Impact of Rural-Urban Migration In Thailand: An Economic Study on the Aging of Rice Farmers

（タイにおける農村から都市への移民の影響：米農家の高齢化局面での経済学的研究）

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ABSTRACT

Urbanization and migration have long been discussed in academic society, as well as their effects to agriculture. However, most of the studies are from micro-viewpoint and use qualitative methods; very few studies concern aging in agriculture as an effect.

Thus, this thesis emphasizes significance of the aging issue in Thailand's agriculture from macro-viewpoint by using quantitative methods. It begins with finding relations between inter-provincial migration and changes in agricultural population age structure from 1980 to 2010. Then, number of agricultural workers by age group and sex are projected to 2040 based on past year data to find out how much aging in the future would be.

Being more unique than the conventional cohort component method, this thesis projection brings in two original components – start-working rates of youngest workers' age group, and net movement rates of workers from agricultural sector to non-agricultural sector. Regarding impact of aging agriculture on rice productivity, aging as an independent variable is added in Cobb-Douglas production function to examine the influence of aging on rice labor-productivity. Besides, future impact of aging on rice labor-productivity in 2040 is also forecasted.

It is found that inter-provincial migration is attracted by higher per-capita GDP and consequently associated with change in percent aging agricultural workers. The agricultural worker projection results show that in 2040, aging percentage of Thailand's agricultural workers will increase to 29.8 percent, from 16.6 percent in 2010. This would make a huge damage to rice productivity from 3,618 Kg per worker to 2,348 Kg per worker, seeing that aging ratio has significant effect on rice labor-productivity in the country. To compensate the damage, mechanization must be practiced more thoroughly and efficiently. Moreover, irrigated area needs to be expanded and irrigation system must be improved as well. Apparently, these long-term measurements cannot be succeeded without cautious supports from the government.

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CHAPER 1
INTRODUCTION

When it comes to rural development, many would think of technologies, economic growth, social security and public health, political situations, etc. It cannot be denied that in order to promote rural development, those things are essential. However, demographic status and changes are mostly likely to be underrated from its importance towards rural development. Its significance is even clearer in case of sustainable development. Those issues that have been already mentioned all connect with population (in this case it refers to human population). Besides, population can be both the reflections of rural development, and the impact to rural development. Thus, in order to create efficient and sustainable development plans for rural areas, demographic structure should be deeply analyzed and carefully projected.

Demographic change comes from three main causes – birth, death, and migration. Wages and infrastructures are two incentives that make people migrate from rural areas to urban areas (Panudulkitti, 2011; Samuel and George, 2002). Not only percentage of urban population, but the distribution of urban population should also be considered. Bertinelli and Black (2004) mentioned that economic and social structures can swing because urban population is distributed unevenly. Thailand, like many Asian countries, experiences city dominated urbanization (Hill, 1995). Several studies about migration and aging population in rural area are found. Nyanguru (2007) mentioned that migration shifts population structure and is around urbanization. Kinsella (2001) indicated urban growth being driven by migration of young people from rural areas. Burholt (2012) also presented that aging population percentage in rural areas is probably higher than which in urban areas because of either out-migrating youngsters or in-migrating elders. In addition, Fongmul and Meka's (2013) study concluded that elderly was the major group of agricultural labor in Chiang Mai province because young labor migrated out increasingly. As well the phenomenon resulted in labor shortage in agriculture. As of 2013, Thailand still had almost half of total working population engaged in agriculture. That means half of them would face serious problems on occupations and their well-beings. Unfortunately, there is hardly no research examining the aging problems in agricultural population in Thailand, either there has not been agricultural population projection research which includes migrant agricultural labor.

Therefore, this dissertation's initiation is to examine whether and how inter-provincial migration creates aging agriculture, and project future aging problems of agricultural population in Thailand in macro-viewpoint as well as probable issues they would encounter in 2040. It begins with examining root causes and factors of changes in both urban population and agricultural population of the country since 1980. Accordingly, future non-agricultural worker numbers and agricultural worker numbers by age group and sex are projected to analyze trends of both sectors. Then, rice

productivity functions are estimated to examine the influence of aging on rice labor-productivity. Before coming to conclusion, several aspects due to aging problems in agricultural society and how Thai farmers adapt to the phenomenon are further scrutinized and discussed.

CHAPTER 2
THE REVIEW OF LITERATURES

This chapter reviews fundamental information of theories, study sites, history, past research, as well as a preliminary survey.

2.1 Definition of Agriculture

The root of the word 'agriculture has been said in several dictionaries that it came from Latin and Greek languages: 'ager' meaning field, and 'culture' meaning cultivation (Gopal and Srivastava, 2008). USDA also defined agriculture as "The utilization of biological processes on farms to produce food and other products useful and necessary to man". Thus, agriculture means any activities related to cultivating farms. Both plants and animals are included in agriculture. Main types of agriculture include crops, livestock, and aquaculture.

There are numerous fields of studies related to agriculture ranging from arts to science. Important fields of them are agricultural economics and agricultural science. Agricultural science is a group of specific studies that use scientific approaches towards problems and development. In many cases social based studies, such as economics, are also considered within agricultural science. Agricultural science improves agricultural quantity and quality in several ways such as in molecular level so-called 'agricultural biotechnology'. Agroforestry is the study of maintaining diversity and ecologically stable planting while being able to give good productivity. Agronomy aims to manage plant productions by researching plant genetics and physiology, or even the atmosphere. Agricultural engineering assesses and builds physical inventions for better performance of agriculture such as irrigation, flood prevention, or environmental impact assessment. Agribusiness is very critical these days due to its main idea of changing agriculture into large scale industry. Principles of agricultural economics are concerning consumption and production of agricultural products (Colman and Young, 1989).

2.2 Definition of Demography

Demography comes from two ancient Greek language roots which are 'demo', meaning the people, and 'grapho', meaning writing. It studies populations of creatures, especially human beings, over time and space. In case of human beings, all types of characteristics of the group of people are analyzed – age, sex, nationality, education, income, expense, health status, religion, etc. There are four main concepts of demography – size of population, distribution of population, characteristics of population, and population change. Size means a number of populations in a specific area and at a specific time. Major characteristics of population are age and sex.

There are several ways to express changes in population, which are linear change, geometric

change, and exponential change. It can be either in absolute manner, or relative manner. Demographic changes are comprised of three possibilities that are birth, death, and migration, normally known as population change components. Birth and death are influenced by numerous factors such as biological factors, cultures, society, economy, and psychological factors. Migration counts the changes in place of residence to another administrative area, which is different from local mobility. Basic equation of demographic change is as follows:

$$\text{End-of-period Population} = \text{Birth} - \text{Death} + \text{Net migration}$$

People in the same 'cohort' share the same demographic experience in a specific duration of time. Normally population cohorts are presented in different age and sex. In general, the oldest cohort should be 75 years and older, or 85 years and older, depending on life expectancy of the cohorts.

