss in productivity due to illness is also a very serious problem.

Overall, modern technology introduced in villages in the Philippines caused serious financial problems especially to small farmers in many aspects. Here, we should note that the incentive of organic farming mainly came from producers' side, not from consumers' demand like in the case of developed countries where health consciousness brought organic booms.

2.3 History and Current Organic Rice Production

In the history of organic farming in the Philippines, the MASIPAG Foundation (Farmer-Scientist Partnership for Development) has been playing a key role since its establishment in 1986. Since then, organic farming has been spread all over the country in the Philippines with initiatives of NGOs. MASIPAG has the largest membership and the number of adopters of their technology (MASIPAG technology = comprehensive organic farming methodology and management) has been increasing over time. For the data of 1999, total membership accounted for 20,864 farmers in Luzon, Visayas and Mindanao and number of MASIPAG adopters was 18,605 for both members and non-members, and both partial and full adopters [13]. Partial adopters have increased dramatically since 1995 in Luzon and Visayas, and since 1997 in Mindanao. As for Visayas, the number of adaptors grew four times from 1995 (about 1,000) to 1999 (5,116) while twice in Luzon in the same period (about 500 to 1,814). As for the adaptors in Mindanao, the number became 4,122 from around 500 [13]. Total area of farms covered by either partial or full MASIPAG is

17,165 hectares. Out of the total number, 90 percent of farms are partial organic farms while 10 percent are fully adapted. Partial adaption means that farmers are in transition and use pesticide for limited and decreasing amount to control their yield in early stages of organic farming. According to a report of MASIPAG, it takes four to six years to stabilize organic rice yield. Therefore, during the transition period, many farmers face production reduction, sometimes even decline into half compare to the conventional farming depending on climate, soil and other conditions.

Large portion of partial adaption implies possible increase in full organic products in the future if they can obtain enough technical support and other necessary services. Average yield is 90.33 cavans or 4.5 tons per hectare. This number is higher than the national average yield of irrigated rice of 3.39 tons [9]. Organic rice is the most widely grown organic crop in the Philippines today. Besides rice, vegetables, sugar cane, bananas, mangos, passion fruit, coffee, black pepper and many other products are already grown in the Philippines [9].

Let us take a look at the Philippine's rice industry in general briefly. Rice is a major staple food in the Philippines, covering about 46 percent of national grain areas in 1990. People in the Philippines consume rice in various ways, including traditional desserts, and many snacks produced by using rice are widely consumed, too. Most of Filipino people eat rice for each meal everyday, and also sometimes for snack. Average per capita consumption of rice during 1992 - 1996 is 90.21 kilos per year, and aggregate domestic rice consumption is estimated at 6,769,570 metric tons in 1996 according to the data from Bureau of Agricultural Statistics (BAS). On the supply side, total palay or paddy production is 11,264,963 metric tons in 1997 with total area harvested of 3,842,270 hectares. This means that Philippines is self-sufficient in rice, and both exporting and importing. The value of rice export in 2000 is 115,000 US dollars while it is less than 1,000 dollars in 1998 and 1997. The value of imported rice is 123,335,000 dollars in 2000. The imported rice is coming mainly from Thailand, and is sold at lower prices in the

Philippines. On the other hand, rice imported from Japan is also available mainly in Manila area, and such rice is very expensive. About 37 percent of labor force is engaging in agricultural industry in the last couple of years, and contribution of agriculture and fishery sector to the GNP is about 16 percent in 2000. 65 percent of the total area is irrigated (2,496,887) while 35 percent is rainfed. Average yield of irrigated rice field is 3.39 metric tons per hectare while it is 2.08 metric tons for rainfed field in 1997 according to the data of BAS.

Therefore, if we assume that total production area and yield in 1997 are almost the same as the ones in 1999, we can conclude that the share of both partial and full organic fields is about 0.45 percent relative to the total rice field in the Philippines while the share of production of both partial and full organic rice compared to the total rice production in the Philippines is 0.69 percent. The share of rice produced in irrigated rice fields is 0.91 percent.

Although organic rice and other organic agricultural products' industry has been growing and many NGOs have been supporting and promoting the new farming methods over time, there is no official commitment by government. Although CITEM (Center for International Trade Expositions and Missions) which is one of branches of Department of Trade and Industry started working on the establishment of organic certification system in the Philippines (details will be discussed in Chapter 6), government has not had any movement toward organic farming in the country. The projects by government which share part of the concepts of organic farming are Integrated Pest Management and promotion of use of the mixed fertilizer with both chemical and organic materials which is proved to increase rice yields more than conventional or organic rice production. Philippines government released Philippines Agenda 21 as an early reaction to the Agenda 21 among Asian countries, and the document incorporates the promotion of organic farming. In the document, we can find a case of organic farming in Nueva Ecija. But government has not actually brought the organic farming concepts into their policy yet. However,

given the current progress of the Philippines Organic Certification Program, we can possibly expect government's policy to change especially when the certification program actually launches in 2004.

Our project site, Pecuaria Development Cooperative Inc. (PDCI) is located in Bula, Camarines Sur. They sell their products to Pili and Naga city. They started the adoption of organic rice in 1991. They have learned organic technology from MASIPAG and have been using MASIPAG lines (varieties). One farmers' technician made small trial farms on his own land, then expanded the area to PDCI members as he obtained enough data, knowledge and technique of organic rice production. In 1997, the total area of the rice field in PDCI was 60 hectares. 16.5 hectares (27.5 percent) of the total paddy fields is used for purely/full organic rice production while 43.5 hectares (72.5 percent) is used for combination/partially organic rice production. By the end of 1999, purely organic rice was cultivated in 75 hectares out of 80 hectares of their paddy field, which counted 93.8 percent of total production area. Rest of the rice field is used for combination rice which is partially organic rice. PDCI was hoping to make all 80 hectares of the field to convert into pure organic farm. But in March, 2001, the number of organic rice field decreased to 40 hectares and combination field increased to 45 hectares out of total 85 hectares of rice field. The main reason that many farmers have been sliding back from organic rice to combination rice is that organic farming is a very labor intensive farming method. Some farmers are not willing to devote their time into extra work for organic farming, such as weeding and water control. If farmers cannot succeed to control pest and weed well, then the quality of the organic rice they produce becomes low and it makes the price of their organic rice lower. Many observed cases show that organic rice produced with bad management contains lots of weed seeds, and has lower purity. On the other hand, organic farming has been expanding outside PDCI. In 2001, 42 hectares of rice farms adjacent to PDCI are producing pure organic rice under the technical support from PDCI technicians. As for the production, for the second cropping season in 2000, an average of 4,500 to 4,600 kilos of organic rice were produced in one hectare. This

number is also consistent with MASIPAG Foundation's data.

Overall, organic farming has been expanding all over the country. But without sufficient technical support and trading mechanisms that ensure the development of organic farming, the number of organic farms can also decline. We take a look at deeper insights about these issues by analyzing the actual farmers' income situations in the following chapter.

Chapter 3

Economic Impact of Organic Farming

In this chapter, we examine the economic impacts of the organic farming on the organic rice producers by involving the actual income statements and data. What kind of factors contribute to improve farmers' economic situation will be analyzed further. We also discuss about financial situation of farmers' cooperative which supports organic rice farms and try to capture the problems and importance of an organic rice marketing.

3.1 Economic Impact for Producers

MASIPAG Foundation has excellent production and income related time series record across the members. Tables 3.1 and 3.2 show the record of MASIPAG member TCSA, farmers association in Mindanao, which adopted MASIPAG technology recently and is still in an early stage of farm transformation from conventional HYV farming to organic MASIPAG farming. The original data contained in this table is taken from the MASIPAG Foundation's report [13]. We added real term calculation and the ratio in the original table. CPI used here is CPI outside Metro Manila. They became a member of MASIPAG in 1997. The table shows a record of 30 MASIPAG adopters. The growth rates of net

income and the production costs show that gross income of 18 out of 30 farms in nominal term and 26 out of 30 farms in real term decreased after adopting organic farming. This is because they are still in transformation process and their production has not been stabilized, and as we mentioned in earlier chapter, the yield of production fluctuates and it takes at least three years until it becomes stabilized. During this transformation period, production tends to decrease, too. For the case of TCSA, the production of about half of farmers declined. This shows critical evidence of fluctuation of organic rice yield in early stages.

One of the main purposes of the organic movement is to let small farmers to be free from debt to local capitalists and traders. As explained before, small farmers have/had been depending on those credits to purchase expensive agricultural inputs including pesticide and chemical fertilizer. By switching the production process to organic farming from the conventional farming and reducing input costs, farmers are expected to be out of the vicious cycle of poverty. The result can be observed clearly in Tables 3.1 and 3.2. For all of the organic adopters, the production costs declined significantly. Reduction in production costs contributed to increase in net income comparing to the one with conventional farming for seven out of 18 farmers in nominal term and ten out of 26 in real term whose gross income decreased.

How about the performance of the organic farming in couples of years after the adoption? In Table 3.3, we listed the net and gross income in 1992, 1994, 1996 and 1999 where 1992 data is based on conventional farming and other years are on organic farming. PATDA is a farmers association in Visayas and is one of the earliest farmers' group accessed to MASIPAG seeds. They established a trial farm in 1991. The data is again obtained from the MASIPAG Foundation's report and real values are added using outside-Metro Manila-CPI for each year. Since weather of the year affects the production significantly, we cannot simply compare data from different years. But average data shows that organic farming has been improving farmers' net income quite well in real term. This is

Table 3.1: Comparison of Income between Conventional and Organic Farming.

Individual	Farm Size (hectare)	Conventional Farming - 1996						
		NPC	RPC	NGI	RGI	NNI	RNI	$\frac{\text{NI}}{\text{PC}}$
A	1.00	11,068	4,990	22,061	9,946	10,993	4,956	0.99
B	0.95	8,970	4,044	30,576	13,785	21,606	9,741	2.41
C	0.50	6,300	2,840	22,932	10,339	16,632	7,499	2.64
D	4.00	11,550	5,207	34,924	15,746	23,374	10,538	2.02
E	1.00	10,280	4,635	28,560	12,876	18,280	8,242	1.78
F	0.50	5,800	2,615	14,280	6,438	8,480	3,823	1.46
G	1.00	10,210	4,603	10,710	4,829	500	225	0.05
H	0.80	8,376	3,776	10,710	4,829	2,334	1,052	0.28
I	1.50	14,980	6,754	57,120	25,753	42,140	18,999	2.81
J	1.50	13,000	5,861	28,568	12,880	15,568	7,019	1.20
K	1.00	9,870	4,450	24,990	11,267	15,120	6,817	1.53
L	0.80	8,700	3,922	19,685	8,875	10,985	4,953	1.26
M	1.10	13,000	5,861	39,627	17,866	26,627	12,005	2.05
N	0.75	8,380	3,778	28,560	12,876	20,180	9,098	2.41
O	1.10	12,000	5,410	57,120	25,753	45,120	20,343	3.76
P	0.25	5,500	2,480	10,710	4,829	5,210	2,349	0.95
Q	0.50	5,800	2,615	13,428	6,054	7,628	3,439	1.32
R	0.50	6,137	2,767	19,200	8,656	13,063	5,890	2.13
S	1.00	12,079	5,446	24,150	10,888	12,071	5,442	1.00
T	0.80	10,289	4,639	22,310	10,059	12,021	5,420	1.17
U	1.00	11,530	5,198	32,763	14,771	21,233	9,573	1.84
V	0.50	5,577	2,514	26,220	11,821	20,643	9,307	3.70
W	1.00	10,650	4,802	35,700	16,096	25,050	11,294	2.35
X	0.70	8,159	3,679	34,796	15,688	26,637	12,009	3.26
Y	0.25	3,259	1,469	8,740	3,940	5,481	2,471	1.68
Z	1.00	12,055	5,435	42,840	19,315	30,785	13,880	2.55
AA	0.95	11,843	5,339	39,850	17,967	28,007	12,627	2.36
AB	0.38	4,186	1,887	9,003	4,059	4,817	2,172	1.15
AC	0.80	10,250	4,621	23,459	10,577	13,209	5,955	1.29
AD	1.50	17,329	7,813	57,120	25,753	39,791	17,940	2.30
Average	0.95	9,571	4,315	27,690	12,484	18,120	8,169	1.89

Source: MASIPAG Foundation report in 2001 "Results and Impact". Modified by the author for ratios and real values. Real values are after deflation by CPI (1988=100). N and R stand for Nominal and Real, respectively. PC: Production Cost, GI: Gross Income, NI: Net Income.

Table 3.2: Comparison of Income between Conventional and Organic Farming (cont.).

Individual	Farm Size (hectare)	Organic Farming - 1999											
		NPC	RPC	$\frac{NC99}{NC96}$	$\frac{RC99}{RC96}$	NGI	RGI	$\frac{RGI99}{RGI96}$	NNI	RNI	$\frac{NNI99}{NNI96}$	$\frac{RNI99}{RNI96}$	$\frac{NI}{CR}$
A	1.00	3,130	1,189	0.283	0.238	17,850	6,783	0.68	14,720	5,594	1.34	1.13	4.70
B	0.95	2,898	1,101	0.323	0.272	42,588	16,184	1.17	39,690	15,083	1.84	1.55	13.70
C	0.50	2,250	855	0.357	0.301	22,932	8,714	0.84	20,682	7,859	1.24	1.05	9.19
D	4.00	3,500	1,330	0.303	0.255	10,920	4,150	0.26	7,420	2,820	0.32	0.27	2.12
E	1.00	3,000	1,140	0.292	0.246	10,710	4,070	0.32	7,710	2,930	0.42	0.36	2.57
F	0.50	2,898	1,101	0.500	0.421	10,710	4,070	0.63	7,812	2,969	0.92	0.78	2.70
G	1.00	3,070	1,167	0.301	0.253	19,635	7,462	1.55	16,565	6,295	33.13	27.92	5.40
H	0.80	2,800	1,064	0.334	0.282	7,140	2,713	0.56	4,340	1,649	1.86	1.57	1.55
I	1.50	4,300	1,634	0.287	0.242	49,980	18,993	0.74	45,680	17,359	1.08	0.91	10.62
J	1.50	3,500	1,330	0.269	0.227	39,270	14,923	1.16	35,770	13,593	2.30	1.94	10.22
K	1.00	3,750	1,425	0.380	0.320	17,136	6,512	0.58	13,386	5,087	0.89	0.75	3.57
L	0.80	2,300	874	0.264	0.223	24,990	9,496	1.07	22,690	8,622	2.07	1.74	9.87
M	1.10	4,080	1,550	0.314	0.265	16,779	6,376	0.36	12,699	4,826	0.48	0.40	3.11
N	0.75	3,400	1,292	0.406	0.342	15,064	5,724	0.44	11,664	4,432	0.58	0.49	3.43
O	1.10	3,500	1,330	0.292	0.246	44,625	16,958	0.66	41,125	15,628	0.91	0.77	11.75
P	0.25	2,800	1,064	0.509	0.429	11,057	4,202	0.87	8,257	3,138	1.58	1.34	2.95
Q	0.50	2,996	1,139	0.517	0.435	8,759	3,329	0.55	5,763	2,190	0.76	0.64	1.92
R	0.50	3,850	1,463	0.627	0.529	10,710	4,070	0.47	6,860	2,607	0.53	0.44	1.78
S	1.00	6,366	2,419	0.527	0.444	22,061	8,383	0.77	15,695	5,964	1.30	1.10	2.47
T	0.80	4,785	1,818	0.465	0.392	17,850	6,783	0.67	13,065	4,965	1.09	0.92	2.73
U	1.00	5,120	1,946	0.444	0.374	28,450	10,811	0.73	23,330	8,866	1.10	0.93	4.56
V	0.50	3,500	1,330	0.628	0.529	17,850	6,783	0.57	14,350	5,453	0.70	0.59	4.10
W	1.00	5,992	2,277	0.563	0.474	17,518	6,657	0.41	11,526	4,380	0.46	0.39	1.92
X	0.70	5,532	2,102	0.678	0.571	38,645	14,686	0.94	33,113	12,583	1.24	1.05	5.99
Y	0.25	1,788	679	0.549	0.462	9,311	3,538	0.90	7,523	2,859	1.37	1.16	4.21
Z	1.00	7,239	2,751	0.600	0.506	49,266	18,722	0.97	42,027	15,971	1.37	1.15	5.81
AA	0.95	6,009	2,283	0.507	0.428	41,085	15,613	0.87	35,076	13,329	1.25	1.06	5.84
AB	0.38	1,837	698	0.439	0.370	29,988	11,396	2.81	28,151	10,698	5.84	4.93	15.32
AC	0.80	5,019	1,907	0.490	0.413	26,320	10,002	0.95	21,301	8,095	1.61	1.36	4.24
AD	1.50	8,720	3,314	0.503	0.424	55,250	20,996	0.82	46,530	17,682	1.17	0.99	5.34
Average	0.95	3,998	1,519	0.418	0.352	24,482	9,303	0.75	20,484	7,784	1.13	0.95	5.12

Source: MASIPAG Foundation report in 2001 "Results and Impact". Modified by the author for ratios and real values. Real values are after deflation by CPI (1988=100). N and R stand for Nominal and Real, respectively. PC: Production Cost, GI: Gross Income, NI: Net Income, CR: Cost Ratio.

again due to mainly reduced production costs in their organic production. Depending on the condition of each farm, sometimes it gives negative increase in net income when compared to the one in 1992, but about 80% of the farms are showing better performances with organic farming.

As a remark related to the organic certification issue discussed in the later chapter, we should be aware of the various degrees of the net income increments of each farm. Since the rates differ, if certification process requires certain costs, the system should take into account the variation in order to avoid making less-improved farmers stop doing organic farming.

We have emphasized the important roll of reduction of production cost by now. We here examine which factors of input have been actually reduced. In Table 3.4, defferences in detailed production cost and the farm's income between conventional and organic farming per one hectare are listed. This is the case of Bukidnon, Mindanao in 1997. Straw application is a part of organic fertilizer. Now farmers do not have to buy expensive high yield variety (HYV) seeds, therefore cost of purchasing seeds is also reduced. They use MASIPAG lines suited to their farms. Organic farming needs transplanting, so this part of the cost increases. Since the organic farm does not use herbicide, the cost of herbicide is zero, but instead, a labor cost for weeding is added. This labor cost is cheaper than herbicide. This point presents an important contrast between organic farming in the Philippines and in most developed countries where labor is expensive. Costs for insecticide and chemical fertilizer are zero for organic farm. As a total, total production cost is 53% lower for organic farming. Even though the resulting yields in this case are almost identical for both farming system, net income is significantly larger for organic farming due to the large reduction in input costs.

Official income statement of PDCI was not available. Therefore we rely on a report created in 1995 to compare the farm performances before and after organic farming adoption [1]. This report is based on an interview with Mr. Gener, who is the main

Table 3.3: Growth in Net Income.

