

Chapter 3

Research Design and Methods

3.1 Internal logic of the research design

In Myanmar communities, there are ethical and social customs that derive directly from Buddhism. Are people aware of the moral nature of conservation? Do people adopt these traditional norms and customs in real life? How strongly do they believe in environment and traditional customs apart from the pressure of survival? These questions were included in constructing in the attitude variables towards ecotourism and reforestation.

The economic situation and welfare of society lie at the core of social construction, conservation and human resources. Thus, the role of economic variables in the system of social, environmental and physical welfare will be important to study in order to formulate better policy. The variables used in the nine hypotheses are collected into twelve groups for the convenience of seeing the root factor (and hence policy category) that predominates in each situation. That helps us to see the target policy we have to look for after each hypothesis testing.

- (1) Environmental Awareness
- (2) Environmental Knowledge
- (3) Environmental Attitudes
- (4) Environmental Behavior
- (5) Environmental

- (6) Well-being
- (7) Physical Well-being
- (8) Economic Well-being
- (9) Technical Efficiency in Economic Activity
- (10) Social Well-being
- (11) Access to Natural Resources
- (12) Employment and
- (12) Communication variables such as phone calls, phone bills and use of transportation, etc.

3.2 Logical Framework of the hypothesis testing and statistical tests

Based on the above logic and the theoretical literature of the previous chapter, we now present the logical framework for testing the nine hypotheses laid out in Chapter 1 (Figure 3.1). We are also in a position, based on the methodological review of the literature in chapter 2, to lay out the choice of the most appropriate means for analysing well-being and testing the policy-oriented hypotheses that seek to explain it (Figure 3.2).