Two ways of measuring death rates are general: crude death rate, and age-specific death rate. There is also alternative to death rate – survival rate. Two types of survival rates are known, life table survival rate, and census survival rate. Death rates can be projected using several methods, namely constant rates, extrapolating the trends, targeting the rates, cause-delaying, and synthetizing.

Birth rates can be calculated via many methods: crude birth rate, general fertility rate, age-specific birth rate, total fertility rate, and child-woman ratio. There are two perspectives of fertility. It can be calculated in either period-based, or cohort based. Period based fertility is cross-sectional, while cohort-based fertility is longitudinal. Projection methods of mortality rates are similar to which of fertility rates.

Migration can be viewed as in-migration rates, out-migration rates, and net migration rates. For a population projection, migration rates can be used either by gross migration or net migration. Using gross migration, there are migration pool models, multiregional models, and two-region models that can be applied. And for net migration, there are top-down models, Hamilton-Perry methods.

There are four major steps in cohort-component method for population projection:
1.   Find survival numbers at the end of the projection interval
2.   Calculate migration rates and project the migration
3.   Project the birth numbers
4.   Supplement the birth numbers to the population.

Figure 1 below is acquired from the book State and local population projections: method and analysis by S.K. Smith and J. Tayman (2001) which illustrates required steps in cohort-component
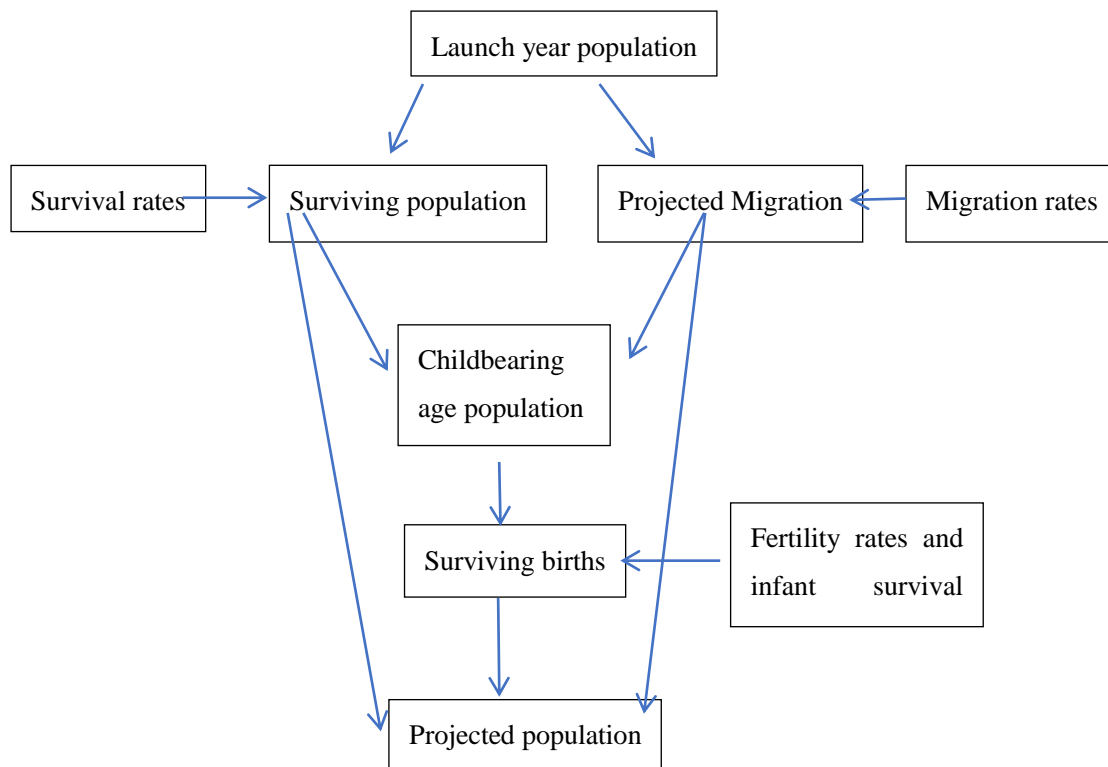
method.

Figure 1 Required steps of cohort component method of population projection, acquired from S.K. Smith and J. Tayman (2001)

2.3 Regression Analysis

Regression analysis is one of the most popular and widely used in academic society ranging from medical sciences, natural sciences, engineering, social science; especially economics related studies so-called econometrics. It is a technique to find one-way relation of independent variables to dependent variables quantitatively. Data derived from observations of two or more elements are used to explain their relations. In general, the steps into regression analysis are similar to other fields of science experiments. It starts from detecting some questionable of two things that are worth finding if there is relation between these two things or not. Then, the question is to be examined with existing theories that can be related. If there is no reasonable theory, the researcher has an opportunity to come up with new theories through the regression analysis. After deciding theories to be used in the regression analysis, a clear hypothesis, or more, is to be raised to make sure that doing regression analysis is the correct direction through the answer. An ambiguous hypothesis or too many hypotheses at the same time will make the analysis distracted and torture the reliability of the analysis. Assumptions are considered thoroughly at this stage.

One should avoid having too many assumptions since it would lead to less reliability of the study.

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After hypothesis is clearly decided, types of regression functions based on the theories and assumptions, that is to say characteristics of relations between independent variables and dependent variables, have to be set. It is also recommended to go back to check again if the functions correspond hypothesis and objectives or not. Each independent variable has its own relation showing element called parameter. Then, all data required in the regression analysis are collected and consequently calculated to estimate the parameters. These parameters are the answers to the research question and have to be analyzed, coming to the reason of the name regression analysis. The analysis can be done by various types of statistical tests, as well as hypothesis testing, which are to be described later on. Already tested regressions, depending on their objectives and characteristics, can be used for future forecasts.

Hypothesis itself can be referred as either maintained hypothesis or testable hypothesis. A maintained hypothesis is fixed and not to be tested in the study; in other words, the assumptions. A testable hypothesis is the main hypothesis being considered in the study. Most of the time, hypothesis is tested by determining either the parameters are significant or not.

The functions used in a regression analysis can be either single equation, or multiple equations known as a simultaneous equation. For single equation, it can be either simple regression, or multiple regressions. A simple regression is comprised of only one independent variable and one dependent variable; while multiple regressions have two or more independent variables. All other factors that might affect the dependent variable but are not considered fall into residual term. There are two types of simple regression – linear, and non-linear. However, at present reliable multiple regressions can be only linear. Multiple regressions are used in this thesis.