Individual	Conventional Farming - 1992			
	NGI	RGI	NNI	RNI
1	25,000	15,420	17,800	10,979
2	22,000	13,569	16,250	10,023
3	25,000	15,420	16,725	10,316
4	25,000	15,420	17,667	10,897
5	15,750	9,714	10,600	6,538
6	23,000	14,186	15,950	9,838
7	19,231	11,861	14,423	8,896
8	25,000	15,420	21,812	13,453
9	20,000	12,336	12,433	7,669
Average	22,220	13,705	15,962	9,845

Individual	Organic Farming - 1996					
	NGI	RGI	NNI	RNI	$\frac{\text{RNI96}}{\text{RNI94}}$	$\frac{\text{RNI96}}{\text{RNI92}}$
1	40,950	18,463	36,810	16,596	1.27	1.51
2	34,020	15,338	29,900	13,481	0.93	1.34
3	39,375	17,752	33,850	15,261	1.60	1.48
4	29,400	13,255	22,233	10,024	0.85	0.92
5	37,800	17,042	34,480	15,546	1.88	2.38
6	40,950	18,463	36,910	16,641	1.27	1.69
7	25,442	11,471	20,980	9,459	1.18	1.06
8	42,525	19,173	36,825	16,603	1.21	1.23
9	33,600	15,149	26,433	11,917	1.11	1.55
Average	36,007	16,234	30,936	13,948	1.22	1.42

Individual	Organic Farming - 1994				
	NGI	RGI	NNI	RNI	$\frac{\text{RNI94}}{\text{RNI92}}$
1	26,880	14,944	23,480	13,054	1.19
2	28,560	15,878	26,160	14,544	1.45
3	21,000	11,675	17,125	9,521	0.92
4	26,133	14,529	21,200	11,786	1.08
5	16,800	9,340	14,890	8,278	1.27
6	26,880	14,944	23,580	13,109	1.33
7	17,231	9,580	14,385	7,997	0.90
8	28,000	15,567	24,600	13,677	1.02
9	24,266	13,491	19,333	10,748	1.40
Average	23,972	13,328	20,528	11,413	1.16

Individual	Organic Farming - 1999					
	NGI	RGI	NNI	RNI	$\frac{\text{RNI99}}{\text{RNI96}}$	$\frac{\text{RNI99}}{\text{RNI92}}$
1	38,500	14,630	34,200	12,996	0.78	1.18
2	36,750	13,965	32,700	12,426	0.92	1.24
3	36,750	13,965	32,700	12,426	0.81	1.20
4	36,167	13,744	31,334	11,907	1.19	1.09
5	37,800	14,364	35,230	13,388	0.86	2.05
6	37,100	14,098	33,660	12,791	0.77	1.30
7	26,923	10,231	22,715	8,632	0.91	0.97
8	38,500	14,630	34,500	13,110	0.79	0.97
9	42,000	15,960	36,333	13,807	1.16	1.80
Average	36,721	13,954	32,597	12,387	0.89	1.26

Source: MASIPAG Foundation report in 2001 “Results and Impact”. Modified by the author for ratios and real values.

Table 3.4: Comparison of Cost and Return - HYV and Organic.

	Conventional	MASIPAG
Straw application	0	225
Land preparation	1500	1500
Seeds	3000	450
Uprooting/transplanting	-	1500
Seed broadcast/seedbed	100	150
Weeding	-	375
Herbicide	542	0
Insecticide	1829	0
Chemical Fertilizer	3600	0
Harvesting/threshing	2948	2948
Total production cost	13519	7148
Yield	4560 kilos	4620 kilos
Price(peso/kilo)	7.4	7.4
Gross Income	33744	34188
Net income	20224	27040
Net Profit/Cost Ratio	1.49	3.78

Source: MASIPAG Foundation report in 2001 "Results and Impact".

farmer's technician in PDCI. Data for 1992, 1993 and 1994 are taken from the report. The data for year 2000 is based on an interview with Mr. Gener in 2001. This data is the average data of organic farmers in PDCI and is shown in Table 3.5.

A similar tendency as the performance of MASIPAG foundation members can be observed for the case of PDCI. For the first year of adoption of the organic farming, real gross income decreased due to reduction in production. However since the production cost also reduced, real net income increased even for the first year of adoption. Overall real net income has been increasing over time since then, and we can conclude that farmers benefit from adopting organic rice.

3.2 Economic Impact for Cooperative

As we have seen in the previous section, although there are some fluctuations especially in the early stages of the organic adoption, real net income has increased for organic

Table 3.5: Income Statement per Hectare - PDCI.

Year	1992	1993	1994	2000
Farming	Conventional	Organic	Organic	Organic
N.Prod.C	17,456	13,412	17,904	14,000
R.Prod.C	10,767	7,743	9,952	5,104
Price(peso/kilo)	4.00	4.50	7.25	10.00
Yield(kilos)	5,184	4,640	4,975	4,600
NGI	20,736	20,882	36,069	45,000
RGI	12,790	12,056	20,049	16,405
NNI	3,280	7,470	18,165	31,000
RNI	2,023	4,313	10,097	11,301
RNI/RPC	0.19	0.56	1.01	2.21
RPCt/RPCt-1		0.72	1.29	0.51
RPCt/RPC92			0.92	0.47
RGIt/RGIt-1		0.94	1.66	0.85
RGIt/RGI92			1.57	1.28
RNIt/RNIt-1		2.13	2.34	1.21
RNIt/RNI92			4.99	5.59

Data for years 1992, 1993 and 1994 is taken from a report of PhilDHRRA[1] and is based on the performance of the farm of a farmer's technician. Data for year 2000 is the average data of organic farms in PDCI.

adopters. In this section, we look at the situation of farmers' cooperative in the case of PDCI.

We have observed the problem of the organic rice management of PDCI since the first time we visited PDCI in 1997. At that moment, they sold organic rice mainly through direct deliveries. However, with the lack of market studies and a comprehensive cost-benefit analysis on both farm and cooperative farm level, they started having problem with expanding their marketing channel as well as keeping their financial situation sustainable. The main reason of their financial difficulties comes from the fact that they set buying price of palay from their member at high level from the beginning, before stabilizing their production and before developing marketing channels with market studies. There have been arguments of reducing the buying price of organic rice since 1999, but cooperative and farmers have not reached an agreement. If cooperative reduces the buying price, it may result in organic farmers' shifting back to the conventional farming since the organic

farming would not be profitable as much as it used to be.

PDCI buys rice and palay or paddy from the members. In PDCI, all farmers are selling their production to PDCI, and PDCI conducts the marketing. Currently they buy palay at ten peso per kilo and sell at 18 to 20 peso per kilo. According to a marketing study conducted by UNAC, the gross margins of the cooperative level for PDCI is negative 10 percent while the average gross margin of rice industry is plus 10 percent [11]. This means that PDCI has to buy palay from farmers at high rate while they have not established sustainable marketing channel and figured out proper price in the market. Thus, PDCI cannot manage organic farming program without financial assistance coming from donor agencies and without changing the system and structure of the management.

As we saw in the previous section, net income of organic farmers has increased and farmers are already enjoying the benefits from organic farming. Specifically for the farmers from MASIPAG foundation, they mostly sell their organic rice in their own community and set the price as low as the regular rice, or slightly higher due to the policy of MASIPAG foundation which is allowing farmers to sell their products outside their community only when there is surplus. However they still make extra profits due to lowered production cost. They do not have to set higher price since they already make larger profit by shifting to organic farming.

Why PDCI has to set extra high buying price for the farmers? One of initial reasons was to give farmers incentive to shift to organic farming from conventional. We have seen that at the peak time, 94 percent of farmers in PDCI produced organic rice. But today the number is decreasing. The reason is mainly because organic farmers are unwilling to spend their extra time on managing technical processes, and once they fail to control weeds and pests, the quality of rice is damaged significantly. Farmers who experienced bad outcome tend to slide back to conventional farming and it ended up reducing the number of organic farm into half. One critique points out a shortcoming of PDCI as instability of organic rice production. He sees the problem of PDCI is that PDCI did not

spend enough time to stabilize productivity including the trials for choosing seeds and technical support for organic farming. Therefore they cannot stabilize their production. As a result, in order to compensate the instability of the organic production, PDCI had to get into organic marketing from the early stage of their organic adoption and they had to set the buying price very high. A report of MASIPAG Foundation also points out the fact the conversion from conventional to organic farming takes long time, four to six years to stabilize the production. If farmers try to take a "short cut" by cutting some procedures, then it will be counterproductive in a long run, and as soon as they face technical problems in their production, they will shift back to conventional farming. Therefore product stabilization is the first stage before going into further marketing procedure.

3.3 Organic Rice Marketing

Besides the product management, organic marketing is still a very difficult issue for most of the organic farmers. The critique of product instability from another perspective shows the fact that due to instability of production in the early stage of adoption, farmers and cooperative need "special" marketing strategy to ensure the profit of shifting to organic farming. It is very difficult to find an optimal strategy since they need to work on both production stability and marketing at the same time even though it may be counterproductive in the long run because most of farmers and cooperatives have to manage their budget in short run due to limited income.

As for members of MASIPAG Foundation, many marketing projects have been carried out but they failed because of miss-management and inability to compete with traders [12]. Therefore many of them have been taking the conventional route in marketing rice, which is to go through traders to sell their products. Even though organic farming cuts vicious cycle by not getting credit from traders to buy expensive inputs, lack of establishment of the organic marketing system for organic rice brought farmers under the

power of traders. Thus, they are also looking for the way to market their product, and are also thinking to involve niche marketing and direct marketing to consumer groups which PDCI has been trying for several years. The MASIPAG report determines marketing as the "next logical step". MASIPAG Foundation has been working on organic certification program with Center for International Trade Expositions and Missions (CITEM) which we will discuss later in Chapter 6 about certification, and they expect the certification program will help educating consumers and promoting awareness of general public.

As for the case of PDCI, they are currently selling their organic rice to three supermarkets, two NGOs and one college. In Naga city, buying rice from supermarket is something middle to high income class people do, not low income group since rice sold in supermarkets is packaged nicely and most of the time more expensive than the one available in wet (public) market. PDCI makes 2 kilo packages with a label explaining how organic rice was produced. They emphasize the point that the rice is premium rice on the label since one marketing study conducted for PDCI recommended that way. We discuss this issue in more detail later.

We have confirmed that economic situation of the organic farmers can be improved by adopting organic farming if the adoption process has been done properly. As we have also seen, pricing organic rice is a critical issue as well as determining possible market and potential consumers. In order to verify consumer's willingness to pay for organic rice, potential consumers and social value of organic rice, we have conducted a survey by using CVM and Conjoint Analysis. The experiments of CVM and Conjoint Analysis are discussed in Chapter 4 and in Chapter 5, respectively.

Chapter 4

Contingent Valuation Method on Organic Rice

In this chapter, we describe the experiments of the Contingent Valuation Method (CVM) in Naga City and Manila. Firstly, we state the theoretical model of CVM and explain the model we actually estimated. Secondly, we explain how we conducted the experiment and provide general information of our respondents to characterize and help to analyze CVM results further. Thirdly, we actually show the estimated results of both Naga City and Manila samples. Scope tests are also conducted to examine the consumers' responsiveness to the health risk and the presented price of organic rice.

4.1 The Model for the Contingent Valuation Method

4.1.1 The Random Utility Model

Assume that we ask the question "Do you want to buy organic rice if its pesticide residue risk is reduced from π_0 to π_1, but the price goes up from p_0 to p_1?" to a representative individual. Suppose the individual has a utility function U. Since a researcher cannot observe U directly, we divide the utility function into two terms, V, which can be observed

directly, and ϵ, a stochastic component of U that cannot be observed directly, as follows

$$U = V(p_i, \pi_i, Y; Z) + \epsilon_i \tag{4.1}$$

where

U : indirect utility function

V : observable utility function

p_i : price

π_i : health risk

Y : income

Z : attitudinal and demographic characteristics of the individual

ϵ_i : error term

$i : i = 0 :$ status quo, $i = 1 :$ after risk reduction.

The probability that the individual says "Yes" to the above question is expressed as follows

$$\begin{aligned} Pr[\text{Yes}] &= Pr[U_1 > U_0] \\ &= Pr[V_1(p_1, \pi_1, Y; Z) + \epsilon_1 > V_0(p_0, \pi_0, Y; Z) + \epsilon_0] \\ &= Pr[V_1(p_1, \pi_1, Y; Z) - V_0(p_0, \pi_0, Y; Z) > \epsilon_0 - \epsilon_1] \\ &= 1 - F_\eta(-\delta V) \end{aligned} \tag{4.2}$$

where

$\eta : \epsilon_0 - \epsilon_1$

F : cumulative distribution function

$\delta V : V_1 - V_0$.

Note here that researchers cannot perceive η while they can do δV. Therefore, if we assume F_η to be the standard normal distribution, the model becomes probit model, and if we assume F_η to be the logistic distribution, the model becomes logit model.

We have chosen to use double bounded dichotomous choice method in order to obtain enough sample size to analyze. Double bounded is the method CV question is asked twice, which is after asking the first stage of questions asking whether or not respondents are willing to pay for the presented price, according to the answer, asking again with higher price to those who answered "yes" and with lower price to those who said "no" to the first price. Hanemann *et al.* [15] also shown that double bounded dichotomous choice method improves statistical efficiency compared to single bound since double bounded makes confidence interval smaller.

The probability of answering "yes" for both stages of questions is expressed as

$$\begin{aligned}
\psi_{YY}(X, X^U) &= Pr[X \leq WTP, X^U \leq WTP] \\
&= Pr[X \leq WTP | X^U \leq WTP] Pr[X^U \leq WTP] \\
&= Pr[X^U \leq WTP] \\
&= Pr[X^U \leq WTP] \\
&= 1 - F(X^U)
\end{aligned} \tag{4.3}$$

where

ψ_{YY} : the probability of answering "yes", "yes"

X : presented price in the first stage

X^U : presented higher price in the second stage

WTP : Willingness To Pay

F : cumulative distribution function (CDF).

The probability of answering "yes" followed by "no" for the second question is

$$\begin{aligned}
\psi_{YN}(X, X^U) &= Pr[X \leq WTP < X^U] \\
&= F(X^U) - F(X).
\end{aligned} \tag{4.4}$$

The probability of answering "no" followed by "yes" for the second stage is

$$\begin{aligned}
\psi_{NY}(X, X^L) &= Pr[X^L \leq WTP < X] \\
&= F(X) - F(X^L)
\end{aligned} \tag{4.5}$$

where X^L : presented lower price at the second stage. The probability of answering "no", "no" is

$$\begin{aligned}\psi_{NN}(X, X^L) &= Pr[X > WTP, X^L > WTP] \\ &= F(X^L).\end{aligned} \tag{4.6}$$

Next, set dummy variables indicating how the respondent answered to be yy_i, yn_i, ny_i and nn_i. For example, yy_i is the dummy variable for individual who answered "yes","yes". When yy_i is 1, then other dummy variables are 0, and so forth for each dummy variables. Given the above setting, log-likelihood function for the double-bounded dichotomous choice method is expressed as follows [30, 19]

$$\begin{aligned}\ln L = \sum_{i=1}^{N} \{ & yy_i \ln \psi_{YY}(X, X^u) \\ & + yn_i \ln \psi_{YN}(X, X^U) \\ & + ny_i \ln \psi_{NY}(X, X^L) \\ & + nn_i \ln \psi_{NN}(X, X^L)\}\end{aligned} \tag{4.7}$$

where N : number of respondents.

4.1.2 The Specified Indirect Utility Function

Following the convention, we assume that indirect utility function has the linear functional form, such that

$$\delta V = \alpha + \beta_1(p_1 - p_0) + \beta_2(\pi_1 - \pi_0) + \beta_3 Y + \theta_i Z_i. \tag{4.8}$$

In this study, the components of Z are the following. As the demographic characteristics,

- sex
- age
- number of the household member
- number of child(ren) under 18 years old

- number of the year of the education
- occupation.

For other attitude related characteristics,

- individual perception toward pesticide residues risk
- knowledge level of organic rice
- knowledge level of pesticide residues
- knowledge level of sustainable agriculture
- knowledge level of water pollution.

We estimated this model with the logit model. The estimated results and discussion are given in the following sections.

4.2 Estimated Results of Contingent Valuation Method

4.2.1 Background Information of Naga Sample

Naga City is located in the center of the Province of Camarines Sur which is the southern part of Luzon and is the largest among the six provinces in Bicol. The city is in about 377 kilometers south of Manila and 100 kilometers north of Legaspi City. It has a total land area of 8,448 hectares and about 75 percentage of the land is used for agriculture. There are 27 barangays in Naga City. Barangay is a kind of a small town which contains around 100 to 3,000 households. In 2000, the total population of Naga City is 137,810 while the population in Camarines Sur is 1,551,549 [27].

One reason why we have chosen Naga City to conduct CVM and Conjoint Analysis is that the project site we have been focusing on (PDCI) is located about 20 km from Naga City so the city can be one of the largest potential market for the production in PDCI.

In fact, Naga City has the largest population among 37 municipalities in Camarines Sur including Bula where PDCI locates. Furthermore, the result of the study on Naga City can be seen as a case of local cities in the Philippines and can be expected to show a different perspective from the study in Manila.

We have conducted both CVM and Conjoint Analysis in Naga City from 2nd to 7th of July, 2001. We employed nine interviewers from three different barangays. Their background varies, but most of them are collage graduates and some of them have degrees in agribusiness, economics or finance. They went into 22 out of 27 barangays in Naga City, visited houses directly, asked questions and wrote the answer by themselves. The time they spent per questionnaire was approximately 20 minutes. They collected a total of 347 answered questionnaires. Pre-test were conducted in March 2001, and questionnaires were modified according to the results of the pre-test.

The general data of those questionnaires is given as follows. Since we targeted the household member who usually buys rice to interview, questionnaires are answered more by females than by males (Table 4.1). Since working age starts at 15 year-old and also year of collage graduation is 20 to 21 years old, we judged that it was appropriate to include even the questionnaires answered by people under 20 years old by assuming that they were capable to understand the questionnaire well (Table 4.2). We have a slightly larger average household size sample in this survey compared to the Naga City average (Table 4.3). Average number of children under 18 is 2.1 (Table 4.4). Target population percentage is calculated with Camarines Sur annual income data due to no Naga City data being available. We have slightly higher average monthly income in the sample data, but the difference from Camarines Sur income data is very small ($1=51.8 peso at a rate of Oct.12.2001) (Table 4.5). Although schooling data in Naga City is not available, literacy rate in Naga City is 98% [27] (Table 4.6). The largest portion of respondents are self-employed while the second largest are housewives (Table 4.7). This is because interviewers visited respondents during daytime, where there was a high probability of

Table 4.1: General Sample Data: Sex, Naga.

Sex	Sample(person)	Percentage	Target Population	%
Male	90	25.9	56,411	49.1
Female	257	74.1	58,487	50.9

Target population data is from [27] for Naga City data.

Table 4.2: General Sample Data: Age of Respondents, Naga.

Age	Sample(person)	%
Under 20	15	4.32
20-29	86	24.8
30-39	82	23.6
40-49	82	23.6
50-59	48	13.8
above 60	34	9.8
average	39.3	

collecting data from people staying at home or near their home.