Logical Framework of the hypothesis Testing and Statistical Tests

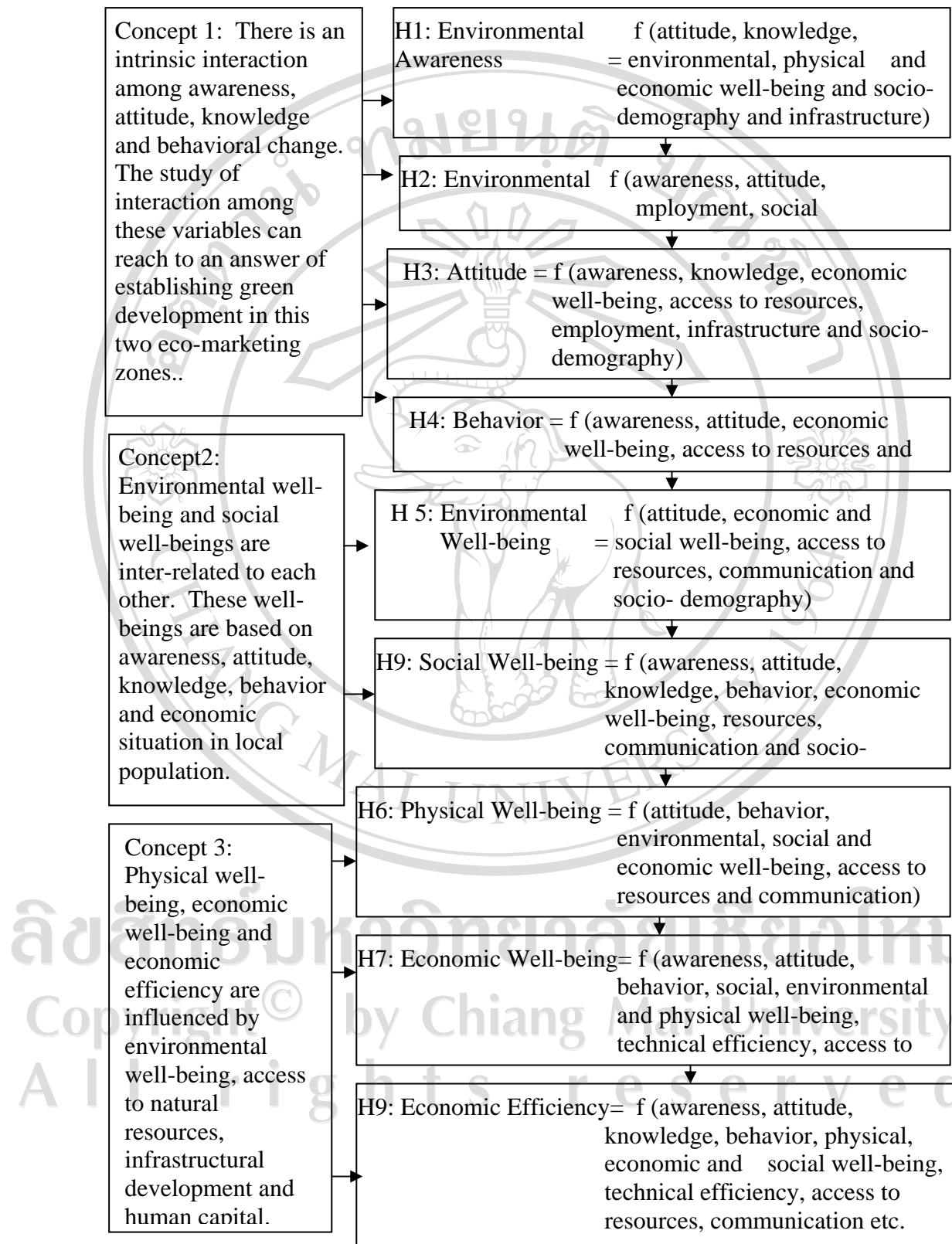


Figure 3.1 Logical Frame-work of the hypothesis

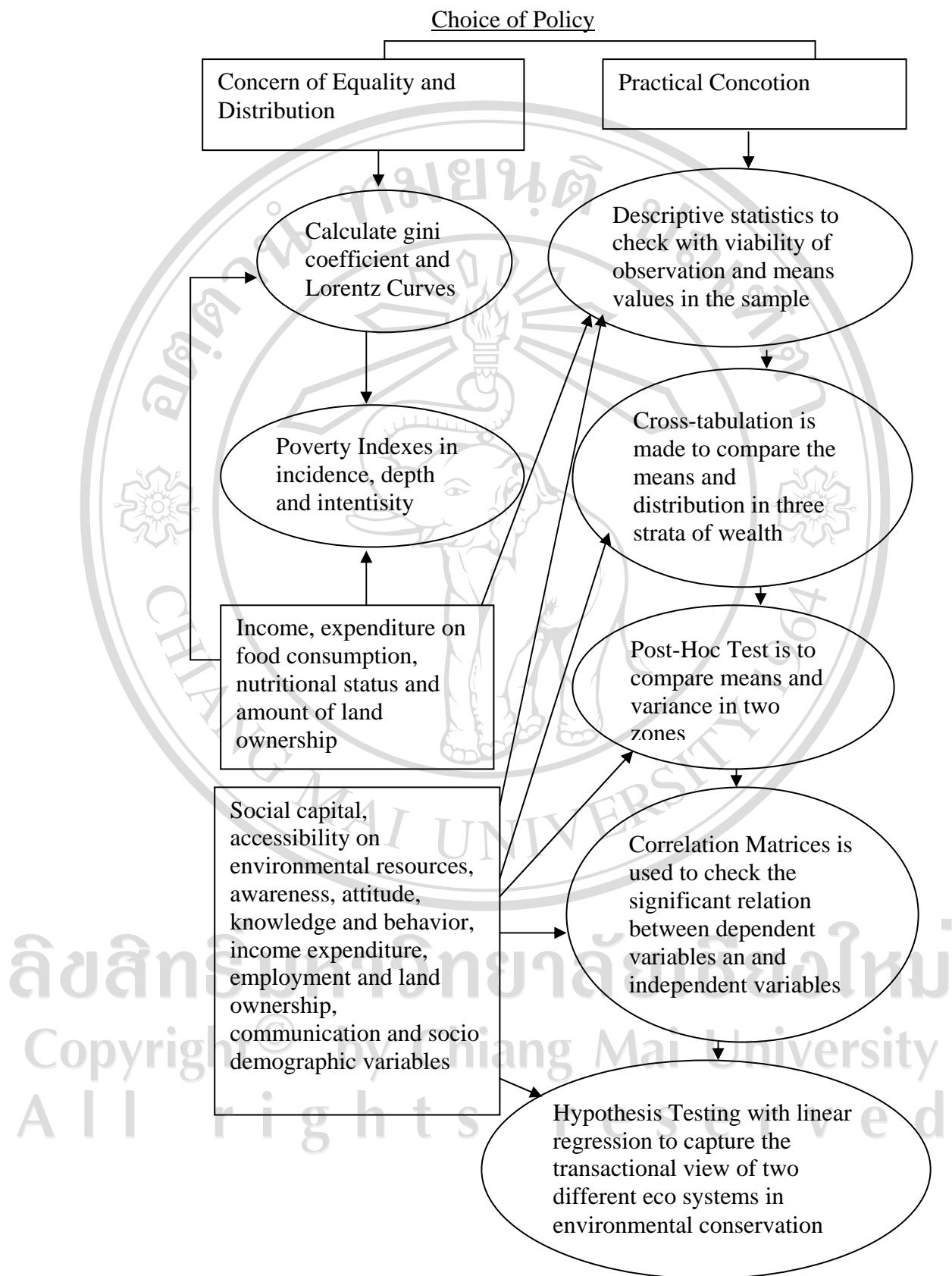


Figure 3.2 Analytical Framework and components of statistical tests

3.3 Variable definition and creation

The variables listed in Figure 3.1 were further refined as a series of indicators of each concept (Table 3.1). Some of those indicators, like income or food expenditure, are standard, simple and straightforward. However, there are other technical indicators such as environmental degradation and social welfare that cannot be measured with a simple scale since they are more abstract. The problem is solved by dictating the different facets of the single problem and then combining all to make a composite score. To add up all the information, the scale has to be a whole number that the observations will not be blended.

Awareness of the environment is divided into two groups, awareness of the degradation and awareness of benefit of conservation. Which society is stronger in awareness is compared in the test of means plots in appendix. The faces of degradation that the community is exposing are combined to build up as an indicator and how much level of intensity people are getting aware is scored.

Attitude towards conservation and tourism is inquired through the questions that asked the understanding of people in these projects and their willingness to welcome them. The issues of whether they want to participate in ecotourism and environmental conservation is denoted as attitude. The attitude in doing livelihood activities for survival is also included in attitude. Is there any frontier for restraining the behavior that degrade the environment is the question that asked in the environmental attitude. Do they know what does it means by conservation project and ecotourism are in the formation of environmental knowledge? Environmental behavior means a collection of good behaviors such as participating in the

environmental conservation and doing agro-forestry, which replenished the forest area in the region.

Environmental well being is measured as the negative of environmental foot-print. It is assigned to be the less environmental foot-print, the better the well-being of the environment. Environmental foot-print is derived from the various variables that consist of size, species and number of the tree people cut for firewood and time taken which represent how far they go into the forest to get the firewood.