2.4 Thailand's background

The formal name of Thailand is The Kingdom of Thailand. Located on the Indo-China peninsula in Southeast Asia, at present the country is expected to have total population of over 67 million (as of 2015), making itself ranked in top twentieth most populous countries in the world. The average population density of the country is 132.1 persons per square kilometers (km^2). Thailand shares borders with Myanmar to the west, Lao PDR and Cambodia to the east, and Malaysia to the south. Thailand is attached to seas both sides: the gulf of Thailand, and Andaman sea. Thailand has the total area of 513,120 square kilometers (Km^2), ranked 51st in the world. The official language is Thai language, and the main religion is Theravada Buddhism. It is said that about 85 percent of population are Siamese, or original Thai; and about 14 percent are Thai Chinese. Among the major ethnicity, there are supposed to be about 10 percent that are hill tribes being difficult to prove nationalities. Below is Table 1 describing fundamental information of Thailand.

Table 1 Background information of Thailand as of September, 2016

Item	Details
Nation	The Kingdom of Thailand
Political system	Constitutional monarchy
Royal monarch	Rama the IX King Bhumibol Adulyadej
Capital city	Bangkok
Official language	Thai
Religion	Theravada Buddhism
Total area	513,120 km^2
Water area percentage	0.4 percent
Total population	About 67 million
Population density	132.1 persons/ km^2
Currency	Baht
Driving side	Left
Area telephone code	66
Time zone	GMT +7

Thailand adopts itself from the Kingdom of Siam which had their civilization in the middle of Indo-china peninsula. After Khmer Empire (ancient civilization on the present location of Cambodia) became weak, a Buddhist kingdom of 'Tai' appeared as Sukhothai Kingdom from 1248 to 1448. The power changed to the new and the longest Kingdom of Siam named 'Ayutthaya Kingdom' for 417 years until 1768. After the collapse of Ayutthaya Kingdom, Thonburi Kingdom temporarily emerged for 15 years then transferred to the present Rattanakosin Kingdom, from 1782 until now. King Rama V Chulalongkorn gathered all neighboring civilizations around the Indo-China peninsula and foundered a formal border of Siam Kingdom. Surviving from the deadly colonization of the westerns, World War I and World War II, the nation's name changed from 'Siam' to 'Thai' meaning sovereignty.

2.5 Thailand's Development

Thailand is notable for its economic growth since it experienced world fastest growing economy for continuous 11 years from 1985 to 1996. This was triggered by the government's development plans, first implemented in 1961 as 'National Economic Development Plan'. Until now, there have been 11 plans. The followings are briefs of the plans.

Plan 1 (1961 -1966): To emphasize in national economics especially in infrastructure investment in communications and transportation, dam system for irrigation and electricity generation, public facility etc. The government put much efforts in providing some kinds of natural resources for private sector investment.

Plan 2 (1967 - 1971): To follow Thailand NESDP No 1 extending the plan to develop every part of the country especially the faraway area. In addition, special projects were initiated and run by government agencies such as Region Development Project and Farmer Supporting Project etc.

Plan 3 (1972 - 1976): To continue national economic stability in expanding money quantity, price of necessary goods for living, international finance stability, export promotion and import improvement.; and, to increase population growth, to extend economic system and social services to the rural, to improve the agricultural institute and organization including agricultural credit while stabilizing agricultural price.

Plan 4 (1977 - 1981): To improve national economic by increasing the agricultural production, developing export industrial structure, distribution income and work to the upcountry, monitoring industrial stimulation measurement, and balancing payment and budget. In addition, it is to restore and improve major natural resources while making the utmost use of natural resources especially land, forest and mining giving priority in land reform, water resource management, sea conservation, survey and developing energy resources in Thai Gulf area.

Plan 5 (1982 - 1986): To maintain Thailand economic stability by mobilizing money saving, using economic and finance discipline motivation, economic restructuring in various sectors such as agriculture, export industry, industrial expansion to the region, foreign commercial and services, production, energy consumption, etc.; to solve poverty problem of rural people.

Plan 6 (1987 - 1991): To develop labor skill and people life quality; to increase organization in local level in order to develop natural resources and environment; and to improve national production structure and extend national marketing as much as possible.

Plan 7 (1992 - 1996): To continuously stabilize national economic growth rate; to expand income and development to rural people in all regions; to develop human resources, quality of life and environment; to develop government working system.

Plan 8 (1997 - 2001): To concern in public participation basing on the idea – people centered development; to develop people potential; and to promote regional and rural development potential to upgrade population quality of life as a whole.

Plan 9 (2002 - 2006) and Plan 10 (2007 - 2011): These two plans were designed for country development and administration basing on NESDP No 8 "People centered development" and also basing on King Rama 9th philosophy "Sufficient Economy". Both plans resulted in great success as national economic growth continuously increased at the rate of 5.7 annually. Economic stability increased while poverty decreased. People quality of life also increased as government released public health security measurement.

Plan 11 (2012 – 2015): To develop national production bases and services, increase fairness and decrease difference in social and economic and create crisis protection.

Regarding economic status, as of 2015 Thailand had the total gross domestic product of 409.74

million USD, and a nominal GDP per capita of 5,938 USD. However, with cheap costs of living, an adjusted GDP per capita with purchasing power parity (PPP) of 16,706 USD. The country has a high human development at 0.726, making Thailand become a middle-developed country. Economic inequalities in Thailand had been expanding and had become a serious issue. GINI coefficient of the income in 2010 was 39.4, in medium level. Unemployment rate is considered as an extremely low, as low as 0.8 percent in 2014.

Economic growth in Thailand seriously depends on global economy due to its largely export-dependent economic structure. For years export sectors have been accounting for over 65 percent of gross domestic product. Automotive industry in the country is the largest in Southeast Asia, and top-ten largest in the world. Despite a decade of the world fastest growing economy, Thailand suffered from big financial crisis in 1997 and its economy declined by 10 percent. Fortunately, the economy recovered itself in only 5 years thanks to substantial export industry. Tourism sector takes 6 percent of total GDP. The main source of electricity in Thailand is natural gas, followed by coals, so the country is not sustainable in resources. For decades, Thailand had been the world's biggest exporter of rice, although it was passed over by Vietnam. The country is also a top-exporter in shrimps.

2.6 Studies on agricultural population

The oldest research related to the topic was 'Economic structure and agricultural productivity in Europe, 1300-1800' by Robert C. Allen (2000). Relations between agricultural labor productivity and agricultural output were estimated. The study sites were England, Netherlands, Germany, France, Spain, Belgium, Austria, Italy, and Poland. Then, output per worker among countries was compared. The results showed that Italy and Spain were successful countries in term of agricultural labor productivity.