In the questionnaire, we also asked the rice price they usually pay together with individual perspective towards health risk from pesticide residues, knowledge level about organic rice, pesticide residues, sustainable agriculture and water pollution to determine what type of person can be a potential consumer of organic rice. Since we realized during our pre-test in March of 2000 that organic rice has not been available in many places and large number of the respondents had not heard about it before being asked questions

Table 4.3: General Sample Data: Household Size, Naga.

Household size	Sample(household)	%	Target Population
1-2	14	4.0	-
3-4	78	22.5	-
5-6	108	31.1	-
7-8	77	22.2	-
9-10	40	11.5	-
11-12	22	6.3	-
13-14	4	1.2	-
above 15	4	1.2	-
average	6.3		5.24

Table 4.4: General Sample Data: No. of under 18 year old children, Naga.

No. of children under 18, Naga	Sample(household)	%
0	79	22.8
1	72	20.8
2	74	21.3
3	51	14.7
4	34	9.8
5	16	4.6
6	9	2.6
7	8	2.3
above 8	4	1.2
average	2.1	

Table 4.5: General Sample Data: Household Monthly Income, Naga.

Monthly Income(peso)	Sample(household)	%	Target Population(%)
below 5,000	108	31.1	57.9
5,001-10,000	131	37.8	29.0
10,001-20,000	82	23.6	9.5
20,001-40,000	19	5.5	2.8
above 40,001	7	2.0	0.8
average	6,679 peso		6,493 peso

Table 4.6: General Sample Data: Education, Naga.

Education	Sample(person)	%
Elementary /Graduates	37	10.7
High School	126	36.3
College/Univ.	174	50.1
Post Graduate	6	1.7
Others	4	1.2

Table 4.7: General Sample Data: Occupation, Naga.

Occupation	Sample(person)	%
Farmer	9	2.6
Self-Employed	119	34.3
Factory Worker	6	1.7
Clerical Staff	6	1.7
Skilled Worker	37	10.7
Technical Worker	26	7.5
Executive	1	0.3
House Wife	78	22.5
Student	15	4.3
Other	50	14.4

Table 4.8: Average Price of Non-Organic Rice Respondent Usually Buys, Naga.

Ave. Income Bracket	Average Price (peso/kilo)
Total	18.22
5,000	17.77
7,500	18.29
15,000	18.60
35,000	18.47
40,000	19.30

regarding to organic rice, we also asked if they are willing to try the organic rice if it is available. The results of those questions are shown in the following tables.

We can see from Table 4.8 that the rice price the respondents are usually paying ranges around 18 peso. Since we have only 5.5 percent of average income group of 35,000 peso per month, the price might be underestimated. Overall, we can see the increasing trend of the price as the income level goes up, but we also should note that the rate of the marginal increase in rice price is very small between different income groups and even at the highest group, the average price is still below 20 peso.

In order to determine subjective attitudes towards the health risk from the pesticide residues on rice, respondents are asked to rate their attitude on a 1 to 5 scale with 1 implying "no risk" and 5 implying "very serious risk". In the past studies, a 1 to 10 scale has been frequently used to elicit perceived risks [8, 29]. Here, we adopted a 1 to 5 scale

Table 4.9: Subjective Attitude towards Pesticide Residue Risk, Naga.

Level	person	%
No Risk	42	12.1
Little Risk	29	8.4
Acceptable Risk	99	28.5
Serious Risk	134	38.6
Very Serious Risk	43	12.4

to make the question look as easy as possible and it was also difficult to assign words to each level if we used 1 to 10 scale instead of 1 to 5 scale. In our questionnaire, in order to help respondents understand levels of the risk more concretely, word descriptions "no risk", "little risk", "acceptable risk", "serious risk" and "very serious risk" have been assigned to the levels 1 to 5, respectively. The result is in Table 4.9.

51 percent of the respondents are feeling the pesticide residue risk as a serious or very serious risk while 49 percent are taking it as no, little or acceptable risk. With 1 to 5 scale, the average is 3.3. In a study in North Carolina, USA in 1990, Eom 1994 asked 276 respondents that subjective attitudes toward pesticide risks on a 1 to 10 Likert scale and obtained a mean of 6.6 [8]. He did not specify a certain kind of produce in this study. Misra *et al.* also asked similar questions to the people in Georgia, USA in 1989. In the study, they asked respondents to indicate how important it is that fresh produce should be tested and certified as free of pesticide residues [23]. Out of 381, 56 percent answered "very important" followed by 33 percent and 4 percent answering "somewhat important" and "not important" respectively. If we can simply assume that the result of a 1 to 5 scale index is possible to re-scale into a 1 to 10 scale index simply by multiplying by two and the doubled result is approximately same as the one in a 1 to 10 scale, we can conclude that consumers in Naga City feel a quite similar seriousness of the health risk from pesticide residues to the consumers in Eom's study. Therefore, the statement we sometimes hear regarding to consumers in developing countries "The first concern of consumers in a developing country about food is to obtain the sufficient amount of food they need, and they do not care much about the safety of food" is obviously not correct

in the case of Naga City.

We asked how much the respondent knows about organic rice, pesticide residues, sustainable agriculture and water pollution. The respondent answered either "never heard about it", "know the word" or "know the meaning well" regarding to each term. These questions are included in the questionnaire in order to attain the information about how consumers' knowledge about environment or food safety relates to their consumption behavior. It turned out that 33.2 percent of the people have at least heard about organic rice while 66.6 percent have never encountered organic rice (Table 4.10). This number is actually higher than what we expected. According to the study on the potential market in Cagaya de Oro City in the Philippines in 1995 conducted with 378 respondents from their target market (consists of employees of 10 banks, 12 government offices and 9 schools in the city), respondents were not aware of organic rice [10]. Furthermore, a marketing study in Metro Manila conducted by Upland Marketing Program Philippines Business for Social Progress in 1997 shows that only 4 percent of 77 respondents has known the concept of the organically grown products. Therefore, we can see the consequence of the organic movement in the last couple of years as the spread of the information about organic rice among consumers. This result confirmed that 42.1 percent of the respondents have already heard about pesticide residues before our survey while about 58 percent of them have never heard about what it is. Together with the results from the organic rice and pesticide residues knowledge, we conclude that about 60 percent of people have never heard about those organic rice related concepts while around 30 percent of people have heard about it and about 10 percent knows the concepts well (Table 4.11). We know that some of them included in the 10 percent are teachers and also post-graduate degree holders. If you think these results with the fact that 75 percent of the land in Naga City is used for agriculture it means that many respondents live very close to the agricultural production site, majority of them are not aware of the adverse environmental impacts from farm land or necessity of the sustainable agriculture in their daily life (Table 4.12). Due to the water pollution issue of Bicol and Naga River which run through Naga City,

Table 4.10: Knowledge about Organic Rice, Naga.

Organic Rice	person	%
Never Heard	231	66.6
Know Word	94	27.1
Know Well	21	6.1

Table 4.11: Knowledge about Pesticide Residues, Naga.

Pesticide Residues	person	%
Never Heard	201	57.9
Know Word	118	34.0
Know Well	28	8.1

almost 90 percent of respondents have already known about water pollution and the majority knows the concept well (Table 4.13).

According to the study in Cagayan de Oro city in 1995, after being asked the hypothetical question about their intention to buy organic rice with the explanation of what organic produces are, 60 percent of the respondents (225 respondents) stated that they will "definitely buy", followed by 23 percent of them says "probably buy" and 2 percent of them are in the "probably not buy" and "definitely not buy" categories [25]. We have got a very similar result although we did not ask with several categories (Table 4.14). We should note here that respondents are asked this question before going through the CVM and Conjoint Analysis questions and their answer is more likely the reflection of their interest and curiosity about organic rice. In fact, many of them commented "I will try", "I want to try if the budget permits" or "try depending on the difference between organic and non-organic rice". Therefore, we can imagine that they may purchase if they see the organic rice actually in the market, but it does not ensure that they would be

Table 4.12: Knowledge about Sustainable Agriculture, Naga.

Sustainable Agriculture	person	%
Never Heard	216	62.3
Know Word	104	30.0
Know Well	27	7.8

Table 4.13: Knowledge about Water Pollution, Naga.

Water Pollution	person	%
Never Heard	38	11.0
Know Word	92	26.5
Know Well	217	62.5

Table 4.14: Willingness to buy if Organic Rice is available, Naga.

Buy or not	person	%
Will not buy	57	17.7
Will buy	265	82.3

regular customers.

Table 4.15 shows the result of the question to confirm with how much of understanding they answered the questions on CVM and Conjoint Analysis. It enables us to assume that they answered those questions with sufficient level of understanding including the panels explained about pesticide residue risks and water pollution categories.

4.2.2 Background Information of Manila Sample

Total population of Metro Manila is 9,454,040 in 1995. There are 12 cities and 5 municipalities in Metro Manila. We randomly chose the place to conduct interviews. Questionnaires were asked by four senior year collage students in Manila. We had several meetings before conducting the survey, and they were well trained. They collected a total of 200 questionnaires from ten different areas in Manila region. Those are Mandaluyoung, Paranaque, Pasig, Quezon City, Makati, Manila, Pasay , Malabon, Alabang and Greenhills. First seven areas are cities, Malabon is a municipality, Greenhills belongs

Table 4.15: Degree of Understanding, Naga.

Understanding	person	%
Very hard	15	4.3
Sometimes hard	34	9.8
Understood well	298	85.9

to Pasig city. They targeted top 30 percent income group which is assumed to be able to afford organic rice. Those income groups belong to middle-high to high income group. Out of 200 questionnaires collected, 14 (seven percent) are from income group A whose monthly income is above 100,001 peso, 34 (17 percent) are from income class B whose monthly income range is 60,000 peso to 100,000 peso, and 152 (76 percent) are from class C which is 45,000 peso to 60,000 peso.

We excluded 17 samples due to incompleteness of the questionnaire, and obtained 183 samples. 47 (26 percent) of 183 questionnaires were answered by males while 136 (74 percent) were by females (Table 4.16). Number of females dominated again because we targeted the person who usually buys rice or makes decision about what kind rice to buy in the household. The average age of respondents was 38.5 years as shown in Table 4.17. In the Metro Manila area, the average size of household was 4.6 in 2000 (Table 4.18). Therefore, our sample has a relatively high value compared to the target population. Since interviewers visited houses, not apartments, we did not capture the tendency of the single residences. That may be the main reason for the higher household size. Compared with the size in Naga City where our average sample size is 6.3, it is lower in Metro Manila. The average number of 18-year-old child(ren) in the household is 0.86, less than 1 (Table 4.19). This means that our sample household have average size of 5.56, but most of them are above 18. The average monthly income of our sample is 60,204 peso while the average monthly income of target population is 25,045 peso in 2000 according to the data from National Statistics Office (Table 4.20). Our sample has higher value since we targeted the middle-high to high income groups. 82 percent of respondents have college degrees or higher. This ratio is larger than the one in Naga City (Table 4.21). The structure of the occupation in Manila is very similar to the one in Naga. Self-employed is the largest group followed by housewife (Table 4.22). Since the interviewers conducted the survey during daytime mostly, it is natural that self-employed people who stay at home and near home, not in offices, and housewives who mainly stay at home are more likely to be interviewed. This may cause a certain bias in our sample.

Table 4.16: General Sample Data: Sex, Manila.

Sex	Percentage	Target Population %
Male	25.7	48.8
Female	74.3	51.2

Table 4.17: General Sample Data: Age, Manila.

Age	Sample(Person)	%
Under 20	3	1.6
20-29	60	32.8
30-39	28	15.3
40-49	51	27.9
50-59	38	20.8
above 60	3	1.6
average	38.5	

But since we targeted people who buy rice by themselves, large number of housewives is consistent with our purpose.

As for the price of regular rice the respondents usually purchase, we found that if the average income is above 52,500 peso, then they consume more expensive rice with higher income level up to 30 peso per kilo (Table 4.23). Although our sample shows an interesting tendency for the income group below 37,500 peso since the lowest group consumes more expensive rice than second lowest and middle income groups, we expect the price of rice people purchase will increase as the income level increases. The tendency in our sample is possibly due to the limited number of samples for lower half income groups. The

Table 4.18: General Sample Data: Household Size, Manila.

Size	Sample(household)	%	Target Population
1-2	9	4.92	-
3-4	60	32.79	-
5-6	87	47.54	-
7-8	19	10.38	-
9-10	6	3.28	-
11-12	0	.00	-
above 13	2	1.09	-
average	5.56		4.6

Table 4.19: General Sample Data: No. of under 18 year-old children, Manila.

No. of under 18	Sample(household)	%
0	91	49.73
1	49	26.78
2	26	14.21
3	13	7.10
4	3	1.64
5	1	0.55
average	0.86	

Table 4.20: General Sample Data: Household Monthly Income, Manila.

Monthly Income(peso)	Sample(household)	%
below 15,000	13	7.10
15,001-30,000	21	11.48
30,001-45,000	18	9.84
45,001-60,000	42	22.95
60,001-100,000	44	24.04
above 100,001	45	24.59
average	60,204	

Table 4.21: General Sample Data: Education, Manila.

Education(Graduates)	Sample(person)	%
Elementary	1	0.55
High school	32	17.49
College/Univ.	136	74.32
Post grad.	14	7.65

Table 4.22: General Sample Data: Occupation, Manila.

Occupation	Sample(person)	%
Factory	6	3.28
Technical	32	17.49
Self-Employed	47	25.68
Skilled	8	4.37
Housewife	33	18.03
Clerical	16	8.74
Executive	22	12.02
Student	19	10.38

Table 4.23: Average Price of Non-Organic Rice Respondent Usually Buys, Manila.

Ave. Income Bracket	Ave. Price (peso/kilo)	Ave. Volume (kilo/mo)
Total	24.29	43.09
15,000	24.62	40.85
22,500	23.48	59.79
37,500	22.61	41.39
52,500	25.32	36.17
80,000	26.88	40.43
100,000	30.97	40.86

Table 4.24: Subjective Attitude towards Pesticide Residue Risk, Manila.

Level	person	%
No Risk	3	1.64
Little Risk	35	19.13
Acceptable Risk	84	45.90
Serious Risk	48	26.23
Very Serious Risk	13	7.10

structure of personal risk perception in Manila is different from the one in Naga where 51 percent feel the risk from pesticide residues as serious or very serious. In Manila sample, the most prominent feature is that 45.9 percent thinks the risk as acceptable while 33 percent perceives it as either serious or very serious risk (Table 4.24). The relationship between education and risk perception varies from study to study as we will discuss later. But by comparing Manila and Naga cases, we see that the higher education the sample has, the less they perceive the degree of risk.

In Manila, about 50 percent of people have at least heard about organic rice and more than ten people know its meaning well (Table 4.25). This number is slightly higher than the one in Naga where 33 percent heard the word. As for pesticide residues, the

Table 4.25: Knowledge about Organic Rice, Manila.

Organic Rice	person	%
Never Heard	93	50.82
Know Word	69	37.70
Know Well	21	11.48

Table 4.26: Knowledge about Pesticide Residues, Manila.

Pesticide Residues	person	%
Never Heard	100	54.64
Know Word	56	30.60
Know Well	27	14.75

Table 4.27: Knowledge about Sustainable Agriculture, Manila.

Sustainable Agriculture	person	%
Never Heard	113	61.75
Know Word	59	32.24
Know Well	11	6.01

values are quite similar to Naga case and 45 percent of the respondents have heard about pesticide residues (Table 4.26). This is much higher than we expected. The result for the knowledge about sustainable agriculture is also close to Naga case (Table 4.27). As for water pollution, more than 70 percent of people know the meaning well and total 95 percent of people have heard about it (Table 4.28). This may be because the river water pollution in Manila is very serious and people are aware of that issue through several media. As for the willingness to purchase organic rice if it is available in the market or places they usually buy rice, more than 70 percent of them answered they would try (Table 4.29). This number is lower than the one in Naga, but it still indicates the possibility of organic rice market expansion. As for the degree of understanding questions asked to respondents, about 60 percent answered "understood well" while 27 percent stated that it was sometimes hard while 14 percent said it was very hard (Table 4.30). The degree of understanding is higher in Naga City. However, total 87 percent of people seem to understand most part of the questionnaire even thought it might be sometimes hard. Therefore, we can still assume that our experiments are based on the data collected based on sufficient understandings of the materials.

Table 4.28: Knowledge about Water Pollution, Manila.

Water Pollution	person	%
Never Heard	8	4.37
Know Word	45	24.59
Know Well	130	71.04

Table 4.29: Willingness to buy if Organic Rice is available, Manila.

Buy or not	person	%
Will not buy	51	27.87
Will buy	131	71.58

4.2.3 Estimated Results of Contingent Valuation Method: Naga Case

Estimated results of Contingent Valuation Method (CVM) is shown in Table 4.32. Although the number of questionnaires collected is 348 as a total in Naga City, after removing incomplete samples, we could use a total of 284 samples for estimation. Model 1 in Table 4.32 is estimated with all parameters including demographic characteristics and respondents' knowledge level about four concepts. The meaning of each explanatory variables are summarized in Table 4.31.

The semi-log transformation of the price outperformed a linear-price model as measured by log-likelihood and Schwarz B.I.C. For the same reason, we used the Logit model instead of the Probit model. Dependent variable is the probability of choosing organic or reduced risk rice. Therefore, if the sign of the independent variable is positive, the variable contributes to increase the probability of purchasing organic rice more, and vice versa for the negative sign. We expect the signs of the estimated parameters to be as

Table 4.30: Degree of Understanding, Manila.

Understanding	person	%
Very hard	25	13.66
Sometimes hard	49	26.78
Understood well	109	59.56

Table 4.31: Explanatory Variables Summary

Price Increase	Price difference between organic and regular rice
Version	Dummy variable, 1 for 80%, 0 for 50% reduced health risk
Risk Seriousness	Respondent's subjective rating of pesticide residues risk, as measured by an index scaled from 1 to 5
Mother	Dummy variable, 1 if mother is the respondent, 0 otherwise
Sex	Dummy variable, 1 for female, 0 for male
Age	Respondent's age
Family Size	Respondent's family size
Under18	Number of child(ren) under 18 years old in the respondent's family
Education	Years of education of the respondent
Job	Respondent's job category
Income	Respondent's monthly household income
Original Price	Regular rice price the respondent usually purchases
Know-Organic Rice	Knowledge about organic rice, 1 for "have never heard", 2 for "know the word", 3 for "know its meaning well"
Know-Pesticide Residues	Knowledge about pesticide residues
Know-Sus.Agri.	Knowledge about sustainable agriculture
Know-Water Pollution	Knowledge about water pollution

Table 4.32: Estimated Parameters of Logit Model, Naga.