Physical well-being is defined as the physical consumptions of people for food. As a hypothesis variable, we chose nutritional status since it is a weighted variable and unbiased of the regional advantage. Because of the different climatic and policy situation, it has to take a great caution to compare the physical support of food for local communities.

Economic well-being is concerned as income sources, nominal income (or) raw income, and average financial viability. Average financial viability is an ordinal scale with dummy variables derived from the financial security of each household.

Economic efficiency is measured with different variables that is concern to technical inputs, benefit cost ratio of investment in the farms and percent specialization. The group of variables that is responsible for hypothesis (8), economic efficiency is “Technical Efficiency in Economic Activity”. Percent specialization is calculated as the number of crop diversity cultivated last year over the future variety that farmers want to grow for the next year multiplied by the number of acres they grow. Economic efficiency is expected to influence in the system because if there is more efficient technology to apply for the livelihood of people, the environmental degradation is expected to fall down since living status of people is raised.

Social well-being is defined as the attitude toward environmental conservation which needed social participation and spirit in community movement. Average community management is used in the hypothesis testing because attitude toward community management seems to be more abstract and the former have more impact.

Table 3.1 Definitions and calculation formulae of the composite variables

Variable Name	Formula
Access_to_inputs_score	-would_like_to_add_chemical_fertilizer_but_get_it +adequate_access_to_markets_to_buy_modern_inputs
Attachment_to_land	Self_cleared_land + 2*Rent_land + 3*Buy_land + 4*Inherit_land + Enough_land - 4*Field_on_the_far_mountain - 3*Field_in_other_village - 2*Field_far_from_this_village + Field_just_outside_village + farming_in_the_valley
Attitude_community_management	community_forestry_can_protect + community_can_plan_no_conflict + community_can_manage_alone + Community_plan_forest_access_and_use_without_internal_conflict + community_manage_alone + rules_easy + everyone_will_obey + already_rules + wish_participate_protect_env + willing_to_participate_in_reforestation_projects_in_the_future - privte_more_efficient

Table 3.1 (Continued)