For Asian research, Shenggen Fan and Connie Chan-Kang studied relations between farm size and agricultural productivity, as well as poverty in Asian countries, namely China, India, Thailand, Japan, and South Korea. Compared to others, Thailand had largest average farm size in the early 1990s. It was found that in order to raise farmers' income, land productivity is to be increased then labor productivity would rise. The government is the key to improve transportation between farm and market, to reduce barriers of farmer income.

Since 1998 Nipon Poapongsakorn, Martin Ruhs, and Sumana Tangjitwisuth had discussed problem overview of agriculture in Thailand. Major problems of agriculture in the country were seasonal shortage of water resources, labor shortage, and inefficient use of pesticides. Less amount of rainfall in that decade accompanied by development of Northern cities were main causes of water shortage. Transition economy triggered workers to move from agricultural sector to

non-agricultural sector. "The application of pesticides adversely affects consumers through chemical residues in food", said the authors. These problems still occur even now and are the challenges for the government.

Stephen J. Walsh et al (1999) studied dependences of scales to relations between population and environment in Northeast region of Thailand. Plant biomass and land-uses were collected by remote sensing and were made regression analyses with population density in study area. A surprising result was that "The variation in relationships among environment and population variables, evidenced through factor loadings associated with canonical correlation, suggest that relationships are not generalizable across the sampled spatial scales".

Aphiphan Pookpakdi (1992) also elaborated sustainable agriculture for small farms. He asserted that using high-yielding varieties of rice since green revolution began diminished protein-rich grains, which was a negative effect to poor farmers. He suggested that technologies should preserve farmers' resource base to get sustainable agriculture. Technologies for low external input cultivations would emphasize soil and water conservation, and to become so, strong and deep participations between researchers and farmers should be built to better understand farmers' realistic situations and on-farm conducting experiments.

Sarun Wattanutchariya and Thanwa Jitsanguan (1992) discussed accordingly small farms in Thailand that is increasing. They mentioned that while non-agricultural sectors boosted land prices, land supply for agriculture was limited because of strict forest conservation. There was no way for farmers to expand their farm sizes; the worse thing was that government implemented policies for large farms leaving small-scale farming behind. They said that the only key to better agriculture was more efficient farm management.

Piyawat Katewongsa et al (2013) studied effects of population changes together with mechanization on agricultural land use. Three kinds of crops are considered in the study including rice, field crops, and rotational crops. The sample size of 5,255 households in Nang Rong district, Buriram province, is surveyed. The reference time period was cross-sectional in 1994 and 2000 to find changes over the period. Dependent variables are number of farms and size of farms; while the independent variables are birth, death, migration, large tractors, harvesting machine, water pumps. It was found that migration was the strongest factor influencing land use while machinery use affected positive effect on number and size of rice farms.

Sanglestsawai and Orachos (2012) compared effects of mechanical use and land size on rice labor productivities of first and second cropping season in 2010. 535 samples from 6 provinces are collected and regressed with Ordinary Least Square. Independent variables were area, harvesting

machine, and planting machine. The results showed that planted rice area was the most influencing factor on rice labor productivities, while machinery uses affected only on first crop productivity.

J. Edward Taylor and Philip L. Martin (2001) researched relations between migration and rural population change. The authors found that migration and remittances could largely affect agricultural households both positively and negatively. They also admitted that "Linkages through product and factor markets transmit impacts of migration from migrant-sending households to others inside and outside the rural economy. Recent theoretical and empirical studies reveal the complexity of migration determinants and impacts in rural economies, and they point to new arenas for policy intervention."

Supaporn Poungchompu et al. (2012) uses secondary population data of Thailand in national level, and data of Tottori province are used to project number of agricultural populations to 2030, based on average changes of survey results. 152 Thai farmers in Khon Kean and 10 Japanese in Tottori that age over 55 are surveyed to compare the effect of age structure changes to food security between the two countries. Projection results showed that Thailand agricultural population is to remain the same level, while which of Tottori province will decrease by half in 2030. "Population aging 65 and over has an upward trend in both counties. To maintain food security both Thai and Japanese farmers should increase crop diversification other than main crops." (Poungchompu et al, 2012)

This is the only one that has been found about agricultural population projection. This paper did a poor methodology, started with incomparable sample scale (National level for Thailand, with mere small prefecture of Japan. Although the authors tried to discuss an impact of aging on food security in both countries, the survey was only to gain only opinions of small-sized samples, not a clear convincing proof.

Waleerat Suphannachart (2016): Time series econometric models are built to examine 9 factors that influence agricultural labor productivity. The agricultural factors are capital-labor ratio, land-labor ratio, export-labor ratio, research expenditure, irrigated area, farmer education, and aging proportion, rainfall, and climate conditions. Data are secondary and official, from 1970 to 2004. A multiple regression with OLS method is used. The results determined that capital-labor ratio, land-labor ratio, research and education level were main influencing factors, while there was no significant relation of actual aging proportion to the labor productivity. It was recommended that the mentioned factors should be promoted to improve the productivity.

This paper is one of the very few studies on aging agriculture issue in macro-viewpoint. The factors considered in the model were extensive as well as size and variety of reliable data. However, actual aging proportion is not supposed to directly affect labor productivity, since

farmers come with adaptation to alleviate the aging problem all along the way, such as by mechanization, labor employment, etc. That means putting the aging factor in the model creates collinearities with other independent factors themselves like capital-labor ratio, land-labor ratio, etc. Relation of aging among those factors should be analyzed

Center for Applied Economics Research, Kasetsart University (2011) uses ARIMA model to predict number of agricultural labor and agricultural product amounts from 2010 to 2020. Then the predictions are used to calculate with Social Accounting Matrix (SAM) to estimate effects of labor age structure on agricultural productivity. All input data are secondary derived from official statistics. Considered population elements are total agricultural population and aging proportion, which are calculated in ARIMA model. It was found that in 2020, there will be less labor in agricultural sector which would negatively affect agricultural productivity, especially rice production to be minus at least 4.18 percent from 2010.

Utilizing Social Accounting Matrix to estimate negative effect of agricultural population age structure and to predict future agricultural productivity at the same time is creativity of the study. However, predicting future aging agricultural proportion with solely ARIMA model might not be convincing, since the proportion is likely to be influenced by other age groups and movement to non-agricultural sectors. Projecting agricultural population by age and sex is required for a better prediction of both agricultural population structure and its effects to productivity.