Independent Variables	Model1	Model2
Intercept	3.0355	2.3082
	(1.9089*)	(3.5923***)
Price Increase(log)	-1.3058	-1.2684
	(-9.6561***)	(-9.7637***)
Version	0.6788	0.6590
	(2.5619***)	(2.6168***)
Risk Seriousness	0.1397	
	(0.9819)	
Mother	1.2054	0.8490
	(2.7983***)	(3.0075***)
Sex	-0.2636	
	(-0.6294)	
Age	-0.0389	-0.0289
	(-3.0238***)	(-2.6871***)
Family Size	0.1388	0.0755
	(2.1656**)	(1.6546*)
Under18	-0.1445	
	(-1.4959)	
Education	-0.0472	
	(-1.0188)	
Job	-0.0209	
	(-0.3512)	
Income	0.000011	
	(0.7372)	
Original Price	-0.0437	
	(-0.8138)	
Know-Organic Rice	0.7893	0.9266
	(3.0989***)	(3.9892***)
Know-Pesticide Residues	0.0228	
	(0.9008)	
Know-Sus.Agri.	0.1630	
	(0.6203)	
Know-Water Pollution	0.1739	
	(0.8214)	
N	284	284
LogL	-304.618	-310.65
Schwarz B.I.C.	352.634	327.597

Inside Parentheses is t-value. *** 1%, ** 5%, * 10% significance levels.

follows: Negative for price increase, positive for version, risk seriousness, under18, education, income, original price, know-organic rice, know-pesticide residues, know-Sus.Agri., know-water pollution, and ambiguous for mother, sex, age, family size and job. As for version, since 80% reduced health version is 1, respondents that are asked the higher reduced risk version will more probably choose organic rice than the ones asked the 50% reduced health risk version. Those who think risk from the pesticide residue is serious select organic rice more compared to the ones who do not take the risk seriously. We expect the families having more young children will choose organic rice more since they care about kids' health. We assumed that if one has a higher education, she/he is more aware of the risk. People with higher income can afford expensive rice and those who are buying relatively high priced rice regularly have less hesitation of choosing more expensive rice. We expect the respondent who has more information or knowledge about organic rice, pesticide residues or other environmental factors will more probably understand and agree with the organic rice concept and select organic rice. Many former surveys show that mother or female factor often has a positive effect on going with healthier food, but it is not required by theory. Age and family size can affect either way.

After estimating the results, we compare them with the sign expectation. As for Mother, we get positive with 1% significant level although Sex is negative but it is not significant. Age is negative at 1% significant level, Family Size is positive at 5% level, under18 is negative but not significant, education is negative but not significant, job is negative but not significant, original price is negative but not significant. The signs for other variables are as we expected. Sex is negative and insignificant but Mother is positive and significant. Sex and Mother have a correlation coefficient of 0.698. Since this is not high enough to cause multicollinearity, we included both in our model. There is no other possible multicollinearity between other explanatory variables either. Former surveys on food safety found female to be a positive factor to probability of purchasing safer food. Blend and van Ravenswaay (1999) show Male variable to be significantly negative which is equivalent to Female variable being positive [3]. Buzby *et al.* (1998)

also conclude that Female variable is significantly positive [4] while Misra *et al.* (1991) show that Male variable is insignificantly positive [23]. Therefore, according to the past studies, if the respondent is female, she is more likely to make the decision of choosing safer food than the case of male. Our result suggests that if the respondent is mother in the family, not just being female, she is more likely to select organic rice. As for age, former studies show negative sign mostly but not significant. As for our result, age is negative and significant means that the younger the respondent is, the more probable that respondent selects organic rice. If we interpret this result directly, younger people are concerned more about food safety. Family size has positive significant effects in this model. This means that a larger family will purchase organic rice more compared to a smaller family. But theory does not require so. The results in Buzby *et al.* (1998) tell that family size has negative sign but insignificant, Blend and van Ravenswaay (1999) show it as positive but insignificant [4]. Therefore, there seem to be no consistent result for family size [3]. The correlation coefficient between family size and number of children under 18 is 0.618, but we again do not expect these variables to cause multicollinearlity. Under18 is negative, but not significant. Buzby *et al.* (1998) has positive but insignificant result in number of under 18 year old children [4]. Huang *et al.* (1999) have significant and positive sign on number of under 12 years old kids [17]. The result of Eom (1994) has negative but insignificant result on number of under 18 years old children and he concludes that "insignificant effects of demographic variables may stem from the nature of choice decisions considered: the one-time choice of a produce type without including any quantity adjustment" [8]. We also take one time decision making style in our study, this can be one of the reasons for insignificance of the variable. As for education, we have obtained negative sign but insignificant although we expect the sign to be positive. Blend and van Ravenswaay (1999) show education to have a positive significant influence in the model [3], Buzby *et al.* (1998) have positive but insignificant result [4], Eom (1994) has negative but insignificant effect in the model [8] and Misra *et al.* (1991) show significant negative influence on respondent who has college education [23]. Therefore, again, we do

not have consistent conclusion about influence of education on choice of pesticide reduced food. Since we have got a negative sing for education although it is not significant, we can state that consumers with higher education understand the slightness of the risk from pesticide residues and judge the increase in price is not necessary to offset the risk. Original price has negative influence on choosing organic rice, but it is not significant.

Model 2 in Table 4.32 has been chosen according to Schwarz B.I.C. We judged the best goodness of fit of the model is the one having the lowest Schwarz B.I.C. among possible specifications. After all, the variables which have statistical significance in Model 1 remained the same in Model 2. Therefore, price, version of the questionnaire, the respondent being a mother in the family or not, age and family size of the respondent and his/her knowledge about organic rice become significant in the model and signs are all the same as in Model 1. In short, the features of the possible marketing target is to be mother, who is relatively young and have large family size. Knowledge about organic rice affect the probability of choosing organic rice. Therefore, an advocacy or advertisement of enhancing the knowledge and interest of organic rice will help increasing organic rice sales effectively in Naga City in general.

In order to see the characteristics of different income groups, we divided total sample into three income groups, low, middle and high. We defined low income as monthly salary of 5,000 peso or below, middle income as between 5,001 and 10,000 peso and high income as 10,001 above. The estimated results are shown in Table 4.33. For low income group, no demographic variables became significant, and only price parameter became significant and remained in the model. Price, Mother, Age and Organic rice knowledge variables remained for the middle income group and Price, family size and Under18 became significant for the high income group. These results estimated according to the income group revealed that each income group has its own features of determining purchasing behavior for organic rice. If producer or marketing NGO targets middle and high income group as possible consumer for organic rice, they can place more weights

of advertising according to the result of Model 6 which is the result of estimation with middle plus high income samples. Past studies are not getting consistent results for the sign of Under18 variable although they mostly expect it to be positive. It is possible that family size and under 18 variables are causing multicollinearity or under 18 has high correlation with volume of rice consumption. But according to our confirmation of correlation coefficients between those variables, we cannot find such a relationship. As for the high income group, correlation coefficient between family size and under 18 is 0.54 while it is 0.60 for the "Mid plus High" income sample. These correlations cannot be seen as high, but when we drop the Family size variable, Under18 is still negative, but not significant. So it is also possible to consider that these two variables are affecting each other in some sense. When we drop Under18, we get Family size still positive and significant. Therefore we at least conclude that family size has positive effects in the model, but for number of children, we need further investigation to conclude it has negative effect. Buzby *et al.* (1998) also include both family size and number of children under the age of 18 in their model, but obtains insignificant results for both variables while family size is negative and number of children is positive [4], while Eom (1994) includes only number of children [8] and Blend and van Ravenswaay (1999) includes only family size [3]. Knowledge about organic rice has significant positive impact in this model. Note that it is not the case in Manila. We discuss it further in the next section.

According to the estimated results for each sample, we calculated WTP as shown in Table 4.34. Average price of regular rice each income group pays are listed in the first column. We calculated WTP for total, low, middle, high and middle plus high and the result is in the second columns. Total price consumers are willing to pay for organic rice is obtained by adding the first and the second column. Percent increase of the price in organic rice is calculated in the fourth column. Since income group of above 40,001 peso as monthly household income has small sample but very high average regular price, we also calculated them separately which is shown as High2 row. But since we cannot estimate MWTP for that group separately due to sample size restriction, we used same

Table 4.33: Estimated Parameters of Logit Model: Income Group, Naga.

Independent Variables	Model3(Low)	Model4(Middle)	Model5(High)	Model6(Mid.+High)
Intercept	2.7658	4.0712	2.2335	2.8113
	(5.6174***)	(4.1883***)	(2.5180**)	(3.3938***)
Price Increase(log)	-0.7910	-1.7462	-1.5298	-1.6056
	(-4.1875***)	(-7.0549***)	(-5.1293***)	(-8.6035***)
Version				
Risk Seriousness				
Mother		1.5225		0.9771
		(3.0245***)		(2.8638***)
Sex				
Age		-0.0694		-0.0380
		(-3.6391***)		(-2.8222***)
Family Size			0.5170	0.2900
			(3.7346***)	(3.7460***)
Under18			-0.4989	-0.3176
			(-3.7781***)	(-3.1113***)
Education				
Job				
Income				
Original Price				
Know-Organic Rice		1.6329		1.0049
		(3.7679***)		(3.9077***)
Know-Pesticide Residues				
Know-Sus.Agri.				
Know-Water Pollution				
N	93	107	84	191
LogL	-94.327	-124.324	-80.789	-210.435
Schwarz B.I.C.	98.860	136.006	89.841	228.818

Inside Parentheses is t-value. *** 1%, ** 5%, * 10% significance levels.

Table 4.34: Total WTP calculated: Total & Income Group (in peso), Naga.

Income Group	(1)Ave.P_0	(2)MWTP	(3)Total WTP((1)+(2))	(4)% Increase
Total	18.22	20.57	38.79	112.9
Low(below 5,000)	17.77	33.01	50.78	185.8
Middle(5,001-10,000)	18.29	13.79	32.08	75.4
High (10,001 above)	18.92	21.25	39.54	109.1
Mid+High(5,001 above)	18.67	16.15	34.82	86.5
High1.(10,001-40,000)	18.53	21.25	39.78	114.7
High2.(40,000 above)	19.30	21.25	40.55	110.1

MWTP as High income group estimates for getting Total WTP for High2 group. So we can think the total WTP for this group as lower bound.

First thing we observe is that WTP overall seems high when we consider the total WTP we have obtain together with the fact that the organic rice that has been actually sold in the market in Naga is priced at 26 peso per kilo. According to our estimation, the purchasing decision is made depending on provided information about risk rather than the risk they perceive personally. Furthermore, more than 50 percent of the respondents think that risk from pesticide residues is either "serious" or "very serious". Together with the fact that respondents who have heard the word "organic rice" before the experiment is only one-third of the total respondents, since many people have never seen organic rice in their daily life and suddenly realized its existence through our questionnaire, respondents in Naga City, especially low income group might overreact to the risk to some extent. This is justified from the result Misra *et al.* (1991) have attained for their educational level estimates in their model [23]. They get negative value for college education variable and conclude that "Consumers with more formal education probably have a better understanding of the true risks associated with residue contamination on fresh produce. Therefore, they are more likely to believe that the benefits derived from FPR (free of pesticide residues) produce do not justify the additional cost". About 50% of Naga sample are college graduates while more than 80% of Manila sample are college graduates. Therefore, according to Misra *et al.*'s logic, this high WTP is more likely due

to the education level factor. Furthermore, if we can generalize the educational factor as level of knowledge, the less the respondent knows about the subject under the survey, higher the WTP will be. Therefore, the fact that about half of the respondents have never heard about organic rice can affect our result in the way we have obtained.

The reason for attaining extremely high WTP for the low income group is also explained as follows. College graduates are 38% in low income sample while about 60% of middle plus high income sample are college graduates. This result implies that respondents from low income group were affected strongly by new information and that impact overwhelmed their concerns about budget constraints.

In general, the higher the household income earns, the higher the average price for the regular rice they usually buy becomes. Due to the reasons stated above, we cannot compare MWTP (additional cost respondents are willing to pay to get organic rice = Price of organic rice - Price of regular rice) of low income and other income groups. But for the middle and high income group, MWTP is higher for higher income group.

4.2.4 Estimated Results of Contingent Valuation Method: Manila Case

We distributed and collected 200 questionnaires in Manila from 27th June to 6th July 2001. We eliminated the questionnaires with incomplete CV questions and used 181 observations. The setting of questions and variables in estimations is exactly the same as the one in Naga City.

Table 4.35 shows the estimated results. We used the Logit model for the estimation and show four different estimation results in the table. Model 1 is with all possible variables. Model 2 includes both education and sustainable agriculture variables but intercept is not significant therefore cannot use it for WTP calculation. Model 3 has education but not sustainable agriculture, and vice versa for Model 4. The dependent

variables is once again the probability of choosing organic/reduced risk.

As a comparison to the results from Naga case, differences in reduced risk levels used in two different versions did not have significant effects on decision making. On the other hand, personal perception of the risk from pesticide residues is significant. This result implies that respondents in Manila make their purchasing decision according to the risk they personally believe in, not according to the risk information given by other sources. This result makes a sharp contrast with the case in Naga where people make decisions based on the given information. Family size has significant effects on probability of buying organic rice in both cities. Income level has significant effects on choosing organic rice. This is firstly because Manila sample has more range in income levels and secondly because respondents take their budget constraints into their decision making quite well. The interesting contrast between Naga and Manila case is the result of the knowledge related parameter. In the Manila sample, whether the consumer has knowledge of sustainable agriculture does not affect their decision making, while in the Naga case, it was the knowledge of organic rice that did not matter. Education is also one of the significant factors in decision making.

We segmented our Manila sample into two according to the income level. We were not able to make it into three due to the sample size limitation. Therefore, in the Manila sample, we separated it into low and high income groups. Low income group contains the income range from monthly average household income of 15,000 to 52,500 peso while high income group includes the average income level above 80,000 peso. The results are shown in Table 4.36. The differences in significant variables in both segments are that education is significant in low income sample while sex variable is significant in high income sample. It implies that as for low income group, education level varies over different income levels even in the same income group, and those differences affect the purchasing decision.

Based on the estimates we have obtained for the whole sample and for each income group, we calculated marginal willingness to pay (MWTP) for organic rice. The results

Table 4.35: Estimated Parameters of Logit Model, Manila.

Variables	Model 1	Model 2	Model 3	Model 4
Intercept	2.1267	1.4324	2.0139	3.2050
	(1.3631)	(1.1685)	(1.7263*)	(3.7861***)
Price Increase(log)	-3.2011	-3.1012	-3.0448	-3.0641
	(-10.5781***)	(-11.0151***)	(-10.9362***)	(-11.1683***)
Version	0.0944			
	(0.2873)			
Risk Seriousness	0.9201	0.9042	0.8942	0.9350
	(3.5864***)	(4.4898***)	(4.4420***)	(4.6914***)
Mother	-0.0559			
	(-0.0904)			
Sex	-0.5161			
	(-1.1138)			
Age	-0.0135			
	(-0.8762)			
Family Size	-0.2771	-0.2871	-0.2962	-0.2788
	(-3.2071***)	(-3.9273***)	(-4.1070***)	(-3.9806***)
Under18	0.0060			
	(0.0361)			
Education	0.1767	0.1460	0.1597	
	(2.0806**)	(1.8196*)	(2.0285**)	
Job	0.0046			
	(0.0550)			
Income	0.00002	0.00002	0.00002	0.00002
	(3.2269***)	(4.0520***)	(4.3183***)	(4.2725***)
Original Price	0.0030			
	(0.1402)			
Volume	0.0015			
	(0.2253)			
Organic Rice	0.3605			
	(1.3165)			
Pesticide Residues	-0.5539			
	(-1.7881*)			
Sustainable Agri.	0.9522	0.6386		0.6642
	(2.8798***)	(2.6300***)		(2.7496***)
Water Pollution	0.1254			
	(-0.4214)			
N	181	181	181	181
LogL	-204.104	-207.647	-211.568	-210.796
Schwarz B.I.C.	250.890	225.842	227.180	226.408

Inside Parentheses is t-value. *** 1%, ** 5%, * 10% significance levels.

Table 4.36: Estimated Results-Income Group, Manila.

Variables	Low	High
Intercept	2.8897	6.2973
	(1.7927*)	(3.8912***)
Price Increase(log)	-2.9369	-3.8479
	(-8.4425***)	(-6.4096***)
Risk Seriousness	0.6704	1.0166
	(2.4747**)	(2.4573**)
Sex		-1.1335
		(-2.4579**)
Family size	-0.3054	-0.2446
	(-3.0790***)	(-1.8562*)
Education	0.2921	
	(2.9272***)	
Original Price	-0.0568	0.0801
	(-1.7791*)	(2.5857**)
N	94	87
logL	-127.537	-75.108
Schwarz B.I.C	141.167	88.506

Inside Parentheses is t-value. *** 1%, ** 5%, * 10% significance levels.

are listed in Table 4.37. As for the estimates with the whole sample, the MWTP is about 6 to 6.5 peso. MWTP for low income group is 7.92 peso while it is 13.28 peso for high income group. These values are lower than the ones in Naga case. This is firstly because decision making in Naga significantly depends on the health risk information we provided in the questionnaire while Manila sample depends on their personal perception of the residue risk, and secondly, in Naga case, 50 percent of respondents think the risk from the pesticide residue is either serious or very serious while 45 percent of the respondents state the risk is acceptable. Thirdly, probably the way respondents take their budget constraints into their purchasing decision is different in both cities. But we cannot confirm if this actually happened or not with the methods we have used for this study.

WTPs for organic rice are calculated for all and individual income groups. Given the average price for the rice each subsample respondent usually buys (shown as P_0 in

Table 4.37: MWTP, Manila.

	MWTP(peso)
Model 2	6.54
Model 3	6.29
Model 4	6.41
Low	7.92
High	13.28

Table 4.38: Total WTP calculated (in peso), Manila

Income Group	(1)Ave.P_0	(2)MWTP	(3)Total WTP((1)+(2))	(4)% Increase
All	24.29	6.42*	30.53	25.7
Low	24.06	7.92	31.98	32.9
High	28.92	13.28	42.20	45.9

*average MWTP of Model 2,3 and 4.

Table 4.38), we obtained WTP for organic rice. WTP with whole sample is 30.53 peso while it is 31.98 peso for low income group and is 42.20 peso for high income group. Compared to the WTP for Naga, the WTP is lower for the whole sample in Manila. We cannot compare the low and middle groups since we changed the segmentation due to the limitation of sample size. But as for high group sample, WTP for Manila sample exceeds the one for Naga sample.

Let us make further comments on Naga sample given the result of Manila case. Sample in Manila has higher education compared to the one in Naga and also larger portion of the Manila sample compared to the Naga sample have known about organic rice. Therefore we expect that the reaction and the decision making procedure in each city differ based on such background of samples, and once organic rice becomes more available in markets in Naga city and consumers get more knowledge and information about organic rice, they may judge information we currently provided differently in the future. Hence, we can think our current result as a "first encounter with organic rice" reaction for only one time decision making process, and following up experiments in the future will reveal the WTP with multiple decision making processes.

4.3 Scope Test

Scope test is a test to measure how WTP responds to the magnitude of risk reduction. We expect that WTP to reduce small probabilities of health risk occurrence should be (a) increasing in the magnitude of risk reduction and (b) approximately proportional to the magnitude [18, 31]. Since in our study one version has 50% risk reduction setting while the other one has 80% reduction, if the WTP increases proportional to the size of the risk reduction, the ratio of WTP for lower risk reduction to the WTP for the higher one will be approximately 1.60.