Attitude_conservation	worried_about_deforestation + feel_bad_when_have_to_cut_down_ayoung_tree + feel_bad_when_have_to_cut_down_an_old_tree + willing_to_reduce_my_use_of_wood_to_protect_the_forest + must_protect_endang_species
Attitude_ecotourist	Ecotourism_is_a_very_effective_way_to_protect_the_environment + would_like_to_set_and_manage_an_ecotourism_firm + benefits_of_ecotourism_higher_than_the_costs + ecotourism_firms_want_to_protect + ecotourism_firms_do_protect + earn_ecotour
Awareness_sustainability	-Not_alternative_energy -Soil_fertility_has_improved_during_the_last_five_years - There_is_no_problem_with_soil_erosion
Awareness_forestry	Reforestation assures_sustainability_of_the_environment + Reforestation_provides_greater_benefits_to_the_poor
Behaviour_environ	do_agroforestry+ participated_in_reforestation_projects
Behaviour_footprint	- Dilocarp - Kanyin - Hardwood - Bufferzone + Villagewood - Time_fires - Small_trees - Large_trees + Medium_trees + 2*Branches - Vegetables_taken_from_forest
Index_financial_viability	income_has_improved_over_the_past_5_years - expenditures_increased_over_the_past_5_years + profits_increased_over_the_last_5_years + not_in_debt + able_to_pay_off_my_debts_on_time - income_unstable_from_one_year_to_the_next - enough_money_to_send_sons_only_to_school + enough_money_to_send_all_children_to_school + return_on_investment_is Quite_high

Access to resources is also an important variable in the hypotheses testing since it is the link between environmental services and economic activities for the livelihood of local communities. Land quality is an ordinal numbers ranked by the villagers. Type of land reflects the degree of property and user right to access the land. The attachment to land is calculated through the fertility, distance, amount and type of land ownership.

Employment is an indicator whether the local people have access to compete in the market or the participation in the economy. It is an indicator of how much the local are empowered. Knowing how much employment opportunities for the local people by studying off farm employment opportunities that exists in the community, the answer is that off-farm employment creation in the rural area is one of the method of sustainable development in Lewis Model of Rural Development.

Communication is also one of the main indicators that is included in checking all the hypotheses. The transportation and communication is assumed as the assets to improve the economic situation of marginalized people. It is also a concern to decide the economic fundamental of a region. In the pilot survey in 2007 in Kyaintali, the transportation is one of the main things debating among the community leaders. Some said that transportation is a threat to environmental conservation while others said that transportation is an asset for development. In the project report of DZGD in central dry zone, it is mentioned that improving the status of transportation for the villagers is to facilitate the sustainable development promoting the economic status of local community. The conflict of using a road is then came into the study to analyze how the people in two different community are using the road, accessibility and importance of transportation and communication in their economic activities.

The socio-demographic variables are also put into the hypotheses testing but the most significance variables in the test are education, gender and age of household head, and location.

The list of composite variables (Table 3.1) mentioned how the composite scores are derived. The qualitative indices are taken as ordinal scores from 1 to 5 not to be nullified each other in the formation of new variables. The ordinal score is used in asking dummy variables and these dummy variables are reconstructed to get the continuous numbers to go under the linear regression analysis.

3.4 Methods of data analysis

Both descriptive and inferential statistical methods are used in data analysis. Lorenz curves are used to explain the pattern of distribution in these study areas. Analytical tools are extended in the calculation of Gini coefficients; and because of some conceptual problems with negative net incomes, to the poverty head count index, the poverty gap, and the intensity of poverty for each eco-marketing zone.

3.4.1 Descriptive statistics

Descriptive table were plotted in SPSS 13 to check the data. The total observations, means, standard deviation are included in this table. This gives us a chance to know whether the variable is significant or not by knowing number of observations. Maximum value and minimum values in the table gives us a way to conclude whether this is feasible or not and re-check the data entry. The variance and mean values are shown to improve the formulation of hypotheses equations.

Correlation matrices are also used to show the dependency of variables and the directions of variables among each other.

3.4.2 The Lorenz curve and Gini coefficient

When economists measure income distribution or inequality in society, they typically measure it with respect to income or expenditure. This opens the possibility of observing negative incomes. In theory, income is equal to expenditure plus savings but in a developing country where financial markets are neither accessible nor mature, income and expenditures plus savings can be unbalanced at some times. By definition, negative savings can clearly produce negative incomes.

There are other non-definitional factors that exacerbate negative income. These include:

- a. Seasonal effects where farmers need to spend more than normal when they cannot get food supply from nature or their own farms
- b. Periods where they have to invest for the next season
- c. Unexpected shocks in certain years
- d. Marriages and funeral ceremonies which are ritually costly in many cultures
- e. Purchase of real estate and
- f. Neglecting the income sources that are from informal economy, illegal markets and illegal lottery.

The negative income is therefore unavoidable for some people at certain times in some economies. The serious researcher cannot in good faith reject negative incomes from primary data collection, set it to missing, or assume it is zero,

since so doing will distort or camouflage certain key dimensions of economic structure. Moreover, informal or illegal economy data are sometimes inaccessible because of the legal or social prohibitions, or even danger to the research team. Although negative incomes can be portrayed on a Lorenz curve, unfortunately, the calculation of Gini coefficients give erroneous results.