2.7 Case Study: A sub-urban aging agriculture in Nakhon Pathom Province

Located next to the capital city of Thailand, Nakhon Pathom is a Northwestern sub-urban province with total area of 2,168.3 square kilometers. It is also adjacent to Ayutthaya (to the northeast), Nonthaburi (to the east), Suphan Buri (to the west), and Ratcha Buri and Samut Prakarn (to the southwest). Nakhon Pathom is comprised of 7 districts, 106 sub-districts, and 904 villages. The 7 administrative districts are Nakhon Pathom city, Kamphaeng Saen, Nakhon Chaisi, Don Tum, Sam Phran, Bang Len, and Phutta Monthon. There are other four vicinities of Bangkok apart from Nakhon Pathom, which are Samut Prakarn, Samut Sakhon, Pathum Thani, and Nonthaburi. Compared to other vicinities of Bangkok, Nakhon Pathom has the largest plain areas which are suitable for agriculture. Samut Prakarn has long been industrial province and a logistic hub to Bangkok. Unlike Samut Prakarn or Samut Sakorn province, Nakhon Pathom had less percentage of population in municipal areas in 1990, but largely expanded from 21 percent to 36 percent in 2010, while the non-municipal one decreased at the same extent.

Another element when considering urbanization is population density. Table 2 summarizes population density of 7 districts in 1990, 2000, and 2010. It is seen that the densest district since 1990 was Sam Phran district because it is adjacent to Bangkok and nearer the capital city than

other districts. Totally population densities group from 290.3 to 435.3 persons per km². Districts with higher growth in density are also Sam Phran (from 611 to 1029 persons per km2), and Phuta Monthon (from 41.2 to 639 persons per km2) because they are nearby Bangkok.

Table 2 Population density of 7 districts of Nakhon Pathom in 1990, 2000, and 2010

Year	2000	2010
Total	375.9	435.3
Nakhon Pathom city	650.2	644.9
Kamphaeng Saen	307.9	290.9
Nakhon Chaisi	354.8	439.3
Don Tum	271.33	260.4
Bang Len	155.7	158
Sam Phran	633.7	1,027.20
Phutta Mon Thon	421.5	639.9

Considering Population structures, Table 3 presents Nakhon Pathom's population structure from 1990 to 2010. It can be seen from the table that population in Nakhon Pathom rose from 0.6 million to 0.9 million, or 50 percent in only 20 years. There have been less young population under age15 from 27 to 17 percent; concurrently aging proportion rose from 8.4 percent to 11.3 percent. That made age dependency ratio, the number of people aged 0-14 and 60 up per 100 working-age population, dropped to only 39.4 from 56.0. There has also been less percentage of population over 15 who are working from 78.8to 71.3. On the top of others, percentage of workers in the agricultural sector dropped a half value from 49.7 to only 23.2 percent.

Table 3 Nakhon Pathom's population structure from 1990 to 2010

Items	1990	2000	2010
Total population (K)	629.6	815.1	943.9
Annual growth rate	1.80	2.58	1.47
Median age	25	29.1	33.3
0-14 years (%)	27.5	22.1	17
15-59 years (%)	64.1	68.6	71.7
60 years + (%)	8.4	9.3	11.3
Age dependency ratio (Per 100 adults 15-59 years)	56.0	45.8	39.4
Population aged 6-24 years not attending school (%)	54.0	42.5	31.5
Population work in the last year 15 yrs old up (%)	78.8	72.2	71.3

Population in the agricultural sector (%)	49.7	33.6	23.2
Private households (K)	135.3	209.3	284.9
Average household size	4.5	3.8	3.1

How important is the agriculture for Nakhon Pathom, compared to other sub-urban provinces? GDP from 6 main industries in 5 suburban provinces are shown in Figure 2. According to the chart, the highest GDP was found in Samut Prakan, while the lowest one was found in Nonthaburi, but when considering agricultural sector, Samut Prakan (the most urbanized vicinity) was negligible. Nakhon Pathom had highest agricultural GDP. High traditional GDP sector of Samut Sakohn was mainly from fisheries; therefore Nakhon Pathom is a good delegate for sub-urban agriculture in Thailand.
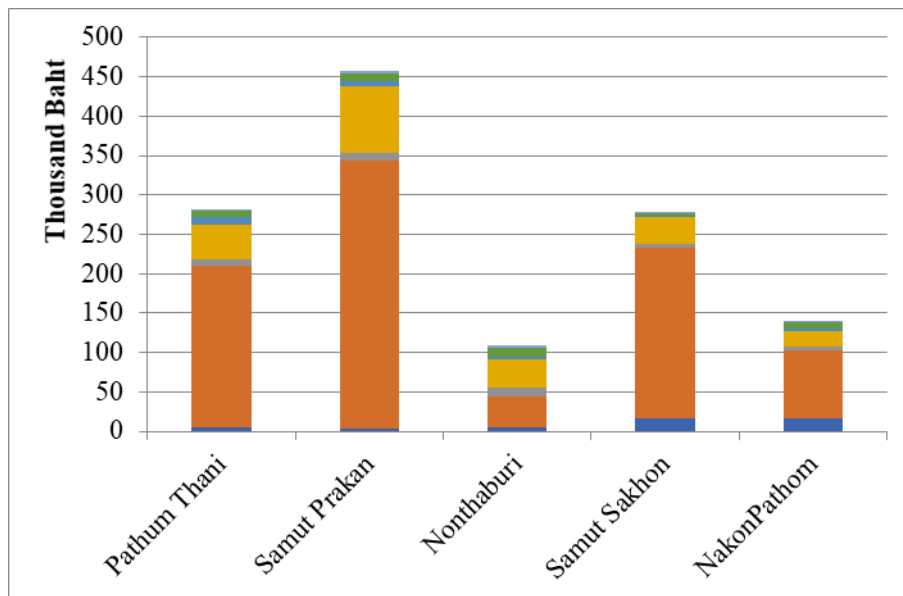
Figure 2 GDP from 6 main industries in 5 suburban provinces