We designed the CV questionnaire so that it is possible to implement an external scope test. External scope test is the test that respondents are asked about their WTP for different risk reductions. Since we used two different risk reduction level, we have two subgroups to compare. Hammitt and Graham (1999) went through 25 CV studies in the past and found that only 9 report information to make it possible to carry out external scope test. But even those 9 studies are not designed for external test explicitly. They found that studies relying on subjective rather than objective probabilities of adverse events have performed little better to measure proportionality of WTP and the magnitude of risk. Those studies have found "statistically significant differences in WTP for risk of differing perceived magnitude, but differences in WTP are less than proportional to the difference in perceived magnitude" [14].

4.3.1 Scope Test, Naga

Estimated results for each version and each income group in the Naga case are listed in Table 4.39. Due to sample number limitation, we could obtain only a few significant variables. But we used these estimates to calculate MWTP for each subgroup. The results are in Table 4.40. The ratio of MWTP with lower risk to the MWTP with higher risk is shown as Ratio in the table. In accordance with the goal of attaining 1.60 by assuming that WTP increases proportionally to the increment of the risk, we have obtained almost

exact value 1.59 for the middle plus high income subgroup. Low income group has very high ratio. We expect this result to be due to the sensitivity or overreaction to the risk by this subgroup as explained earlier. Middle income group has less than proportional ratio. One possible reason for this is that 50% risk reduction subsample has a significant Knowledge about pesticide residues variable while 80% sample has a significant education variable. Therefore 50% sample concerned more about health risk from pesticide residues while 80% sample reacted to the risk for the reason explained earlier. The higher the education level is, the lower the reaction to the risk from pesticide residues becomes since the respondents think that it is not worth paying certain amount for the very small risk reduction. Thus we obtained relatively higher MWTP for 50% sample and lower WTP for 80% sample. By adding these features up, we have attained slightly higher ratio for all sample. This is higher than proportional because the higher ratio for low income group overwhelmed the effects from lower MWTP for middle income group. The ratio of 1.70 is still very close to the proportional level.

4.3.2 Scope Test, Manila

We also implemented the scope test for the Manila case. Due to the limitation of sample size, we could obtain estimates only for the whole sample and low income sample for each risk reduced level. The results are in Table 4.41. Based on the estimates, we calculated MWTP for each case and the results are in Table 4.42. As the ratio between MWTP for 50 and 80 percent reduced risk indicates, Manila sample fails the scope test. This is obvious because the purchasing decision of Manila respondents over organic rice depends on their personal perception towards pesticide residues risk, not on the information provided by a third party. Therefore, we found that the result of scope test largely depends on how much respondents' decision making processes rely on the technical information provided. If they depend on personal perception more, scope test fails.

We have seen the estimated results of CVM and the scope test in this chapter. CVM

Table 4.39: Estimation by Version of Risk Reduction, Naga.

Sample	(1)All Sample		(2) Low		(3) Middle		(4) High		(5) Mid+High	
Variables/Size of Risk Reduction	50%	80%	50%	80%	50%	80%	50%	80%	50%	80%
Cons	3.117	2.786	11.737	3.310	-8.786	10.518	4.371	3.270	4.448	1.981
	(4.598***)	(4.080***)	(2.175**)	(3.532***)	(-2.070**)	(3.594***)	(5.313***)	(2.963***)	(4.528***)	(2.108**)
Price Increase(log)	-1.312	-1.275	-1.173	-0.808	-1.756	-2.380	-1.543	-0.940	-1.658	-1.703
	(-8.008***)	(-5.370***)	(-3.500***)	(-2.285**)	(-5.787***)	(-4.351***)	(-4.794***)	(-2.231**)	(-7.069***)	(-4.543***)
Seriousness										
Mother	1.411								1.678	
	(3.499***)								(3.534***)	
Sex										
Age	-0.049					-0.073			-0.066	
	(-3.382***)					(-2.218**)			(-3.533***)	
Family Size										0.425
										(3.064***)
Under18										-0.551
										(-2.430**)
Education						-0.314				
						(-2.322**)				
Job										
Income										
Original Price			-0.570		0.508					
			(-2.113**)		(2.304**)					
Know-Organic Rice		0.810			1.404	1.982				0.964
		(2.500**)			(2.713***)	(2.812***)				(2.689***)
Know-Pesticide Residues			-2.821		1.146				0.964	
			(-2.534**)		(2.385**)				(2.881***)	
Know-Sus.Agri.	1.027		4.417							
	(3.164***)		(3.141***)							
Know-Water Pollution										
N	150	134	51	42	59	48	40	44	99	92
LogL	-86.92	123.25	47.57	33.68	-76.06	42.24	49.10	39.00	126.73	80.66
Schwarz.B.I.C.	199.45	130.60	57.40	37.42	86.25	51.91	52.79	42.79	138.22	91.96

Inside Parentheses is t-value. *** 1%, ** 5%, * 10% significance levels.

Table 4.40: MWTP (in peso), Naga.

	(1)All Sample		(2) Low		(3) Middle		(4) High		(5) Mid+High	
Reduced Risk	50%	80%	50%	80%	50%	80%	50%	80%	50%	80%
MWTP	14.91	25.33	24.70	60.14	11.93	16.39	17.00	32.48	12.78	20.27
Ratio	1.70		2.43		1.37		1.91		1.59	

Table 4.41: Estimation by Version of Risk Reduction, Manila.

	(1)All Sample		(2) Low	
Reduced Risk	50%	80%	50%	80%
Cons	2.5952	3.7960	3.3284	3.1187
	(2.24564**)	(3.59934***)	(1.97281**)	(2.87819***)
Price Increase(log)	-3.3382	-3.1428	-3.1577	-2.3855
	(-8.20682***)	(-7.67645***)	(-6.49584***)	(-5.77547***)
Risk Seriousness	1.2873	0.7827	0.7766	0.5337
	(3.54896***)	(3.19116***)	(1.86597*)	(1.88726*)
Family Size		-0.3158		
		(-3.7772***)		
Income		0.00005		
		(4.59769***)		
Know-Pesticide Residues	-0.8447			
	(-2.10058**)			
Know-Sus.Ari	1.6426		0.9795	
	(3.09341***)		(1.63905*)	
N	89	92	45	49
LogL	-99.460	-103.813	-60.076	-71.958
Schwarz.B.I.C.	110.682	115.118	67.689	77.796

Inside Parentheses is t-value. *** 1%, ** 5%, * 10% significance levels.

Table 4.42: MWTP (in peso), Manila.

	(1)All Sample		(2) Low	
Reduced Risk	50%	80%	50%	80%
MWTP	10.29	10.65	9.43	7.10
Ratio	0.034		-0.247	

can evaluate one specific aspect of the subject under the test. In our study, it is health risk from pesticide residue and we have obtained the consumers' willingness to pay to the "risk reduced rice" which is interpreted as organic or partially organic rice, given the price we announced to the respondents. Although the health risk factor is one of the most important factors in consumers' purchasing decision, there are several other factors which can be the reasons for choosing organic or partially organic rice. We examine those factors by implementing the Conjoint Analysis by involving five different attributes of the product. We will discuss about the Conjoint Analysis in the following chapter.

Chapter 5

Conjoint Analysis of Organic Rice

In this chapter, we describe the Conjoint Analysis we have conducted in Naga City and Manila. Conjoint Analysis gives detailed information about the consumers' purchasing decision making features. We analyze how and which attributes actually affect the choice between organic and regular rice. The model we estimated is explained followed by the estimated results in Naga City and Manila. We also compare the results of CVM and Conjoint Analysis and obtain the values and benefits of organic rice production as indicators for the projects on organic rice production, marketing and certification.

5.1 The Model for Conjoint Analysis

For Conjoint Analysis of organic rice, we employ the model developed by Baker (1999) [2] and modify it into a model that suits our case as follows. Denote the product under test with x_1 and its price with p_1. Alternative products are represented by vector $\mathbf{x} = (x_2, x_3)'$ and their prices are represented by $\mathbf{p} = (p_2, p_3)'$. Product x_1 is composed of 5 attributes, $\mathbf{a}_1 = (a_{11}, \ldots, a_{15})$. Product $\mathbf{x}$ contains a matrix of attributes, $\mathbf{a} = (a_{ij}|i = 2, 3, \text{ and } j = 1, \ldots, 5)$. We assume that those attributes are

1. price,

2. level of health risk,

3. level of environmental pollution due to the production of the rice,

4. quality of rice,

5. fair trade.

We assume that consumers' utility depends directly on the level of attributes. Therefore, utility function is expressed as

$$U = u(\mathbf{a}_1, \mathbf{a}) \tag{5.1}$$

and individual's budget constraint is

$$p_1 x_1 + \mathbf{p}'\mathbf{x} \leq Y \tag{5.2}$$

where Y is the income of the individual. We can rewrite consumer's problem with the indirect utility function as

$$V = v(p_1, \mathbf{a}_1, \mathbf{p}, \mathbf{a}, Y) \tag{5.3}$$

such that

$$p_1 x_1 + \mathbf{p}'\mathbf{x} = Y \tag{5.4}$$

V is the maximum utility achievable for a consumer given product attributes, prices, and income [2].

Suppose the Random Utility Model is defined as

$$U_i = V_i(a_i, p_i) + \varepsilon_i \tag{5.5}$$

where V_i is the observablepart of the utility and ε_i is the unobservable part of utility. Since we presented three choices with five attributes for each choice in our survey, $i = 1, 2, 3$ and 3 is set as status quo.

When a respondent makes a choice $i = 1$, it means that for the individual, U_1 is higher than $U_k, k = 2$ and 3. The probability of choosing option 1 is

$$\begin{aligned} P_1 &= Pr(U_1 > U_k, k = 2, 3) \\ &= Pr(V_1 + \varepsilon_1 > V_k + \varepsilon_k, k = 2, 3) \\ &= Pr(V_1 - V_k > \varepsilon_k - \varepsilon_1, k = 2, 3). \end{aligned} \tag{5.6}$$

In the equation above, V_1 and V_k are observable but ε_1 and ε_k are not. If we assume ε_1 and ε_k to have Normal distributions, we can derive the probit model, if we assume them to have Gumbel distributions, we can derive the logit model [30]. We use the logit model in this study. Then, the probability of choosing option i where $i = 1, 2, 3$ can be expressed as [30, 22]

$$P_i = \frac{e^{\mu V_i}}{e^{\mu V_1} + e^{\mu V_2} + e^{\mu V_3}} \tag{5.7}$$

where μ is the scale parameter for the Gumbel distribution and is usually set to 1.

Estimation is done by maximizing the log-likelihood function

$$\ln L = \sum_{n=1}^{N} \sum_{i=1}^{3} \alpha_i^n \ln P_i^n \tag{5.8}$$

where n is the index of profile answered, N is the total number of profiles answered, i is index of the choices (three options in our survey) in one profile, α_i^n is a dummy variable which equals to 1 when option i is chosen from the profile and 0 otherwise.

We assume individual i's indirect utility function to be a linear function and define it as

$$\begin{aligned} V_i = &\beta_{i1}\text{PRICE} + \beta_{i2}\text{RISK} \\ &+ \beta_{i3}\text{Env't(Fair)} + \beta_{i4}\text{Env't(Good)} \\ &+ \beta_{i5}\text{Env't(Very Good)} \\ &+ \beta_{i6}\text{Eat.Quality(Bad)} + \beta_{i7}\text{Eat.Quality(Fair)} \\ &+ \beta_{i8}\text{Eat.Quality(Excellent)} \\ &+ \beta_{i9}\text{Cert.(Coop)} + \beta_{i10}\text{Cert.(NGO)} \\ &+ \beta_{i11}\text{Cert.(DA)} + \beta_{i12}\text{FairTrade.} \end{aligned} \tag{5.9}$$

PRICE is the difference between the prices of status quo rice and other options' rice in the profile and RISK indicates the percentage of the reduced health risk. Environmental pollution variables are expressed as Env't(level of pollution). Status quo is set to "Bad" in our study. Therefore, WTPs obtained for each variable will be WTP to improve the environmental condition from bad to fair, good and very good, respectively. Eating quality of rice is shown as Eat.Quality(level of quality). Status quo is set to be "Good". Therefore, for Eat.Quality(Bad) and Eat.Quality(Fair), negative WTP shows the amount the respondent is hoping to be paid if he needs to get lower quality of rice. Eat.Quality(Excellent) measures WTP for improving the rice eating quality. Certification factor is expressed as Cer.(name of certification body). Coop. is farmer's cooperative, NGO is non-governmental organization, and DA is Department of Agriculture. Status quo is no certification. Status quo of Fair Trade factor is no fair trade. The meanings and levels of all variables are explained in the next section.

5.2 Estimated Results of Conjoint Analysis

5.2.1 Estimated Results of Conjoint Analysis: Naga Case

The third section in the questionnaire is about conjoint analysis. We asked six choice experiments to each respondent. 348 questionnaires were collected and after deducting incomplete ones 2074 answers were used for the analysis. The questionnaire and the cue cards are given in Appendix A. Interviewers firstly showed three panels explaining about health risk (see Panel 1 in Appendix A), water pollution (see Panel 2 in Appendix A), and definitions of eating quality levels and fair trade factors (see Panel 3 in Appendix A). After showing and explaining the panels, interviewers asked choice experiment questions with cue cards (see Cue Cards in Appendix A). Each card contains one choice question and each respondent was asked six different cue cards. Six attributes - price, health risk, environmental quality, eating quality, organic certification and fair trade - were used in the profile design of the choice experiment. The profiles were arranged by the orthogonal

Table 5.1: Attributes and Levels in Conjoint Analysis Profiles.

Attributes	Levels
Additional Price (peso)	P2, P4, P6, P10, P15, P20
Reduced Health Risk	0%*, 50%, 80%, 99%
Environmental Quality	Bad* , Fair, Good, Very Good
Eating Quality	Bad, Fair, Good*, Excellent
Certification	None*, Farmer's Cooperative, NGO, Dept. of Agri.
Fair Trade	No*, Fair Trade

* indicates status quo.

main effect design. Levels of each attribute were six for price, four for health risk, four for environmental quality, four for eating quality, four for organic certification and two for fair trade. This is summarized in Table 5.1.

These attributes are chosen based on the research objectives. We set four health risks which can be reinterpreted as the pesticide usage level on the farm. Therefore 50 and 80 percent reduced risk can be equivalent to the result of the production method, called "combination rice", which involved reduced amount of pesticide. In order to avoid the effect of over reaction towards "no health risk" or "100 percent reduced risk" by the respondent, we set the lowest level as 99 percent reduced risk. Since it is also possible for organic rice to have little amount of pesticide residues due to limited processing equipments and also influence from surrounding non-organic farms, we think that it is a realistic assumption. As for environmental pollution level, we explained it as the lake water pollution level on farm site due to the pesticide use. We set four levels for the pollution as "Bad", "Fair", "Good" and "Very Good". We set the status quo to "Bad" based on the farmers' observation of water around their farms. Farmers we interviewed mentioned that before shifting their production to the organic farming, they could not find many aquatic or semiaquatic animals in the water, but after adopting organic farming, they observed that those animals are back to their farm and water. In the graph we showed to the respondents, we express bad level as "fish cannot live", fair as "Fish can live, but better not to eat them", good as "safe to live in the water", very good as " safe

to eat fishes from the lake". We set it specifically as lake water pollution because we expected different respondents to imagine similar situation as much as possible. Another reason for the choice of late water pollution is that pesticide residues have serious problem when they stay in a pond or a lake where water stream is relatively gentle or steady since pesticide can be accumulated in the bottom of a lake or pond causing ground water pollution and also in the aquatic animal's body as a result of a food chain. As for eating quality, we defined them as follows: "Excellent" has the features {softness, white grain, good smell, high purity}, "Good" has {softness, white grain, good smell, low purity}, "fair" has {softness, white grain, not good smell, low purity}, and "bad" has no good features. We set status quo as "Good" since rice is consumed every day for every meal even including as snacks in the Philippines and consumers are fastidious about rice quality. The certification attribute has four different kinds: no certification, certification by farmers' cooperative, by Non Governmental Organization (NGO) and by Department of Agriculture. Fair trade factor is added because of the requests from a local NGO working on marketing organic agricultural products. The basic idea of the fair trade here is that a trader who purchases rice from organic farmers pays the appropriate value to organic rice, which is 10 to 15 percent value added price. There are many cases in the Philippines that a trader has strong business power and purchases organic rice as non-organic rice and pays less than the proper price of organic rice. Therefore, in the panel, we explained that "fair trade" as 10 to 15% higher purchasing price than prevailing market price, i.e. higher economic benefits to farmer/producers, and "no fair trade" as regular/prevailing purchase price from producers, i.e. minimal economic returns to producers.

We firstly estimated with the whole data we have obtained as well as with the data for the respondents that understood the questionnaire well. The result is shown in Table 5.2. Every variable but Eat.Quality(Fair) is statistically significant at 1 percent significance level. Estimated parameters indicate how much individual's utility increases when each attribute goes up by one unit. When the additional price of purchasing organic rice

increases, individual utility goes down. Therefore, the sign is negative. As for risk, here we are using percentage reduced risk; therefore, as health risk from pesticide residues decreases by one percent, utility goes up by 0.00789 for all, and 0.00852 for the respondents that understood the questionnaire well (in the rest of the chapter we denote the sample of respondents that understood the questionnaire well as the "understand" subsample). As for environmental quality parameters, since now we are assuming that the environmental quality of status quo is bad, we can interpret the result as when environmental quality improved from "Bad" to "Fair", utility goes up by 0.5673 for all and 0.5533 for "understand" only, improved from "Bad" to "Good", individual's utility goes up by 0.6773 for all and 0.6527 for "understand" only, from "Bad" to "Very Good", utility increases by 0.7559 and 0.7264 respectively. The fact that estimates with whole data is higher than the one only with "understand" only. We assume that status quo of the eating quality is "Good". The results show that consumer's utility actually decreases when eating quality of rice gets worse from "Good" to "Bad". Therefore, the sign here is negative. The sign of Eat.Quality(Fair) is expected to be negative, too, but here we could not get a significant result. When the eating quality improves from "Good" to "Excellent", utility in fact increases. When we talk about organic certification, we found that if Department of Agriculture becomes the certification institution, individual utility goes up the most comparing to the case of farmer's cooperative or NGO. Consumers prefer farmer's cooperative to NGO to be the certification body. If the rice is traded in the "Fair Trade" manner, utility also increases as the parameter sign is positive.

We also observed a tendency that respondent who understood the questionnaire well get more utility from reducing health risk, certification and fair trade factors and less utility for environmental quality comparing to the group of those who had hard time understanding questions. The reason why we could not get a significant result for Eat.Quality(Fair) might be because the respondents could not identify the difference between levels "Fair" and "Good" since the result for Manila version shows significantly negative for the parameter. We might have to set the status quo level at Fair instead of

Table 5.2: Estimated parameters of Multinomial Logit Model, Naga.