In the **Wealth of Nations** (1976), Adam Smith introduced the Value Paradox by differentiating the value in use and value in exchange. The diamond paradox compares the value of water, which is valued principally in use, and diamonds, which are valued principally in exchange.

One purpose of chapters 3 and 4 is to explore and discuss some possible methodological corrections to data from income and well-being surveys conducted in two fragile eco-marketing systems in Myanmar. We seek to answer the question: *How can inequality best be portrayed so that corrective policies, programs, and projects can be put into place that will help to equalize economic opportunities and outcomes?* The data were collected in 2008 from a total of 100 households each in Bagan, Central Burma and Kyaintali on the Western coast. The income and use of natural resources for food are different between the Bagan and Kyaintali regions of Myanmar according to the natural endowment of forest and common property resources. Income inequality, which is inequality in terms of Smith's value in exchange, is lower in central Myanmar; while nutritional status, Smith's value in use, is higher in central Myanmar. This research seeks to determine the conditions that define these two different ecosystems in terms of productivity and sustainability.

Put simply, the Lorenz curve is a visual comparison between the actual and a perfectly equal distribution of land, credit, income, expenditures, food

availability, health and other possible indicators of well-being. It shows how far away the actual distribution in the society lies from perfect distribution. A perfectly equal distribution in the society means that each portion – typically a centile, decile or quintile -- of a certain population is getting equal portion of a welfare input or outcome. When we speak of land or credit, we speak of equality in opportunity, commutative justice, or what Amartya Sen terms the right to access well-being. Most people would agree that perfect equality in opportunity, without discrimination or reverse discrimination, is a good thing. However, when we speak of food, income, or expenditures, we are normally referring to equality in post-economic results, or distributive justice. Perfect equality in incomes is not necessarily equitable because it gives equal rewards to unequal effort, entrepreneurship, investments in human capital, and inborn talent.

In either case, perfect equality means that each proportion of the cumulative population will add up the equal amount or portion of increase in cumulating the welfare-good. The line of perfect equality, the 45 degree line in the graph, means that the X-axis, the percentage of population, and the Y-axis, the proportion of the welfare-input or -outcome, is increasing in the same proportion. The slope of separate Lorenz curves can then be analyzed for population or regional subgroups to know which subgroup lies farthest away from the perfect distribution; it is those subgroups upon which we normally focus our policy and programmatic interventions in order to restore greater equality in the aggregate population.

On the basis of the Lorenz curve for each subgroup, Gini coefficients may be calculated to reflect the situation of economic-welfare, physical welfare and or distribution of resource opportunities. The amount of land per capita was used as a

measure of commutative justice, or Sen's access to opportunity in the case study of Bagan and Kyaintali. Meanwhile, income, nutritional status, nutritional cost per day, and net income in exchange value (Net income per capita – nutritional cost per capita) were used to compare welfare effects of the two regions in terms of distributive justice. The reason net income in exchange value was calculated was that some poor households are landless and have more nominal income from their random jobs but have to spend a greater proportion of their income for food since they lack access to land for food production. This introduces a great bias in calculating the Gini coefficient for income and nutritional cost per day of the poor households. Furthermore, the Gini coefficient for nutritional status, net income for exchange and land ownership was calculated to portray more accurately the multidimensionality of the welfare situation of poor families.

The Gini coefficient is the area between the Lorenz Curve which is sagged beneath the perfect equality line and the 45 degree straight line. It indicates how far the distributional pattern in the community is away from the perfect equality line. Area A in the figure is the Gini coefficient.

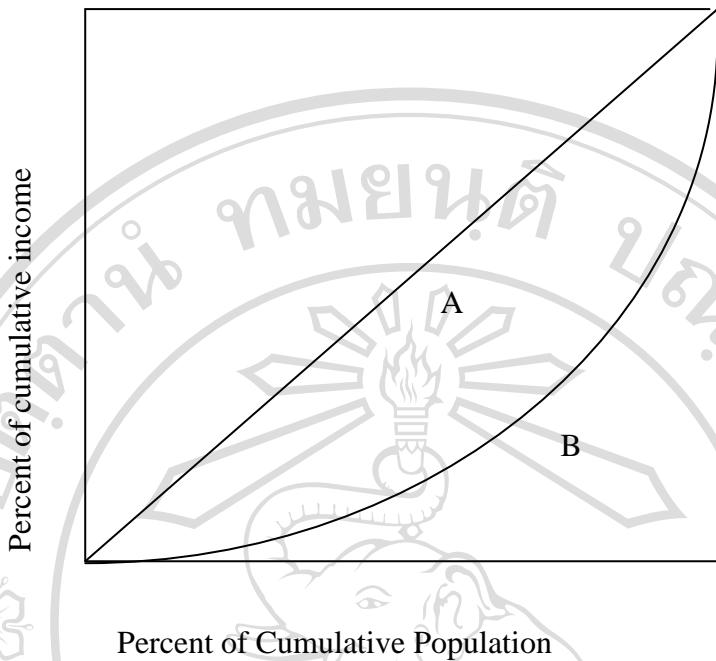


Figure 3.3 Lorenz Curve and Gini Coefficient.