Considering types of agriculture in Nakhon Pathom province, Figure 3 shows total agricultural holdings (farms) by types of agriculture in each district. According to the figure, types of agriculture varied in different districts in 2003. Bang Len was the district with highest holding of rice fields, over 5000 holdings, which accounted approximately half of total agricultural holdings in the district. The majority in Nakhon Pathom city and Kamphaeng Saen district was vegetable crops and herbs, which was also the main agricultural types of overall province in 2003. However, in terms of area, rice was still the agricultural type with longest areas in Nakhon Pathom in 2003. Based on Table …, rice covered around 44 percent of total agricultural land area while the second largest type was fresh water agriculture, 15 percent, and followed by permanent crops, 13 percent.
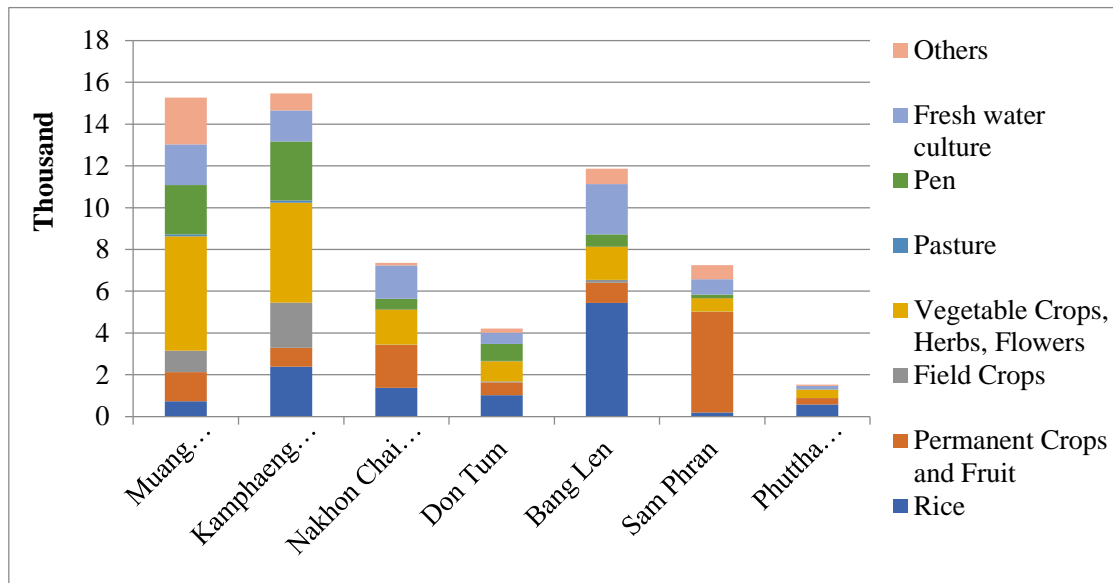
Figure 3 Total agricultural holdings (farms) by types of agriculture in each district

Nakhon Pathom province, adjacent to Bangkok, the capital city, has been influenced by urbanization of Bangkok Metropolis, working population in the province can leave agricultural sector and enter modern sectors early. With this reason, agricultural population in the province changed dramatically in the last 20 years. Figure 4, 5, and 6 compare age structure of various types of workers in Nakhon Pathom from 1990 to 2010. As seen from the figures, in 1990 the age group with highest worker numbers was 20-24 years old and half of total workers in the year were agricultural workers. The second most industry was manufacturing, gathered by young ones. The third important sector was wholesale and retail trade. Ten years later, numbers of agricultural workers largely dropped in every age group, making the highest age group of agricultural changed to 35 to 39 years old. In contrast, workers in manufacturing sector rose up sharply in each age group and maintain young age groups, highest aged 25-29. The increase was also found in wholesale and retail trade sector in 2000. In 2010, while numbers of workers in manufacturing sector were still expanding, agricultural worker numbers dropped further in age group 15-44. The peak of agricultural worker age structures shifted to 45-59 years old. This influenced the aging agricultural worker percentage extending to … percent. Thereby, this sub-urban agriculture has become an aging society, which is supposed to affect their agricultural stability.
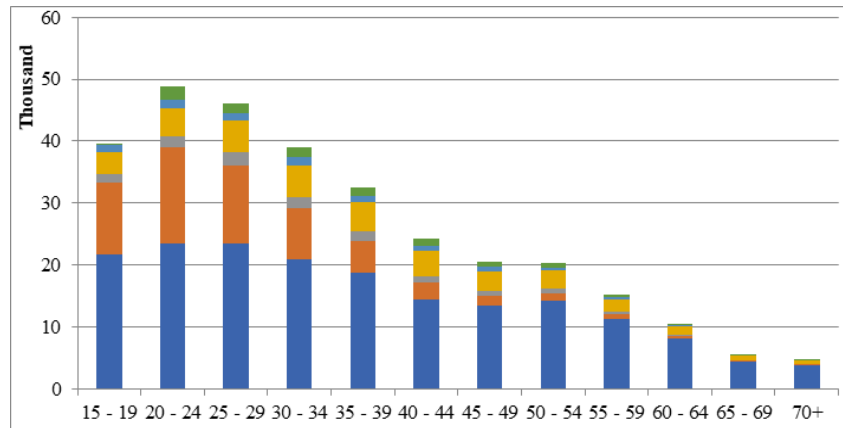
Figure 4 Age structure of various types of workers in Nakhon Pathom in 1990
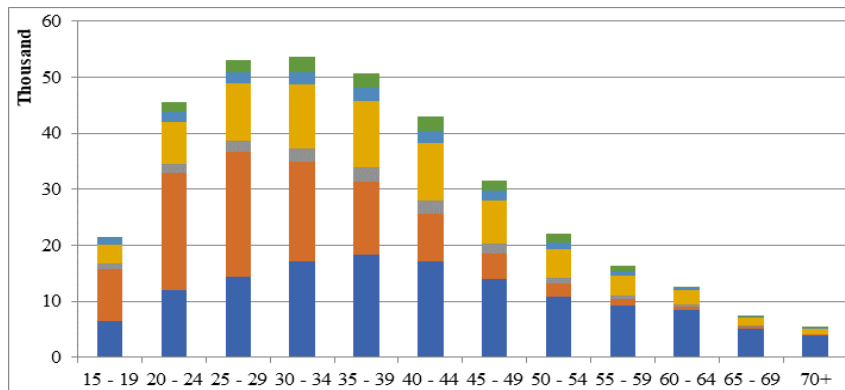
Figure 5 Age structure of various types of workers in Nakhon Pathom in 2000
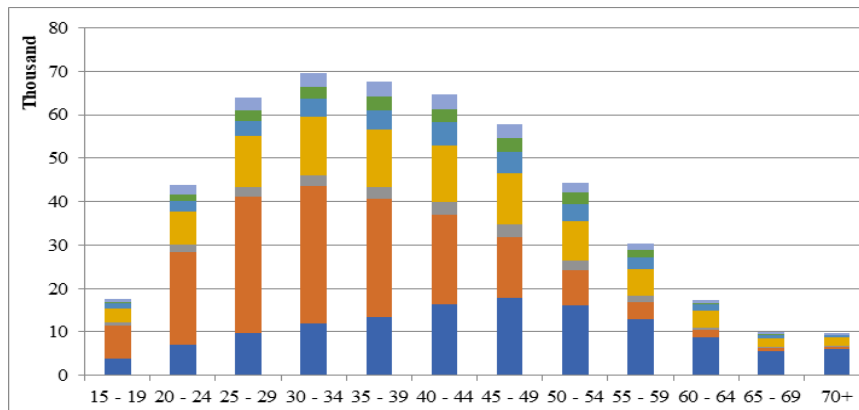
Figure 6 Age structure of various types of workers in Nakhon Pathom 2010