Independent variables	(1)All	(2)Understand
Price	-0.0234	-0.0267
	(-4.3833***)	(-4.5966***)
Risk	0.00784	0.00852
	(9.4659***)	(9.4175***)
Env't(Fair)	0.5673	0.5533
	(5.9663***)	(5.4124***)
Env't(Good)	0.6773	0.6527
	(5.4620***)	(4.8489***)
Env't(Very Good)	0.7559	0.7264
	(6.8099***)	(5.9820***)
Eat.Quality(Bad)	-0.5002	-0.5309
	(-5.2427***)	(-5.1019***)
Eat.Quality(Fair)	0.0285	0.0190
	(0.2964)	(0.1835)
Eat.Quality(Excellent)	0.4063	0.3853
	(4.8631***)	(4.2429***)
Cert.-Cooperative	0.3614	0.4425
	(4.4809***)	(5.0650***)
Cert.-NGO	0.3407	0.3584
	(3.1255***)	(3.0307***)
Cert.-Dept.of Agri.	0.4170	0.4605
	(4.8887***)	(5.0149***)
Fair Trade	0.2642	0.3058
	(3.6012***)	(3.8269***)
N	2074	1781
LogL	-1967.41	-1677.75
Schwarz B.I.C.	2013.23	1722.66

Inside Parentheses is t-value. *** 1%, ** 5%, * 10% significance level.

Good. It needs more investigation before we reach the conclusion.

As for the Naga version, although values of WTP are quite high because of the reasons mentioned in Chapter4, CVM section, we can still describe the tendency of the consumer preference. Firstly, we take a look at the results from the version where all data is used. The result is in Table 5.3.Note that we dropped WTP calculated with insignificant parameters from the table and those are shown with "-". The values inside the brackets are the 95% confidence intervals for each WTP calculated by a monte carlo simulation of Krinsky and Robb's method done 1000 times. WTP for health risk is 0.35 peso per one percent of risk reduction. This implies that 17.5 peso for 50 percent reduction, 28 peso for 80 percent reduction and 34.65 peso for 99 percent reduction. Once again, comparing to other factors, the health risk reduction factor has a big influence on purchasing behavior. The second factor which consumer concerns about is environmental quality. Consumer's WTP to improve environmental quality from bad to fair is 25.33 peso, to good is 30.74 peso and to very good is 33.81 peso. Consumer is willing to pay 18.51 peso for the improvement of eating quality from good to excellent while they want to be paid 23.15 peso if the quality degrads from good to bad. Obtaining the organic certification from farmer's cooperative, NGO and Department of Agriculture are 16.06 peso, 15.62 peso and 18.82 peso, respectively. Fair trade factor has the least attention and has a WTP of 12.21 peso. High concerns toward health risk was expected beforehand, but high concerns about environmental factor is something we did not expect. We can explain one of the reasons to be that since they live near the farmland in Naga city, they imagined that environmental pollution or water pollution may have direct impact on their own life. There are high possibilities that the family or relatives are engaged in agriculture, too. This result has sharp contrast with the result in Manila. Among three possible certification institutions, Department of Agriculture was the most popular or the trustable one among Naga respondents. Fair trade factor was relatively less concerned by consumers comparing to other attributes. For those who understood the questionnaire well (this subsample only includes those who said "understood very well" the questionnaire and

Table 5.3: Marginal WTP for Each Attribute (in Peso), Naga.

	(1) ALL		(2) Understand	
Attributes	WTP	95% C.I.	WTP	95% C.I.
Risk	0.35	[0.24 - 0.52]	0.33	[0.23 - 0.49]
Env't Qual.(Fair)	25.33	[16.34 - 37.53]	21.56	[13.71 - 32.31]
Env't Qual.(Good)	30.74	[19.65 - 46.39]	25.78	[15.76 - 39.06]
Env't Qual.(Very Good)	33.81	[23.12 - 50.72]	28.21	[18.85 - 40.63]
Eat. Qual.(Bad)	-23.15	[-37.42 - -14.01]	-20.53	[-31.67 - -12.08]
Eat. Qual.(Fair)	-	-	-	-
Eat.Qual.(Excellent)	18.51	[10.74 - 29.54]	15.43	[8.02 - 24.74]
Cert.Coop	16.06	[9.00 - 25.71]	17.54	[10.29 - 27.81]
Cert.NGO	15.62	[6.25 - 28.75]	14.03	[5.94 - 25.69]
Cert.Dept.Agri.	18.82	[10.95 - 29.41]	17.94	[10.95 - 26.48]
Fair Trade	12.21	[5.96 - 20.80]	11.98	[6.36 - 20.16]

explanation of the interviewers), their Marginal Willingness to Pay (MWTP) is lower except one variable, Cert.Coop than the results with the whole sample.

In Table 5.4, estimated parameters of multinomial logit model with data depending on each income group are shown. As for the low income group, price, cert.NGO and Fair Trade parameters are not significant even at the 10 percent significant level. The characteristics we want to note are that the low income group tends to get higher utility from environmental quality improvement comparing to other income groups and also that the low income group prefers the certification by Department of Agriculture. The middle income group obtains the least utility from the reduced health risk relative to others and prefers certification by cooperative. The high income group gains the greatest utility from reduction of health risk and also eating quality improvement from Good to Excellent comparing to other income groups. They want organic rice to be certified by the Department of Agriculture. Fair trade is also a significant factor. As the result from the estimation with middle and high income data, all except Eat.Quality(Fair) became significant at one percent level.

When we compare the outcomes from each income group, we see that the high income group has higher MWTP over all variables except risk. Since the price parameter is not

Table 5.4: Estimated parameters of Multinomial Logit Model-Income Bracket, Naga.

Independent variables	(3)Low	(4)Middle	(5)High	(6)Mid.+ High
Price	-0.00826	-0.0349	-0.0273	-0.03118
	(-0.8580)	(-3.9352***)	(-2.7800***)	(-4.7624***)
Risk	0.00415	0.0106	0.00879	0.00974
	(2.9241***)	(7.5341***)	(5.6430***)	(9.4004***)
Env't(Fair)	0.5560	0.5197	0.6074	0.5700
	(3.0607***)	(3.4390***)	(3.5602***)	(5.0727***)
Env't(Good)	1.0413	0.6981	0.2273	0.5106
	(4.5261***)	(3.6722***)	(0.9436)	(3.4436***)
Env't(Very Good)	0.8030	0.8018	0.6603	0.7432
	(4.0582***)	(4.4316***)	(3.1474***)	(5.4474***)
Eat.Quality(Bad)	-0.4481	-0.6617	-0.3209	-0.5129
	(-2.5864***)	(-4.1451***)	(-1.8663*)	(-4.4064***)
Eat.Quality(Fair)	0.2919	-0.2332	0.1054	-0.0866
	(1.6452*)	(-1.5164)	(0.5919)	(-0.7506)
Eat.Quality(Excellent)	0.4139	0.1825	0.7232	0.4168
	(2.7035***)	(1.3520)	(4.6936***)	(4.1283***)
Cert.-Cooperative	0.3781	0.3829	0.3279	0.3504
	(2.5636***)	(2.9365***)	(2.1817**)	(3.5834***)
Cert.-NGO	0.1065	0.2957	0.6036	0.4212
	(0.5432)	(1.7207*)	(2.8274***)	(3.1703***)
Cert.-Dept.of Agri.	0.3795	0.3333	0.6186	0.4481
	(2.4559**)	(2.3970**)	(3.9147***)	(4.3328***)
Fair Trade	0.0456	0.3781	0.3814	0.3811
	(0.3502)	(3.1360***)	(2.6973***)	(4.2123***)
N	643	786	642	1428
LogL	-608.341	-748.651	-574.321	-1333.94
Schwarz B.I.C.	647.129	788.652	613.109	1377.52

Inside Parentheses is t-value. *** 1%, ** 5%, * 10% significance level.

significant for the low income group, we could not calculate its MWTP. There are some interesting differences between the middle and high income groups. If we evaluate the health risk MWTP at 80 percent reduced level, risk has the highest WTP among other variables for the middle income, but not for the high income group. At 80 percent reduced risk level for the high income group, we get 23.2 peso. However we obtain higher MWTPs for improvements of both environmental quality and eating quality than 80 percent reduced health risk. Therefore, consumers that belong to the high income group have relatively lower WTP for risk and higher WTP for environmental quality and eating quality comparing to the ones in the middle income group. On the other hand, middle income consumers care more about health risk. Furthermore, the middle income group marks relatively lower WTP for certifications while the high income group puts relatively high weights on certification. This becomes obvious when we compare the value of "very good" Environmental quality and the highest certification values in both income groups. This result indicates that the middle income consumers may pay much less attention to organic certification comparing to the high income consumers.

As for the certification factor itself, we see an interesting contrast between those two income groups. Analyssi of the middle income group shows that they want farmer's cooperative to be the certification body the most, followed by the Department of Agriculture and NGO. In contrast, the high income group favored the certification by NGO and the Department of Agriculture the most, and placed the least value on the certification from farmer's cooperative. The MWTP for cooperative relative to NGO or Department of Agriculture is almost one-half. Once we add up the middle and high income group subsamples, we get almost the same MTWTP for the NGO and the Department of Agriculture certification. Therefore, we can at least state that certification by cooperative like the current case with the PDCI rice is the least preferable one. Manila sample shows that NGO certificaiton is the best one. Therefore, when one actually places certification on the organic products, she/he should do so according to the target income group and the marketing location. Overall, consumers in the middle and high income groups place

more attention into health risk and environmental quality and relatively low value on fair trade factor. Certification is one of the important factors for the high income group, but is less important for the middle income group.

Since the low income group does not give significant result, we deducted the sample from whole data and estimated only with sample from the middle and high income groups. The result is shown in the last column in Table 5.5. As before health risk factor is the largest factor followed by the environmental pollution attributes. Certification and fair trade factors are given less value compared to the other attributes. Therefore, in Naga city, marketing strategy of organic rice should emphasize on the reduced health risk and improvement of the environmental pollution. Certification is the least important factor in Naga city comparing to Manila. This result implies that the closer the production site is to the consumption site, the less need for certification becomes.

5.2.2 Estimated Results of Conjoint Analysis: Manila Case

The design of the questions related to conjoint analysis is exactly the same as the one we used in Naga city including the values we used in the profile. Since 17 respondents out of 200 answered that they do not buy or consume rice often, they were not asked the conjoint analysis questions. Therefore, 183 respondents were asked choice experiments style conjoint analysis questions, and a total 1098 samples were used in the estimation.

All parameters are statistically significant at at least the 10% significance level for both the whole sample and "understand" subsample. Signs are all consistent with the ones we expected. Comparing the results of the whole sample with those of the "understand" subsample, we can see that utility of the "understand" subsample increases more with better environmental quality and certification. Results of eating quality varies over degrees of improvement. We have to note that only 60 percent of the total sample in Manila said they understood the materials well while 84 percent of respondents stated so in Naga city. There might be several possible reasons for this result. But we assume

Table 5.5: Marginal WTP of Each Income Group (in Peso), Naga.

	(3) Low	(4) Middle		(5) High		(6) Mid+High	
Attributes	WTP	WTP	95% C.I.	WTP	95% C.I.	WTP	95% C.I.
Risk	-	0.33	[0.21 - 0.51]	0.29	[0.19 - 0.79]	0.33	[0.23 - 0.46]
Env't Qual.(Fair)	-	15.80	[7.63 - 25.93]	28.16	[11.31 - 53.76]	19.37	[12.62 - 28.71]
Env't Qual.(Good)	-	21.27	[10.99 - 34.99]	-	-	16.68	[8.03-27.03]
Env't Qual.(Very Good)	-	24.53	[14.10 - 38.69]	34.14	[11.88 - 54.70]	25.01	[16.70 - 35.97]
Eat. Qual.(Bad)	-	-19.96	[-34.69 - -10.74]	-13.53	[-31.55 - -2.22]	-17.07	[-27.08 - -9.75]
Eat. Qual.(Fair)	-	-	-	-	-	-	-
Eat. Qual.(Excellent)	-	-	-	33.13	[14.03 - 70.53]	13.91	[7.49 - 22.35]
Cert.Coop	-	11.76	[4.72 - 21.18]	15.66	[2.48 - 32.87]	11.79	[5.75 - 19.71]
Cert.NGO	-	9.41	[0.55 - 19.66]	32.52	[7.55 - 63.42]	14.29	[5.74- 24.32]
Cert.Dept.Agri.	-	10.18	[2.94 - 18.98]	24.16	[10.50 - 55.54]	14.97	[8.43 - 23.23]
Fair Trade	-	11.92	[4.67 - 21.30]	18.74	[4.98 - 38.21]	13.06	[7.17 - 21.21]

Table 5.6: Estimated parameters of Multinomial Logit Model, Manila.

Independent Variables	(1) All	(2) Understand
Price	-0.0693	-0.0526
	(-8.5817***)	(-5.2915***)
Risk	0.0119	0.0101
	(10.1413***)	(6.7265***)
Env't(Fair)	0.3172	0.5037
	(2.3777**)	(2.8888***)
Env't(Good)	0.3746	0.5643
	(2.1763**)	(2.4935**)
Env't(Very Good)	0.4528	0.6503
	(3.1245***)	(3.3762***)
Eat.Quality(Bad)	-1.0899	-1.0200
	(-7.4502***)	(-5.5269***)
Eat.Quality(Fair)	-0.5911	-0.7458
	(-4.3214***)	(-4.2271***)
Eat.Quality(Excellent)	0.4062	0.3822
	(3.3566***)	(2.4772**)
Cert.-Cooperative	0.2214	0.2897
	(1.9131*)	(1.9498*)
Cert.-NGO	0.6853	0.7071
	(4.4908***)	(3.6170***)
Cert.-Dept.ofAgri.	0.5020	0.5532
	(4.0670***)	(3.3552***)
Fair Trade	0.3807	0.3498
	(3.7476***)	(2.6692***)
N	1098	655
LogL	-1040.65	-616.21
Schwarz.B.I.C	1082.66	655.11

Inside Parentheses is t-value. *** 1%, ** 5%, * 10% significance level.

that it is either because people in Naga city said they understood well just because of being "polite" to the interviewers and the respondents in Manila stated more directly, or, because of the differences in interviewers in each city. Either way, since we have obtained significant results for the "understand" subsample, too, we can still state implications based on these estimated results.

The MWTP results are shown in Table 5.7. Since the average regular price in Manila is 24.30 pesos per kilo and the highest price for organic rice we have observed in Manila is

40 peso per kilo, we are able to say that WTPs for Manila fall in the quite realistic range. The result of the whole sample shows that they put highest weights on health risk (13.6 peso at 80% reduced risk), followed by certification and environmental quality. They do not put so much value on improving eating quality which implies that they are satisfied with the current rice quality, but they strongly dislike the degrading of the rice quality they consume. Placing more importance on certification rather than environmental quality contrasts the differences in preferences from the Naga City case. This is possibly because in Manila production site is far from the place the organic rice is consumed so consumers cannot verify or trust if it is really organic or not. Therefore, they need the third body to certify that it is actually grown organically more than the consumers in Naga City who have the production sites very close. On the other hand, they put relatively less value on environmental quality factor. This can be because they are paying less attention to the farm environment since they do not have direct effects from the pollution there. Table 5.7 includes the results with the "understand" subsample and it shows the tendency of the respondents in the "understand" subsample putting more values on all attributes. We can see the significant differences especially in environmental quality and certification attributes from whole sample results. It is also interesting that "understand" subsample strongly dislikes the degradatioin of eating quality. Comparing to the whole sample result, the "understand" subsample values environmental quality relatively higher. We can conclude from these results that those who understand the questionnaire and probably has information related to the situation beforehand understand the importance and meaning of the environment more than others.

We did the estimation for each income group of Manila sample as we did in Naga sample. As you can see in Table 5.8, some of the estimates are significant, but some are not. Signs are consistent with the ones we expected for all parameters. All the estimated parameters of the subsample with both middle plus high income group are significant at least at 10% significance level.

Table 5.7: Marginal Willingness to Pay for Each Attribute (in Peso), Manila .

	(1) ALL		(2) Understand	
Attributes	WTP	95% C.I.	WTP	95% C.I.
Risk	0.17	[0.13 - 0.22]	0.20	[0.14 - 0.29]
Env't Qual.(Fair)	4.54	[1.54 - 7.64]	9.78	[4.62 - 15.60]
Env't Qual.(Good)	5.35	[1.30 - 9.07]	10.98	[3.86 - 18.37]
Env't Qual.(Very Good)	6.47	[3.39 - 9.66]	12.51	[6.67 - 19.24]
Eat.Qual.(Bad)	-15.90	[-20.62 - -11.84]	-20.07	[-30.04 - -12.57]
Eat. Qual.(Fair)	-8.67	[-12.74 - -4.92]	-14.68	[-22.83 - -7.96]
Eat. Qual.(Excellent)	5.93	[2.97 - 9.31]	7.55	[2.17 - 13.17]
Cert.Coop.	3.23	[0.43 - 6.11]	5.73	[0.69 - 11.39]
Cert.NGO	9.97	[6.14 - 14.30]	13.85	[7.04 - 22.97]
Cert.Dept.Agri.	7.36	[4.45 - 10.41]	10.79	[4.98 - 17.83]
Fair Trade	5.48	[3.13 - 7.97]	6.97	[2.29 - 12.12]

MWTP results are shown in Table 5.9. We did not place the results with insignificant estimates in Table 5.8. Although we showed low income group results there, since the price is significant only at 10%, we cannot strongly trust these results as the variance of the WTPs and the actual values of WTPs are very large. Furthermore, risk factor is not expected to be negative. It is obvious that the high income group has larger WTPs in general. The MWTP of the "Middle plus High" income group is lower than that of the whole sample results. This is mainly because the low income group result is not trustable and, as seen in the table, MWTP for the low income group is extremely high. Therefore, when we deduct the low income subsample from the estimation, it is reasonable to get lower MWTP comparing to the result from the whole data. The basic structure of the WTP of the "Middle plus High" income group is the same as the one from the whole sample, i.e. high values on risk and certification and relatively lower values in environmental quality. Eating quality is somewhere in between and the fair trade factor is the least concern for the consumers in Manila. The certification by NGO is the most popular one among three possibilities. The least focus on the cooperative certification is the same as the result in Naga city. The reason for the people's preference of NGO certification to the one of Department of Agriculture is somewhat ambiguous. But one possible reason might be that people in Manila see the NGO being relatively free from

Table 5.8: Estimated parameters of Multinomial Logit Model-Income Group, Manila.