The range of Gini coefficient is between zero and one. The perfect equality line is the situation, at which the distribution of social good is increasing in the same proportion with the increase in cumulative population. That means, good consumption increase one unit with the increase of population in one unit. The area under perfect equality line is one unit square.

If the distribution of good tends to be absolutely unequal, the area between absolute equality line and actual distribution approach to one and if the distribution is equal, the Lorenz Curve will approach to the perfect equality line and the area between them will approach to zero.

The weakness of Gini coefficient is that the effect of negative value in the data is neglected. In the real world, there could be negative income in the primary data collection because of the effect of periodical shocks or seasonal cyclical pattern.

Sometimes, it is not convenient to check only the inequality to compare the income of the two places that we go further beyond the Gini coefficient.

3.4.3 Sen's Welfare Coefficient

To evaluate the welfare of a local community, Sen's Welfare Coefficient was calculated with the following equation:

$$W = I * (1 - G) \quad (1)$$

where, W = the Welfare Coefficient

I = Income

G = Gini coefficient.

Despite the interest of this formula, it, like the Gini coefficient upon which it is based, becomes impracticable in the presence of negative incomes. The welfare coefficient for each household could not yield policy-applicable conclusions as to the incidence, depth or intensity of destitution, measures which were defined by Foster, Greer, Thorbecke and Ravallion, and which will be taken up in the following section.

3.4.4 Incidence, depth, and intensity correctives to the Gini coefficient

The absolute poverty is measured in Gini coefficient calculation by arranging the income in ascending order. But the information of how poor or how much it is needed cannot be measured. The standard of one dollar a day income is used in measurement of relative poverty.

The incidence or headcount index of poverty shows the percentage of households in the population that receive less income or welfare than a given poverty threshold. For example, if we assume the international standard of one dollar per capita per day, we find the proportion of all households under that line out of the entire target population. Households with daily per capita income of less than one dollar per day are then defined as poor. The incidence, depth of poverty (or) poverty gap and intensity of poverty gives us a chance to compare the two eco-marketing zones. The formula of poverty incidence is as follow:

$$\text{Poverty incidence} = \frac{\text{per capita income per day in } \$ < 1}{\text{Total population}} \quad (2)$$

The income gap or depth of poverty is an indicator that how much people are away from the standard income in average. If we are interested in poverty reduction, the income gap tells us which population will need how much to be away from poverty:

$$\text{Poverty gap} = \frac{\sum (\text{Poverty line} - \text{income})}{\text{Incidence}} \quad (3)$$

So, the poverty gap indicator might say that the whole population need how much in average but we really did not count the intensity of the gap. In the population of poor, some people are further away but some are not so highly deviated but when it is summed up and take average, the pattern of distribution is blended.

So the intensity can tell us which population of poverty is more unequal when we calculate the intensity of poverty by giving the more weight to

people who are further away from poverty line. Intensity of poverty is an indicator that we can weight the person with the income further away from the standard poverty line the highest. The pattern of distribution of the income in poor is weighted by taking the square of income gap. The intensity of poverty of a population is calculated by squaring the gap and take average on it.

$$\text{Intensity of poverty} = \Sigma (\text{Poverty line} - \text{income})^2 / \text{Incidence} \quad (4)$$

The concept of food pyramid is that what people may consume apart from rice will come in line from the most necessary to luxury goods. So, the topmost minority section of the pyramid is weighted most as the highest utility consumption and the most basic, the lowest weight and calculated the score of utility in a continuous measures by multiplying the given scores to each item the people consumed and add up all is named nutritional status. This gives us a chance to compare the welfare of food consumption in the two study areas.

3.4.5 Tests of means

Independent sample T-test, T-test and Post-Hoc test were conducted by region, villages, wealth status and gender. The test was used to determine whether or not the mean values were significantly different between groups. Comparisons of means also give the research a further opportunity to study the nature of two eco-marketing zones comparing similarities and differences. This allows for further refinement of the hypotheses by choosing promising variables and adapt the assumptions from these tables.