There was a national survey on migrant laborers in several sectors, by International Labor Organization (2006). Four main sectors – agriculture, fisheries, domestic, and garment industry – are surveyed. It was found that 57.4 percent of migrant laborers in agriculture were male. However, there was a difference about proportion of sex between migrant workers in crop agriculture and livestock agriculture. There were more females in crop farms, 62.7 percent, while there were less females, 47.8 percent, in livestock farms. Of total surveyed migrant workers, 71.3 percent age more than 17 years old, while 24.3 percent are between 15 and 17 years old. The rest

3.9 percent were under 15 years old, which found only in crop farms. 62 percent of the migrant workers in agriculture were registered by the government, meaning almost one-third were not registered and considered non-existing. Regarding education attainment, most migrants attained 7-9 years of education at 48.8 percent, while 41.9 percent received none education. Seven percent could speak Thai fluently; 24.8 percent could speak good Thai; and the other half, 43.8 percent, could speak some Thai. A good opinion of migrants in agriculture was a vast majority of them, 84.8 percent, could leave the job if they want. It was also found that they received wages lower than average minimum wage of the country. At that time, average minimum wage was 150 Baht per day, while the median of wages received by surveyed migrants was 130 per day (International Labor Organization, 2006).

Many surprising points about wages of migrants in the four sectors were also observed in the national survey on migrant laborers (International Labor Organization, 2006). Garment and fishery shared the same median wage, at 4500 Baht per month, which is higher than the other two sectors. Garment industry had highest maximum wage at 10,000 Baht per month and had 25 percent with higher than 5000 Baht per month, yet the minimum wage was as low as 1000 Baht per month. Migrants with domestic works suffered most with median wage of solely 1000 Baht, and the minimum wage of as low as 400 Baht; even the maximum wage was only 6000 Baht. Most sectors give wage to migrant workers on monthly basis, except fishery that mainly give every two weeks. This implies that although agriculture does not give best wages for migrants, the sector is still relatively more reasonable and reliable than domestic jobs.

As a preliminary study, a survey by the author of this thesis and laboratory was conducted from March 5 to March 15, 2015 regarding effects of aging on incoming foreign migrant to agricultural sector. The survey was in Nakhon Chaisi district and Kamphaeng Saen district. March is the middle of dry season, so rice and crop related field in action were little found.

Two household of farmers were found in Nakhon Chaisi district. The first family was agricultural workers and came to fish Tilapia and Java Barb every weekend. The Tilapia fish was available all year; normally they can fish about 70 per day, mainly for household consumption. The second household was doing shrimp farm. They had 2 farms, the other one was in Ratchaburi province. There were 5 ponds in Nakhon Pathom province and 15 employees were hired. All of the 15 employees were immigrants and medical check needed to be conducted for drugs every three month. Among immigrant workers, Burmese were the most skilled and educated, so most of them pursued service sector. Compared to Thai laborers, Burmese were stronger and healthier. Laos and Cambodians were relatively unskilled and pursued unskilled jobs. The family also felt that migrant workers were everywhere.

The other four agricultural household were interviewed in Kamphaeng Saen district. A household was doing water convolvulus farm. They were binding corianders, which were minor crops of them, with their neighbors. They gave opinions about differences between Thai workers and migrant workers. In their opinions, while Thai workers haggle works and immigrants do not; Thai workers were likely to claim higher wages, while the migrants always accepted the minimum wages. The way of raising children of Thai parents may impede children themselves from working hard. Burmese migrants even started local business such as ice-cream street vending, used oil collecting, etc., which gave good returns and depended less on Thai agriculture. Thai farmers are always taken advantages by intermediaries.

The second agricultural household in Kamphaeng Saen district did paddy-sown fields, orchid yard, and rose yard. Due to less water from irrigation, they mainly use ground water to agriculture. They complied 'sufficient economy' introduced by Rama 9 King Bhumibol Adulyadej, so they believed that the influx of migrant labor would not affect directly to them. Another household was a taro farm. The husband also worked as company officer at the same time, and the grand-father of this family managed the farm full-time. The family hired Thai neighbors to mow grass 200 days per year. They asserted that returns from agriculture did not satisfy. In their opinion, migrants do not want to work in agricultural sector, and the reason why there were less migrant workers in agricultures is that immigrants accept only the same wage rates as Thai nationalities. Furthermore, the wages were climbing up; farmers were not potential to hire them due to low returns. At present, they said, farmers did not need migrant labor but might need in the future.

The other household was running a flower farm. Main economic flowers were Jasmine and Crown flower. In their opinions, labor wages were too expensive. At that time, they hired 5-6 employers; all were Thai. Around the farm's area there was plenty of ground water coming up to surface sometimes. The mother of the family was going to retire from public officials, so they were newcomers to agriculture, finding information regarding agriculture on the internet. They admitted that prices of flowers greatly fluctuated. Jasmine ranging from 40 Baht to 1500 Baht; crown flower ranging from 50 Baht to 200 Baht. The family suggested that future number of migrant laborers in agriculture depends on future minimum wage of Thai labor. In addition, agricultural area in Thailand will decrease due to fewer skills in agriculture of children.

Having interviewed 6 agricultural farms, evidenced that no matter which kind of agriculture is, migrant workers are needed, and they are more efficient than Thai workers in several ways, except the farm complying the sufficient economy. Most of them believe that agriculture in Thailand would shrink in the future due to inequalities.

CHAPTER 3
TRACKING INTER-PROVINCIAL MIGRATION TO BANGKOK

Demography is associated with economy, sociological perspective, culture, history, environment, and natural resources; population analysis is inevitably essential for any public administration. Developers of any countries surely desire well-conducted population projections for efficient development planning, even though human population dynamic is somehow difficult to be noticed by publics (Cohen, 2005). Human population projection can be done in various scales, e.g. global scale, country scale, and local scales. There have been various global-level population projections; United Nations Population Division's World Population Prospects is a well-known one with diverse scenarios ranging from high to low. Utilizing the prospects, Cohen (1995) extrapolated how much capacity the earth could carry human population in various criteria, such as energy consumption, food demand, natural resource supply, economic welfare, environmental quality, etc. Besides, the United Nations gives population projection by age group and sex of all countries.