Independent Variables	(3) Low	(4) Middle	(5) High	(6) Mid+High
Price	-0.0294	-0.0991	-0.0748	-0.0828
	(-1.7349*)	(-5.8700***)	(-6.4387***)	(-8.7851***)
Risk	0.0112	0.0114	0.0129	0.0123
	(3.8236***)	(5.4168***)	(7.6365***)	(9.4395***)
Env't(Fair)	0.3926	0.4947	0.2461	0.3373
	(1.3154)	(1.9629**)	(1.2683)	(2.2212**)
Env't(Good)	0.7483	0.5113	0.2045	0.3221
	(1.9187*)	(1.6630*)	(0.8038)	(1.6574*)
Env't(Very Good)	0.8378	0.1321	0.5687	0.3910
	(2.3655**)	(0.5023)	(2.7141***)	(2.4189**)
Eat.Quality(Bad)	-0.7830	-1.1178	-1.2362	-1.1807
	(-2.6751***)	(-4.0295***)	(-5.4693***)	(-6.8217***)
Eat.Quality(Fair)	-0.6314	-0.4757	-0.6488	-0.5710
	(-2.0012**)	(-1.9864**)	(-3.1734***)	(-3.7056***)
Eat.Quality(Excellent)	0.2612	0.3174	0.5863	0.4803
	(1.0287)	(1.4275)	(3.1858***)	(3.4195***)
Cert.-Cooperative	0.1582	0.2912	0.1988	0.2273
	(0.6384)	(1.3581)	(1.1588)	(1.7183*)
Cert.-NGO	0.2368	0.7413	0.8487	0.7971
	(0.6886)	(2.7941***)	(3.6099***)	(4.5969***)
Cert.-Dept.of Agri.	0.3100	0.5195	0.5242	0.5210
	(1.0942)	(2.4046**)	(2.8316***)	(3.7573***)
Fair Trade	0.5195	0.4336	0.3495	0.3671
	(2.1000**)	(2.3710**)	(2.3420**)	(3.2412***)
N	204	360	534	894
LogL	-192.26	-338.92	-492.11	-838.10
Schwarz.B.I.C	224.17	374.24	529.80	878.87

Inside Parentheses is t-value. *** 1%, ** 5%, * 10% significance level.

the influence of certain political powers so that their certification is more reliable than the one by the Department of Agriculture while consumers in Naga city see the Department of Agriculture as more reliable. In either case, we need further investigation to determine the factors affecting people's preferences.

5.3 Social Benefit of Organic Rice Production

We have observed the MWTP for organic rice in each city by using CVM and Conjoint Analysis. MWTP is the value of organic rice consumers evaluate given the contingent situation. Therefore, as a summary of our CVM and Conjoint Analysis in both cities, we calculate the value of organic rice itself depending on different scenarios. We use the MWTP of the whole sample in each city. As for CVM, two versions, 50 and 80 percent reduced risk versions, are involved. As for Conjoint Analysis, we set five scenarios. First two are equivalent to CVM, those are MWTPs for 50 and 80 percent reduced risks given other attributes set to status quo. Scenario III and IV are for valuing the environmental factor of the value of organic rice, and Scenario III is when organic rice production can improve farm environment from "bad" to "good", Scenario IV is when it improves from "bad" to "very good". Scenario V is when production of organic rice enhances fair trade. Based on the MWTP for each scenario, we calculate the annual value of organic rice. We express the value as MWTP per kilo times annual rice consumption per person times population in the city. The values for Naga and Manila are given in the last rows of Tables 5.10 and 5.11, respectively.

Since the reduced health risk feature of organic rice benefits the individual who actually consumes the rice, we cannot call it as social benefit or welfare. But as for the environmental factor, since MWTP for this factor reflects how consumers evaluate the value of farm environment, we can interpret the value as social welfare improved because of organic rice production. Fair trade factor has both individual benefit and social benefit features because it benefits organic farm and it increases farmers' income, and at the

Table 5.9: Marginal WTP of Each Income Group (in Peso), Manila.

	(3) Low		(4) Middle		(5) High		(6) Mid+High	
Attributes	WTP	95% C.I.	WTP	95% C.I.	WTP	95% C.I.	WTP	95% C.I.
Risk	-0.01	[-0.27 - 1.39]	0.12	[0.08 - 0.17]	0.18	[0.13 - 0.24]	0.15	[0.12- 0.19]
Env't(Fair)	-	-	4.85	[0.87 - 8.72]	-	-	4.09	[1.31 - 6.87]
Env't(Good)	22.09	[-4.05 - 96.57]	5.28	[0.10 - 10.19]	-	-	3.85	[-0.14 - 7.69]
Env't(Very Good)	62.05	[0.42 - 92.61]	-	-	7.57	[3.24 - 12.05]	4.65	[1.63 - 7.69]
Eat.(Bad)	-47.87	[-113.54 - -5.95]	-11.62	[-16.99 - -7.07]	-17.01	[-24.82 - -11.08]	-14.33	[-18.78 - -10.41]
Eat.(Fair)	-3.42	[-106.25 - 8.88]	-4.89	[-9.32 - -0.80]	-8.85	[-14.63 - -4.01]	-6.94	[-10.38 - -3.88]
Eat.(Excellent)	-	-	-	-	8.20	[3.82 - 13.21]	5.85	[2.98 - 9.08]
Cert.Coop	-	-	-	-	-	-	2.76	[0.12 - 5.53]
Cert.NGO	-	-	7.93	[3.31 - 13.27]	11.60	[5.82 - 18.10]	9.77	[6.09 - 13.87]
Cert.Dept.Agri.	-	-	5.37	[1.46 - 9.97]	7.10	[2.94 - 11.81]	6.29	[3.46 - 9.30]
Fair Trade	31.96	[-4.09 - 79.36]	4.45	[1.61 - 7.64]	4.83	[1.61 - 8.44]	4.47	[2.30 - 6.86]

Table 5.10: Value of Organic Rice, Naga.

	CVM		Conjoint Analysis				
	50%	80%	Scenario I (50%)	Scenario II (80%)	Scenario III	Scenario IV	Scenario V
MWTP per kilo	14.91	25.33	17.5	28	30.74	33.81	12.21
Annual Rice Consumption per person (kilo)	90.21		90.21				
Population	137,810		137,810				
Value of Organic Rice per year (peso)	185,358,736	314,898,510	217,557,202	348,091,523	382,154,765	420,320,514	151,792,768
Value of Organic Rice per year (US dollar)	3,603,372	6,121,625	4,229,311	6,766,897	7,429,086	8,171,028	2,950,850

Table 5.11: Value of Organic Rice, Manila.

	CVM		Conjoint Analysis				
	50%	80%	Scenario I (50%)	Scenario II (80%)	Scenario III	Scenario IV	Scenario V
MWTP/kilo	10.29	10.65	8.5	13.6	5.35	6.47	5.48
Annual Rice Consumption per person (kilo)	90.21		90.21				
Population	9,454,040		9,454,040				
Value of Organic Rice per year (peso)	8,779,016,629	9,080,060,023	7,249,216,061	11,598,745,698	4,562,741,874	5,517,932,696	4,673,612,237
Value of Organic Rice per year (US dollar)	170,664,025	176,516,307	140,924,712	225,479,539	88,699,672	107,268,575	90,854,991

Scenario I: 50% reduced risk, Scenario II: 80% reduced risk, Scenario III: Environmental Quality Bad to Good, Scenario IV: Environmental Quality Bad to Very Good, Scenario V: Fair Trade

same time, it improves the welfare of the society. Organic rice production contributes to poverty alleviation since small farmers who live below or around poverty line can increase their income. Therefore, the social benefit of organic rice production can be obtained as an addition of values that are attained from a scenario organic rice production actually achieves. Although the government has not had official commitments on organic rice production in the Philippines, these values we have obtained can be possible indicators for the government and other agencies to implement projects related to organic agriculture, farm environment conservation and other related areas.

We can also obtain the social value of the organic certification. This is valued by consumers in the Philippines. Therefore, it does not include the benefit of certification to farmers and to international traders and consumers in countries importing organic rice with certification. Since organic rice will not be consumed by all rice consumers in general, we can obtain the true value by multiplying by the percentage of people who actually consume organic rice. Therefore, the value we obtained in Table 5.12 is actually a maximum value of the organic certification by each certification body. These values can also be indicators for the cost benefit analysis of the certification program.

According to the scenario we actually obtain from producing organic rice, we can compute its social value and values for consumers. For example, if one attains the scenario such as 80 percent risk reduction, good environmental quality, fair eating quality, certification by Department of Agriculture and no fair trade, then marginal willingness to pay becomes $0.17 \times 80 + 5.36 - 8.59 + 7.32 = 17.69$ in Manila. Multiplying it by annual rice consumption and the population in the city, we obtain 15,086,897,897 peso (293,289,195 US dollars) as the social benefit of organic or partially organic rice per year.

We have observed the estimated results of the Conjoint Analysis as well as the values of organic rice and its attributes in this chapter. Given various scenarios, we could calculate the value of the organic rice and its attributes. These calculations can be applied to real scenario actually achieved, such as the true value of the water pollution level improved in

Table 5.12: Value of Organic Certification.

	Naga			Manila		
Certification Body	Cooperative	NGO	Dept. of Agri.	Cooperative	NGO	Dept. of Agri.
MWTP/kilo	16.06	15.62	18.82	3.23	9.97	7.36
Annual Rice Consumption/person(kilo)		90.21			90.21	
Population		137,810			9,454,040	
Value of Certification year(peso)	199,655,352	194,185,342	233,967,231	2,754,702,103	8,502,904,016	6,276,968,260
Value of Certification/year(US dollar)	3,881,299	3,774,962	4,548,321	53,551,391	165,296,398	122,024,221

the organic farm, quality of organic rice, and market share of organic rice, and can give policy makers and projects managers of organic rice related area good indicators in terms of the value of organic rice, its production and consumption. The value of the certification is also calculated. We will develop the certification issue further in the following chapter together with the actual plans of national certification program.

Chapter 6

Organic Certification

In this chapter, we first discuss about the importance of the organic certification to enhance the development of organic farming in the Philippines. We also introduce the organic certification program planed in the Philippines, followed by the analysis of possible organic certification program including a cost structure. Implications for the organic certification program is stated in the last section.

6.1 Current Situation

Certification is one of the critical issues in the marketing of organic products. Since no certification system exists in the Philippines today, the main tool of distinguishing organic from others is placing a label on the organically grown products. As for the case of PDCI, they created a label which contains the product name "Pecuaria's Healthy Rice" together with the words like "chemical and pesticide free", "organic rice", "a healthy habit" as well as the name of the cooperative and its location. In order to sell the organic rice to supermarkets, PDCI made as two-kilo package the unit of sales instead of selling them per cavan which contains 50 kilos. On the back of the they post the following package to enhance consumers' understandings about organic rice:

"Pecuaria's Healthy Rice is totally the Premium Rice you can buy in the market

today. It gives you more than just whole grains, high purity and good eating quality but more importantly, Pecuaria's Healthy Rice provides you with premium rice that is free from any chemical fertilizers and pesticides that harm your health. Unlike other commercial rice products, we give you 100% guaranty that Pecuaria's Healthy Rice was grown using traditional rice varieties and only natural and safe organic materials. This gives you Premium Rice Quality that is not only good to eat but also good to your health and general well being."

"The Pecuaria's Healthy Rice is produced by the Pecuaria Development Cooperative Inc. (PDCI). The Home of Organic Farms in Lanipga, Bula Camarines Sur, PDCI is a major producer of organic farm products in the Bical Region. Within its 817 hectare estate, PDCI together with its 426 members, produce quality farms products, develop appropriate farming technology and engage in various livelihood activities. With the help from NGOs and various government agencies the cooperative was established in 1991 through the government's Agrarian Reform Program. The Philippines Development Assistance Program is among the main support groups of the cooperative."

They repeat and emphasize that their product is a "Premium Rice". This is because the series of marketing projects for organic rice conducted by UNAC (NGO which support organic farming and also does marketing) under the request of PDAP which supports PDCI in 2000 revealed the fact that consumers choose rice according to price and quality (eating quality, high purity) and are not aware of organic factors yet since very limited number of organic rice is available in current market and no significant advertisement activity has been done yet. Therefore, the result of the marketing project recommended to sell the organic rice as a premium rice.

Most of the first reaction of consumers in Naga city to this organic rice with a label was "so, what is the difference between organic rice and regular rice?" or "we have been eating the regular rice for some decades and do not see any bad health effects". Most of them are very suspicious about organic rice in the first place. This is a very natural

reaction one is because it is the first time for them to encounter organic products so they do not have any or only limited background information about differences in production methods, and the other is because it is in fact very difficult to prove that pesticide residues on rice are actually causing allergy, cancer or other adverse effects on human's body. There is no study on rice at least in Japan and in the Philippines about how exactly pesticide residues are affecting human health although studies on vegetables and fruits prove hazardous effects on human health caused by certain kinds of pesticides.[32] In addition to the reasons listed above, who is claiming the product is organic is also a critical issue here. As for the PDCI's case, they are the ones who are producing the organic rice and also "certifying" that it is organically grown and "healthier" than regular rice. Our conjoint analysis result also suggests that consumers in Naga city prefer the certification body to be the government instead of cooperatives or NGOs. Therefore, it shows the importance of the certification that ensures the "differences" between organic products and non-organic products being based on a scientific point of view and an officially accepted way.

Besides the points above, there is one more important role of organic certification in the Philippines. That is to ensure the profit of organic producers and help them benefit from producing organic rice. Since the Department of Agriculture or the Philippines government is not really aware of organic movement officially, there is no category in the rice market for organic rice. The only categories that exist today are the ones depending on quality of rice (purity, whiteness of the grain, smell, shape etc.) and certain kinds of rice. Therefore, when producers need to sell their organic rice though normal marketing channels, traders categorize according to the existing quality criteria. Thus, even though farmers are producing organic rice, the rice is treated as regular rice and they cannot usually attain the premium price for organic rice. Given such background system, it is possible that certification by officially admitted agencies change such a scheme and incorporate organic category into the current marketing system. In other words, the absence of the Philippine certification becomes a big obstacle for the development of the

national organic market.

On the other hand, there is a discussion whether organic certification is really necessary for local consumers if the certification causes an increase in the rice price. Our conjoint analysis result suggests that consumers in Naga place less weight to organic certification compared to the ones in Manila. If we assume that Naga is a typical case for rural cities, one should be careful about adopting a single certification system since people in rural cities may want "cheaper" or no certification. We discuss further about kinds of certification later in this chapter. The organic certification in the Philippines has several different issues from the certification in developed countries and we should analyze the effects of the organic certification on various groups such as producers and consumers.

6.2 Philippines Organic Certification Program

Center for International Trade Expositions and Missions (CITEM), one of the branches of the Department of Agriculture, has been working on the establishment of the organic certification with a core group of farmers group (MASIPAG), organic traders and producers (OPTA), the academia (Dr. Lina Briones from UPLB), several other NGOs like PDAP, PHIL-NET, SIBAT, representatives from organic farmers groups, and other government institutions such as the Philippines Coconut Authority and the Department of Agriculture.[9] In their proposal in 2000, their objectives are stated as follows:

"The short-term objective of the project is to set up a national certification system appropriate for the Philippine domestic market. The national certification program is expected to: a) standardize and continuously improve organic production methods in the country; b) unify organic produces and enhance synergy among them (producers and processors, crops and animal producers, etc.); c) strengthen marketing mechanisms and develop consumer confidence, eventually enabling the organic industry to gain

recognition both at the national and international market; d)facilitate certification of production systems of local organic producers and processors that are ready for export through collaboration with the internationally recognized certification body bio.inspecta from Switzerland; e) catalyze cooperation projects between government agencies and the organic movement for research, development and extension work in order to make organic producers more competent and competitive locally and internationally. The long-term objective of the project is to gradually raise the standard and the quality of the national certification system, in order to meet, after four years, the requirements for IFOAM accreditation. The achievement of both the short and long term objective is supported through a consultancy arrangement with the Research Instituted of Organic Agriculture (FiBL) and the certification body, Bio.inspecta, both from Switzerland. IFOAM accreditation is aimed on as it seems appropriate for the possible export markets (Japan, China, etc.) and as no national accreditation bodies exist so far."

IFOAM stands for International Federation of Organic Agriculture Movements. Their head office is locateed in Germany and their mission is to coordinate the network of the organic movement in the world, and to represent worldwide movement of organic agriculture and to provide a platform for global exchange and cooperation. They are a democratic federation and a grass-root oriented. Bio.inspecta is a certification and inspection body. In Switzerland, they certifies all Swiss organic farms and inspect 5,000 organic farms and 800 processing companies and traders. FiBL (Forschungsinstitut fr biologischen Landbau or Research Institute of Organic Agriculture) works as a consulting agency. The overview of the plan of activities and the expected results and indicators are shown in Table 6.1 6.2.

Obviously this program targets both domestic and international markets. The proposal states that the lack of a Philippine certification system weakens the organic production of the country and hampers the development of the national organic market and lists the specific reasons as -the absence of guaranty systems for organic consumers,-the

impossibility for farmers to segregate their organic production. Indeed, lack of certification system forces them to sell their production on the agricultural market without any recognition of the quality and specificity of the products, -the absence of common standards defining what is organic provokes the confusion among producers and consumers.[9] As for the international market, they mention that current exporters of organic products have to depend on foreign certification bodies and it has been making small and medium organic producers difficult or impossible to certify their products in the international market. It turns out that only large and commercial farms can capture the benefit of organic product exports since they can afford obtaining the certification through private certification agencies. However, this situation is against most NGOs' policies, and the Philippine certification program places the main priority on small and medium size farmers and private entrepreneurs although large-scale organic producers can also obtain their service. It can be said that this policy stems from the characteristics of the core members of the certification set up, which is a mixture of different agencies including NGOs. Targeting small and medium producers is a major difference from the certification systems in developed countries. The fact that the need of certification mainly coming from the producer side is also different from the case of developed countries where the motivation originates from consumers' protection relatively more than from producers' side.

6.3 Structure of the Organic Certification System

The Philippine Certification Program is mainly targeting small and medium producers, but at the same time allowing large farms to obtain the service. We could not obtain a detailed statement about the cost structure of the certification program. If large farms can enjoy the service at the same cost as small and medium producers, then large producers may be able to capture the extra benefits from the national certification program since they do not have to pay to foreign private certification agencies. Therefore, how the government funds the certification program affects the welfare of producers of various

Table 6.1: Overview Plan and Activities.

2001	2002	2003	2004
-December 2000/ January 2001: initial training and selection of partners in the Philippines -January to February: review and approval of standards, deciding about project implementation plan, consolidating financial plan -January to April: development of the first version of program structure, manuals and forms -June to August: start small scale operation of the certification program, registration and promotion -August: training of inspectors and certification staff, first inspections by bio.inspecta, on-the-job training of inspectors and certifiers -September and onwards: review of manuals and forms	-Reviewing procedures and documentation with regard to compliance with IFOAM Accreditation Criteria -Inspection for the domestic market implemented by the certification program, certification with supervision by bio.inspecta -Inspections and certifications for the export market commonly by bio.inspecta and local inspectors, second on-the-job training	-Applying for IFOAM Accreditation -Inspections and certifications for the domestic markets fully implemented by the Philippine certification program -Inspections for the export market by local inspectors, certifications under collaboration with bio.inspecta -Improving manuals and documentation	-Process of IFOAM Accreditation -Inspections and certifications for both domestic and export market by the Philippine certification program -Certification for the international market under review of bio.inspecta until international recognition is gained -Aiming on mutual recognition by other Asian certification bodies

Source: CITEM, "Philippine Organic Certification Program Proposal".

Table 6.2: Expected Results and Indicators.