3.4.6 Cross-tabulation analyses and bar-charts with Chi-square and other tests of significance for ordinal and nominal categories

Cross-tabulations were used to analyze the different patterns of distribution according to non-continuous categories of wealth rank, gender, village and region for income, food consumption, use of education services, land distribution, economic opportunities, use of transportation, communication and other socio-economic variables. Cross tabulations were based upon subdivisions of households into three ordinal classes in order to discern the neediest target group for the formulation of policies affecting income security, welfare and conservation.

After the cross-tabulation analysis, bar charts are often used to express the difference in distribution of resources, level of development, perceptions and income. A Chi-square test is for testing the significance of differences in proportion, means or allocation. It is made on non-parametric means plots.

3.4.7 Correlation matrix analysis

Each category of variables was subdivided into a set of specific nominal, ordinal and/or cardinal indicators in order to choose the most significant for hypothesis testing. (Please see the Appendix for the complete correlation matrix including all candidate indicators).

Correlation matrices help us to find out the possibility of multicollinearity, tautology⁴⁵ and highly associated variables in the hypotheses equations. It helps us to know the direction of the relationship among variables and pick up the most suitable one for our regression equations. The absolute correlation coefficient

⁴⁵ These terms will be defined in Chapter 5.

that is higher than 0.5 could lead to multicollinearity or tautology. To avoid tautology and multcollinearity, some of the variables that overlapped each other were taken out from the regression equations. In some cases like inquiry for the situation of shifting cultivation and actual possession of land that is related to illegal process in the economic activity of farmers were redundant again and again since the questionnaire has to be designed through triangulation in the research process. These variables were left out after the test of means and correlation matrices according to their low levels of significance.

3.4.8 Regression analysis and final hypothesis testing

Linear regression analysis with systemic equations was used for final testing of a series of linked hypothesis (Figure 1.1). This is because the concept of intricate web of life or food web in nature has no clear ending or beginning. It is assumed that all elements in nature or the system are inter-linked. The variables were entered into the equation according to the correlation matrix and number of viable observations, in order to conserve the maximum feasible number of degrees of freedom. The assumptions concerning the prospects and possibility of conservation in Rakhine State was changed after studying Bagan Area. The equations were adapted after the correlation analysis and cross-tabulations are made.

The situation of the two different areas was determined by the other socio-economic factors, the use of land, attitude toward environment and road infrastructure. Linear regressions were estimated using SPSS 13 for Windows to discover the most significant relationships among attitudes, conservation, behavior,

institutional myths and resources endowment as they interacted to determine welfare factors in each of this two regions.

3.4.9 The structure of the linked hypotheses

The prospected variables under each group were under gone into bivariate analysis and were chosen according to the level of significant in the correlation matrices. The hypotheses equations are constructed through taking variables under each category of variables under the twelve groups. The testing of regression equations are under stepwise and enter method using SPSS 13. The tables of each hypothesis testing results for each of the hypotheses are shown in chapter five. The general equation used all the total two hundred samples to test the policy variables for the overall planning for the government and regional equations with one hundred sample households in two different regions are to inquire further more for the micro planning of local governance, development projects for the NGOs and guidance for the civil society. The three equations show policy variables for each different region and central planning of government.

The distribution of social, economic and nutritional welfare in the two different communities is analysed in chapter four. Further more, the inter-linkages among environmental, physical, economical and social welfare, and knowledge, awareness and behavior is analysed in systematic equations.

3.4.9.1 Adjusted R-Square

To assure the robustness of a model, we sought regression equations with a strong adjusted R-square of at least 0.5. Otherwise, it must be recognized that the variables in the model, even though significant in themselves, explain less than half of the variation in the dependent variable.⁴⁶ The formula of adjusted R-square is,

$$\text{Adjusted R-square} = (\text{TSS}-\text{RSS})/\text{degree of freedom} \quad (5)$$

Total sum square (TSS) means the sum of the square of each actual observation minus the true mean. The residual sum of squares (RSS) means the TSS minus the variations explained by the regression itself. Degree of freedom is the number of observation deducted by number of variables in the model including the intercept.

3.4.9.2 F-statistic and level of significance

F-statistics is to indicate whether the model is acceptable or not. It shows the external validity of each variable in the model. The model is accepted when F-statistics is higher than 4.2.

3.4.9.3 t-statistics for each variable and group of variables.

The level of significant in t-statistic shows the internal validity of each variable in the system of equations. I.e., some non-significant variables are retained to

⁴⁶ Some of the results in Chapter 5 fail to achieve an adjusted R-squared of 0.5, but we retained them for analysis because the overall relationship, as measured by the F-statistic, was still significant.

test the hypothesis as originally stated. The level of significance of each variables or t-statistics reveals how much the variable is relevant to the model. The level of significant in t-statistic shows the internal validity of each variable in the system of equations.

3.4.9.4 Logic of the signs

- The sign of beta coefficient indicates the direction of the relation between hypothesized variables. If the beta coefficient is positive, the variable is directly related to the dependent variable and if it is negative, the variable is inversely related to the dependent variable in the model.

3.5 Methods of data collection

Questionnaire survey with stratified random sampling method is used. The time limitation for making interview with each household is limited between 45 minutes to one hour. Each questionnaire include two parts, the part for inquiring the household information and socio-economic variables and second part is about the personal perceptions, knowledge, attitude, awareness, behaviour and conditions of environmental degradation.

The three strata in each village are categorized by the local community leaders according to the contribution each household made to the community. The wealth is determined by the sharing of each household. After getting the wealth status of each household, the survey is decided to make with the ratio of 1:2:2 of wealthy, middle class and poor. So, the random households are collected from each stratum. The populations of the villages are different in the two eco-marketing zones. So, to

get the one hundred households in Bagan is not difficult because of high population density in the villages. The two villages in Bagan is chosen for the questionnaire survey, one with environmental conservation project and the another without environmental projects. For Kyaintali area where population density of the villages are low, we have to collect 5 villages in a group and pool out the households with the information of wealth rank the community leaders determined. In central Myanmar, the range of households in a village is 750 to 1500 and in Rakhine, it is between 17 to 150 households in a village.

Non-probability random sampling is made in each stratum because of the limitation of time frame and data availability. Non-probability sampling or non-parametric sampling is a more free style of sampling than probability or parametric sampling. The chance for estimating for the whole population or calculating the precision have to trade-off because sample size does not reflect the population size.

Data collection is done at the end of harvest season considering the convenience of villagers to easily estimate gross income and expenditure since income and payments are cleared annually for the farmers in the villages. The last year's income in this study mean the annual income of 2007 for each household.

The key informant interview is made with local leaders, government officers and NGO workers. The secondary data is used to triangulate the results that come out from the survey. The source of secondary data is also inquired from local leaders.

3.5.1 Questionnaire

The questionnaire is designed to inquire about the socio-economic situations, the use of economic infrastructures, and role of knowledge, environment and community institutions in depth. Because of trying to get many information in a limited time, there were so many missing values. However, the questionnaire included repeating questions to triangulate later in the analysis part because the inquiry went into the part of economic activities doing under the carpet and illegally in the forest resources. The situation of the progress of livelihood people under the development project was also inquired with the presence of NGO workers from the projects that there were so many proxy variables to measure one indicator. The time frame of household interviews was set up to be between forty-five minutes and one hour. The precision of this survey might be low since there were many concepts of sustainable development that are not easy for many people to understand. Whatever the reason, this kind of survey is necessary for Myanmar since the management of natural resources and economic infrastructure is poor. This kind of survey in the area of environmental economics, ecological economics and resources economics have not been done in Myanmar.

3.5.2 Pre-test

The questionnaire is tested with the local NGO workers, community leaders, and the local people before going into to the community. Then, the small difference of local dialogue and the standard Burmese language is adjusted. There are some differences in the local language among Burmese villages. It has to be adjusted to get to the point directly when we interview with the villagers. The explanation of

the format of questions and the target for each questions is explained to the local leaders and NGOs who assisted in the survey.

The scale of the variables is clearly defined with the assistants, participants and local communities. The transparency of the questionnaire is that, we declared about the target we are inquiring by grouping the variables in the questionnaire and declare which groups of variables the questions are belonged to.

3.5.3 Pilot survey

There was a prior inquiry for the choice of site. The general situation of each region has known from the literature and former experience with the local trips and volunteer work. The two region is chosen to study the different impacts of economic fundamentals and development projects on the environmental degradation, poverty alleviation and welfare of local community. Rakhine State was assumed as a problem state in the study but after the analysis, it was found out that there are different strengths and weaknesses of different areas, policies and endowments of natural resources such as land quality, forest and water.

The pilot survey was conducted in 2007 March in Kyaintali before doing the research project with 50 households. The pilot survey data directed the local norms, gaps of information and feasibility of data analysis questions that there is a chance to adapt the questionnaire for the research project. The former assumptions in the research proposals are derived from that pilot survey. However, we found out that the assumptions made before the field survey of the research project need to be readjusted when we go to actual survey in both Bagan and Kyaintali.