Items	2001	2002	2003	2004
Standards	Initial standards reviewed: consistent and appropriate for inspection	Gradually improved until adapted to local conditions Gradually raised to meet IFOAM basic standards in all aspects		Standards fully appropriate to the different stakeholders of the Philippines organic movement: processing, animal husbandry, etc. Philippine Basic Standards conformed to IFOAM Basic Standards
Structure & Operating System: -Inspection manual and forms -Certification manual -Structure	First edition of the manuals formulated Simple structure is defined	Manuals and structure gradually refined and developed		Manuals and structure are in compliance with IFOAM accreditation criteria; IFOAM accreditation is applied for
Human Resources Development: -Inspection -Certification - Administration -Management	Inspection done by local staff for domestic market and under supervision of bio.inspecta for intl market Certification done by local staff under supervision of bio.inspecta for domestic market and by bio.inspecta for intl market	Improvement of effectiveness in inspection and certification capability both for national and international markets	Improvement of efficiency in inspection and certification capability both for national and international markets, with a minimum supervision	Capable of their own both for domestic and international markets

Source: CITEM, "Philippine Organic Certification Program Proposal".

sizes differently. In the following discussion, we examine several cost structures and reveal possible problems upon different assumptions.

Let us think about possible costs for the certification and inspection of organic rice. The first stage of costs comes from the cost of applying for organic certification which is mainly the administrative and start-up costs. This includes possible fees paid to bio.inspecta and FiBL certification/inspection staff training costs, government's monitoring and enforcement costs, periodical investigation costs, and various other costs including travel costs of the staff. The second stage of costs are operational costs including inspection and certification for each producer and processor, monitoring costs occurring in each production site, registration fees, costs for purchasing new/separate equipment for rice processing if the certification requires, monitoring costs for cooperatives and travel costs for training, costs for record keeping etc. Those are costs for the examination of the production process. Caswell [5] suggests that "labeling of process attributes may impose significant costs on an industry's supply chain related to segregating products and verification." Furthermore, if the certification involves investigations of the products themselves, then, costs for lab analysis will also occur. Whether the certification is voluntary or mandatory, and also whether the same certification and inspection criteria would be adopted for both international and domestic markets makes the cost structure and the welfare in various sectors different.

The proposal by CITEM implies that they use different criteria of certification for domestic and international markets since inspection and certification are done by local staff for the domestic market and are supervised by bio.inspecta for the international market in the plan of 2001. However, whether costs differ between two kinds of certification and if it does, how the costs and the way of financing of the program vary has not been reported clearly yet.

Several ways of financing the certification program are adopted in different countries. According to Crespi and Marette [6], possible ways of financing are fixed user fees, per-

unit fees, no-fee with inspection costs and borne indirectly by the public through taxes, and combination of user fees and public support. EU imposes user fees, Japan and Mexico use per-unit user fees together with public financing, Australia applies fixed registration fees, and US uses combination of different kinds of user fees such as hourly fees, fixed application fees, annual fees etc. It is apparent that if one uses per-unit fees such as fees according to the volume of rice inspected and certified, the problem of benefitting large farms more than small and medium producers can be possibly avoided.

Together with the certification mechanism, trading and marketing structure should also be adjusted to some extent to accept the organic rice and other products as a new category. According to a report by the MASIPAG foundation[12], even after farmers' adopting organic farming, some of them have to take the conventional route in marketing rice. In that case, traders still have strong power in purchasing rice from farmers, so farmers cannot break the vicious cycle which makes farmers rely heavily on traders. As a result, farmers and cooperatives should look for other alternative marketing channels such as niche marketing or direct marketing to consumer groups. But this process obviously generates further costs to cooperatives and farmers. This report suggests that "marketing after all is the next logical step to a donor-assisted program aimed to establish a new production system such as MASIPAG." [12] But if the market could adjust to the new structure involving organic products and the certification works as a clear signal to consumers, then organic market would be established and ideally farmers can conduct marketing without or with very limited amount of grants from donors in the long run.

The Certification structure is summarized in Figure 6.1. From the top, certification can be conducted either publicly or privately. In the case of public, some public enforcement systems are required to ensure the overall integrity of the labeling program.[5] Even for the case of private certification, governmental regulation may be enforced to some extent to avoid consumers' confusion. In the case of the Philippines, their program is public. Current situation of exporting organic products is relying on the private certifi-

cation system due to the lack of public mechanism. Certification system and criteria can vary according to the target markets. They can use the same criteria for both international and domestic markets while they can segment into two different markets depending on the market needs and costs. The certification procedures and costs may differ for each segmented market. The program also determines the cost funding measures. As we mentioned earlier, it can be fixed fees, per-unit fees, subsidies or public financing program borne by tax payers, and combination of those options. Fixed fees expected to be collected from producers benefit large producers more due to economies of scale. Per-unit fees can vanish the problem. Since organic products more likely consumed by middle to high income groups if the prices of the organic products are higher than those of ordinary products, as is the case of the most organic commodities, subsidy indirectly borne by taxpayers will work regressively. This is against many NGOs' policies. Donations and grants from foreign or domestic foundations can also be one source of the funding. Although this kind of funds can be utilized as administrative costs or initial setting-up costs, in the long run, program can be ideally financed by own funds.

From production side, their decision making process is shown in the bottom part of Figure 6.1. They first decide which farming method they would choose according to their net income differences and their own beliefs. Their cost-benefit analysis depends on several different scenarios. The first one is whether they would target the domestic market, international market or both markets. The second is the regulations by the government and costs for certification. If the certification is mandatory, or even though it is voluntary but the farms not allowed to place any label claiming the product is organically grown by themselves to differentiate their organic product from conventional ones, and farmers have to pay certification costs entirely or partially, then farms who cannot afford the cost have to withdraw from organic production. Although organic farming improves farmers' income in general as we shown before, a large variance exists from farm to farm, and it is necessary to have a careful investigation before setting the rate of fee which would be paid by farmers. Furthermore, in the case of segmenting

certifications between domestic and international markets, if the cost of international certification is higher than domestic one and only large farms can afford it, then the opportunity of benefiting from exporting organic products is mainly captured by large farms but not by small or medium farms without certain remedies. Therefore, overall increase or decrease in number of organic producers and the amount of organic products produced after introducing the certification program depend on the cost structure of the certification mechanism.

6.4 Implications to the Certification Program

There are several studies examining the impacts of stricter food safety requirements in developing countries. These cases are not for organic products, but for more general produces requiring a certain level of food quality and safety mostly by developed countries though a hazard analysis and critical control point (HACCP) program. These studies can be seen as an analog of organic certification and their implications are still valid for the case of organic foods to some extent. One case is reported by Henson, Brouder and Mitullah examine the impact of food safety regulations on developing country exports of agricultural and food products through a case study of fish exports from Kenya to the European Union (EU).[16] EU requires for imports of fish to follow the principle of HACCP. In order for Kenyan fish exporters to meet EU's hygiene requirements, they had to change or modify fishing boats, landing facilities and processing plants in their production and processing. As the result, the only firms who could afford these transformations could survive in this industry and traders started playing a fundamental role as a medium between fisherfolk and industrial processors. Traditional supply channels has been mostly dismissed, processing depended on modernized infrastructure and facilities, and women who had jobs related to by-products of fish lost their job. After all those transitions, normal price of whole fish became beyond the reach of most people in the fishing communities and surplus fish were transported to urban markets where middle-income

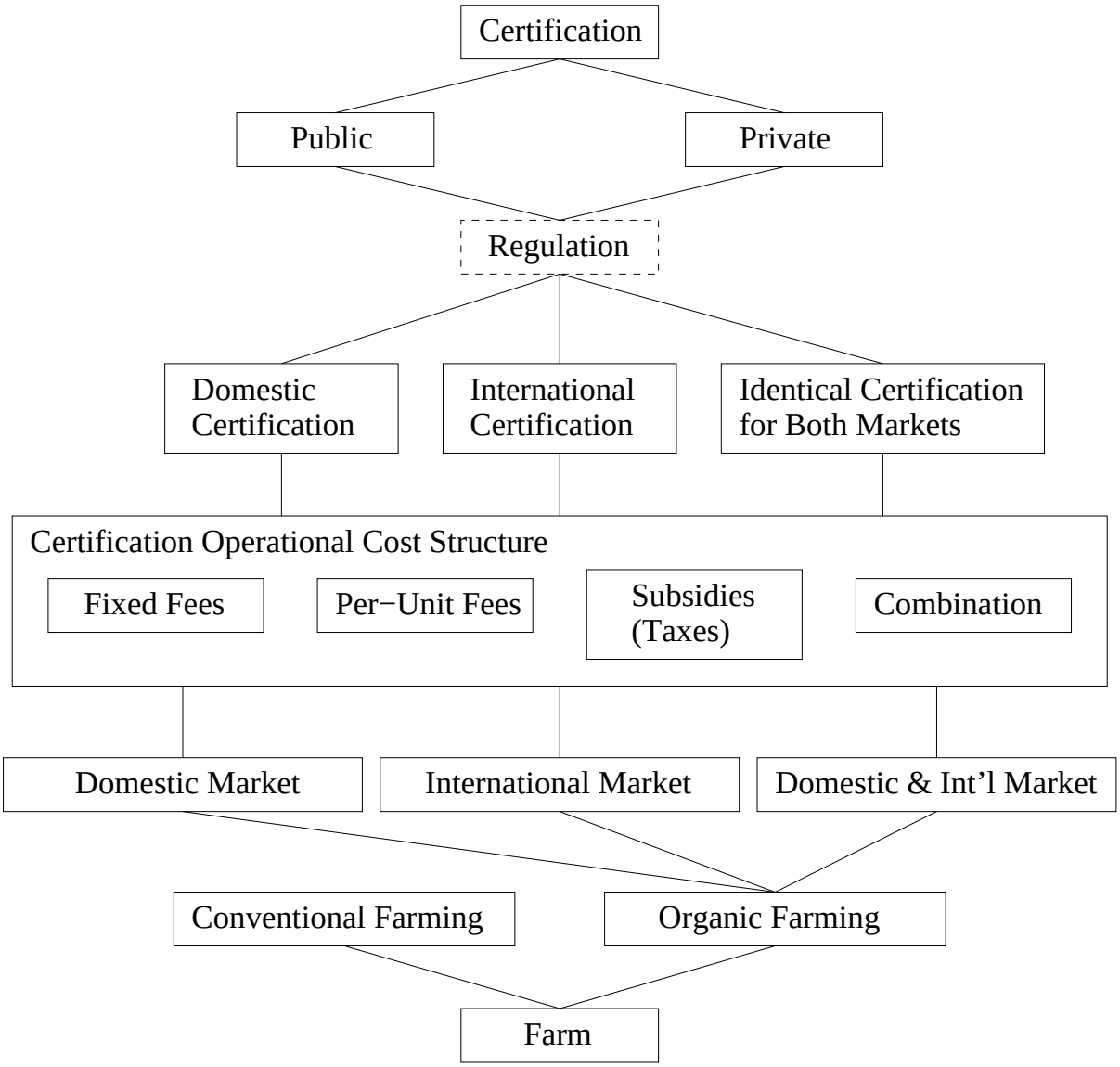

Figure 6.1: Certification and Cost of Certification/Inspection Structure

consumers increased their consumption of fish.

This example is an analog to the organic certification in the following context. If the certification become mandatory requiring certain facilities to make transformations in production sites, small farmers who cannot afford such change will be dismissed from the organic farming. Even though MASIPAG's policy insists that selling of MASIPAG outside the locality should be pursued only if there is surplus production in a locality in order to be consistent with concerns of food self-sufficiency and food security in the farm [12], if there is a more profitable market in urban cities, it might be difficult to prevent organic rice grown in the rural area from being transported to the urban area. Furthermore, once organic certification program is implemented, farmers outside MASIPAG members will also enter this market once they see it is profitable, then the food sufficiency issue occurs. In fact, there are many NGOs supporting selling organic products in urban markets today. If organic farming prevails quite a few areas and those products are transported to urban markets, it is possible for the price in the local market to raise due to the decrease in supply. This change will not occur in a short run, but is quite possible in the long run.

Donovan, Caswell and Salay [7] report a case of food safety regulations in Brazil. The purpose of the study is to address whether stricter product safety standards in importing countries affect safety levels for the same products in the domestic market of the countries that export to them. They also analyze the case of fish industry. The Brazilian government passed a laws in 1993 requiring processors to gradually adopt HACCP. In the study, they found that plants that were not exporting their products had much lower rate of HACCP adoption. While 38.6% of the plants that were on Brazil's export roll had implemented a HACCP plan, only 9.3% of the non-exporting plants had been approved for a HACCP plan. Adopting of HACCP improved or maintained the export market successfully, but has had much less impacts for domestically sold products. Therefore, the government's program benefited plants in export markets, but not in the domestic market, at least so far. The study also revealed the fact that for the domestic market the

private costs of HACCP adoption are perceived to outweigh the private benefits while those who adopted HACCP are selling in both the export and domestic markets. These facts imply that farmers who can afford the certification for the international market can sell their products both in domestic and international markets while the number of farmers who cannot afford international certification but can afford domestic certification might not increase at least for some years. Furthermore, given the assumption that the farms who can pay for international certification is more likely to be large farms while the farms cannot afford it tend to be small farms, if both internationally and domestically certified products exist in the domestic market at the same time, the market share for the small organic farms will be shrunken if high income group prefer highly certified products more. As is the case in Brazil, even though the Philippines government starts a certification program, the number of farmers transforming from conventional to organic farming may not increase if the cost is high and benefit is not clear.

Marketing studies for foreign organic markets are of course necessary, too. A mission with some NGOs' representatives and government officers from the Philippines was sent to Japan to attend an organic food fair in March, 2001, and participants realized that it was very difficult or even impossible to enter the organic rice market in Japan. How sensitive the issue of the rice imports to Japan is a well-known factor. Besides the traditional fact, since the Japanese government passed laws and mandates about the national certification program, domestic organic market has been getting very competitive in the last couple of years. Therefore, although organic rice is the most grown organic sector in the Philippines and the certification program lists Japan as one of the main targeting export countries, organic rice cannot be easily accepted in the Japanese market. On the other hand, banana and several other fruits are mainly imported to Japan from the Philippines. Although banana is one of the cheapest fruits sold in Japan, the price of the organic banana is very high comparing to the ordinary banana. Therefore, there may be more opportunities to make profits in those markets.

We analyzed possible certification program scenarios and implications obtained from other studies in developing countries. The most important factor in this Philippine Certification Program is how they arrange the cost structure of the certification and inspection, and how they segment the certification mechanism according to the markets. Since they explicitly express their primary target as small and medium size farms, it is necessary to implement very careful studies to analyze the impacts and welfare effects of their certification system.

Chapter 7

Conclusions

In this thesis, we discussed the organic rice production and consumption situation in the Philippines. Even though there is currently no official commitment of the government toward organic agriculture, number of organic farmers and areas of organic farms have been increasing over time with support from NGOs especially in the last couple of years. We confirmed that organic farming actually improves farmers' income situation mainly due to significantly reduced production cost. Some farmers like members of PDCI enjoy the benefit from increased price of their organic production. However, there were two problems observed in PDCI. One is a cooperative level's management of organic farming. This is mainly an issue of proper organic rice pricing of both buying and selling prices and marketing. The other is a technical support issue. If organic farmers cannot obtain enough technical support when they need, there is a possibility that organic farmers slide back to partial organic farming or even to conventional farming. Product stabilization with enough technical support and farmers' education and appropriate marketing system for organic rice are necessary for development of organic farming in the Philippines.

In order to determine the value and the consumers' willingness to pay for organic rice, we have conducted CVM and Conjoint Analysis in two cities, Manila and Naga City. Followed by the pre-test in March 2001, 200 and 348 questionnaires were collected in Manila and Naga City respectively, by well-trained interviewers in July 2001. We have analyzed

the collected data by using CVM and Conjoint Analysis by using total and subsamples segmented according to respondents' income levels. We calculated marginal willingness to pay and willingness to pay for organic rice given the price of rice respondents' usually purchase. We also arranged our questionnaires to make it possible to conduct the external scope test to determine if consumers' WTP increase proportionally to the level of the reduction in health risks. Given city population and annual personal rice consumption data, we also calculated the value of organic rice in different aspects to show the indicators to policy makers.

MWTP obtained with CVM in Naga was 20.57 peso for the whole sample and 16.15 peso for middle+high income sample. Low income group in both cities overreacted to the health risk information and marked highest MWTP compared to other income groups. Since the regular rice the middle+high income sample usually purchases was 18.67 peso, WTP for organic rice was 34.82 peso for this income group. According to the scope test for Naga sample, MWTP of mid+high income sample responded to the magnitude of risk reduction almost proportionally. This implies that mid+high income group understood the magnitude of risk well. Even though the MWTP may seem to be quite high, the observed WTP for organic rice can be considered as a realistic number. Since half of Naga respondents never heard about organic rice before, there is significant room for consumers' education to make organic rice marketing more successful. Higher WTP in Naga sample was also consistent with the result of the question asking about personal perspective about risk from pesticide residues. Larger portion of people thought the risk as either serious or very serious compared to Manila case where MWTP was lower than the one in Naga. Since personal risk perception had significant impacts on purchasing decision of organic rice in Manila case and the respondents took the risk as "acceptable", the MWTP for Manila sample was lower than the one in Naga city. The MWTP for the whole sample in Manila was 6 to 6.5 peso per kilo while it was 17.28 for the high income group. Given the original price, those MWTPs made organic rice prices 30.53 peso and 42.20 peso for the whole sample and the high income group sample, respectively. This

indicates that the organic rice currently sold in Manila at 40 peso per kilo is reflecting the WTP for the high income group well.

Conjoint analysis results show more detailed information about what attributes consumers actually care about. The attributes used were price, health risk, environmental quality, eating quality, certification and fair trade. In both cities, the health risk factor was the first concern. In Naga city, environmental pollution attribute came the second since they are closer to production sites and possibly many of their family members or relatives are engaged in agriculture. Certification factor came the second last. In Manila case, the second concerned factor was certification. This is possibly because they are far from the production site and they need a third party to prove it is actually organic or not. Environmental factor came after the certification factor. They were concerned about the degrading of eating quality quite a lot, too. WTP calculated at 50 percent and 80 percent reduced risk settings were 16.5 peso and 26.4 peso, respectively, for conjoint analysis in Naga city case.

We have also discussed that there are many possible mechanisms of certification systems. The most important issue of organic certification in a developing country is the cost structure of the system. How the certification program affects small farmers should be carefully studied since it is possible that the system only benefits large farms.

Organic farming in the Philippines has been expanding and is accounting almost one percent of production from irrigated rice fields today. Organic farms are enjoying several benefits such as improvement in the farm environment, in the farmers' own health, reduced production cost and increased price. Especially after the implementation of the Philippines Organic Certification Program, which is explicitly targeting small and medium farms, further investigation can be made about who is benefitting from organic farming.

As future's works, we would like to implement Cluster Analysis by using the date from Conjoint Analysis to analyze consumers' segments with various characteristics and

to obtain deeper insights of potential organic consumers. There will be large amount of studies to be conducted regarding to the Philippines Organic Certification Program especially after getting more information and cost structure and inspection/certification procedures. We can also analyze the issues in organic certification with game theoretic approach. Obviously, impact studies after the implementation of the certification will be very important.

We have observed the situation of organic rice production especially in PDCI since 1997. We are glad to be able to complete our research as one of the first studies on evaluating the value of organic rice production and consumption from several different aspects in the Philippines, one of a developing country. Hopefully, the results and indicators we have obtained and discussions and implications being came up will contribute to the development of organic agriculture and poverty alleviation in the Philippines.

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Appendix A

Questionnaire