Population projection depends mainly on existing statistics. Different data collection methods or measurements give diverse projection results. Projecting future population of Bangkok, the capital city of Thailand, is apparently valuable for the country's development. As a remarkable primate capital city (Sternstein, 1984), Bangkok became the medical hub of the country. According to the Ministry of Public Health (2010), in 2010 the capital has 192 medical institutions and 5420 physicians, offering 0.95 physicians per 1000 people. In the same year, the whole country had only 0.34 physicians per 1000 people; even ratios of provinces surrounding Bangkok was around 0.51. These relatively better resources call residents in provinces around Bangkok to enter for the capital healthcare including giving births. Bangkok's fertility rates reported by Ministry of Public health are suspected being overestimated because it would include numbers of births by outsider mothers that influence projection results of Bangkok population.

Before projecting future agricultural population, urban population needs to be forecasted due to the fact that agricultural workers tend to migrate to urban area, specifically Bangkok, and leave their agricultural jobs. Hence, this chapter aims to waive the effect of Bangkok-born outsiders and project real population in Bangkok by age and sex to 2030 to get a concrete idea how urbanization in the country would expand. After revising population characteristics and statistics, fertility in Bangkok were analyzed. A new calculation approach of Bangkok's fertility rates is then introduced with detailed steps of projection. Next, projection results are elaborated and compared with an official one concluded by Office of the National Economic and Social Development Board (NESDB), follow by conclusion.

3.1 Thailand and Bangkok: A brief review

In spite of experiencing a financial crisis during 1997 and 1998 (Chang, Gunnel, Sterne, Lu, and Cheng, 2009), the export-based economic structure (Phiromswad, 2015) turned the country into a middle-income country putting more industrialization (Suebsman, Kelly, Yiengprugsawan, Sliegh, and the Thai Cohort Team, 2011). However, Thailand economy has been developer unevenly (Doner, 2009). Bangkok has become largely urbanized with expanding population from 4.69 million in 1980 to 8.30 million in only 30 years (National Statistical Office, 1980; 2010). The capital city grows its population proportion of whole country from 10.5 percent to 14.5 percent (National Statistical Office, 1980, 2010), which can be found in Figure 7.
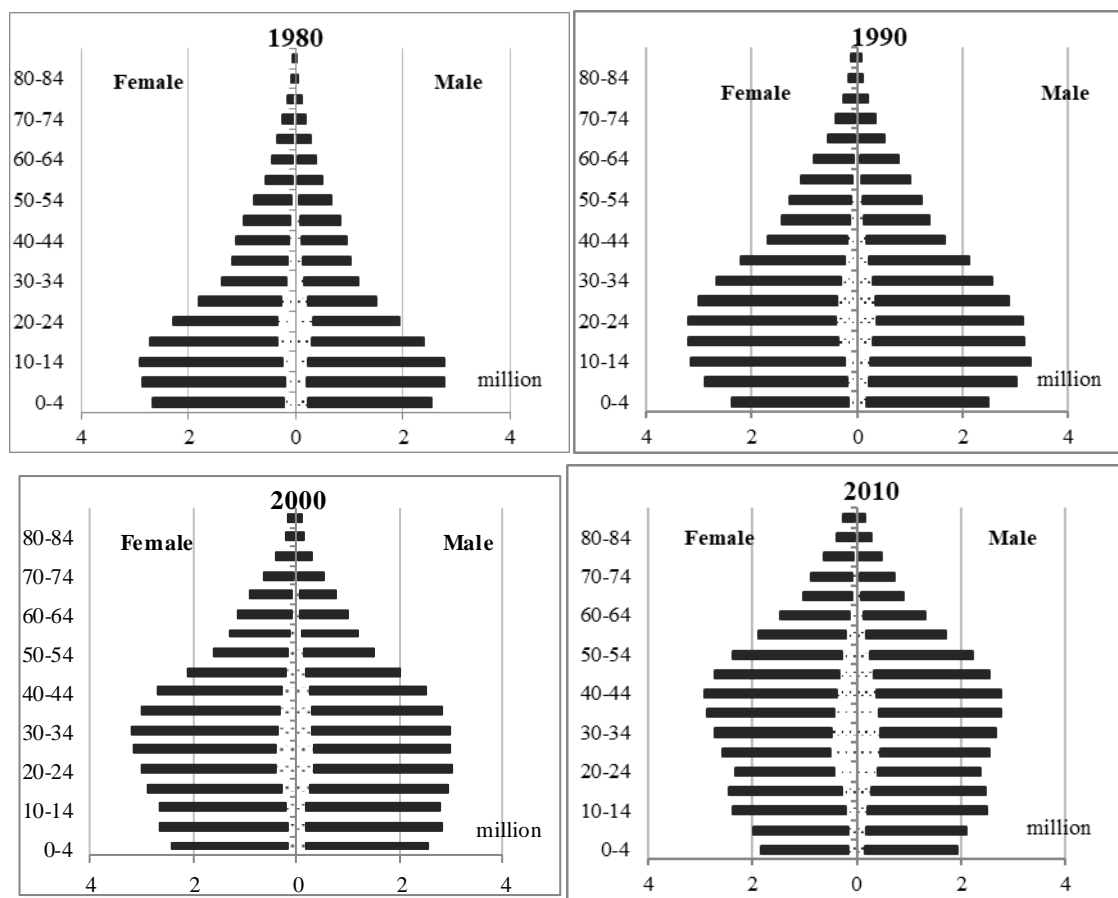
Figure 7 Population pyramids of Bangkok and the whole country from 1980 to 2010

Note. ■ is population of the whole country, ▦ is population of Bangkok

This phenomenal population growth mainly came from its mortality, and migration. According to Ministry of Public Health (2010), life expectancy at birth in Thailand for males and females increased from 63.8 and 68.9 years in 1985, to 70.4 and 77.5 in 2010 respectively. However, there have been no significant changes in life expectance at birth since 2010, so mortality rates in 2010 can be used in this projection. Bangkok has also been the highest province in both in-migrant numbers and out-migrant number over three periods of migration censuses: 1985 to 1990, 1995 to

2000, and 2005 to 2010 (National Statistical Office, 1990; 2000; 2010). Net migration rates (defined as a proportion of net-migration number on total population in a specific area) of Bangkok were 7.75 percent during 1995-1990, and 5.70 percent during 2005-2010. Since number of migrants relies on population in the rest provinces, this study's projection uses the migration rates of 2005-2010 period while the migrant number would not be the same due to population sizes in other provinces. Figure 8 illustrates how the net migrant numbers in each age group to Bangkok were during 1985-1990.
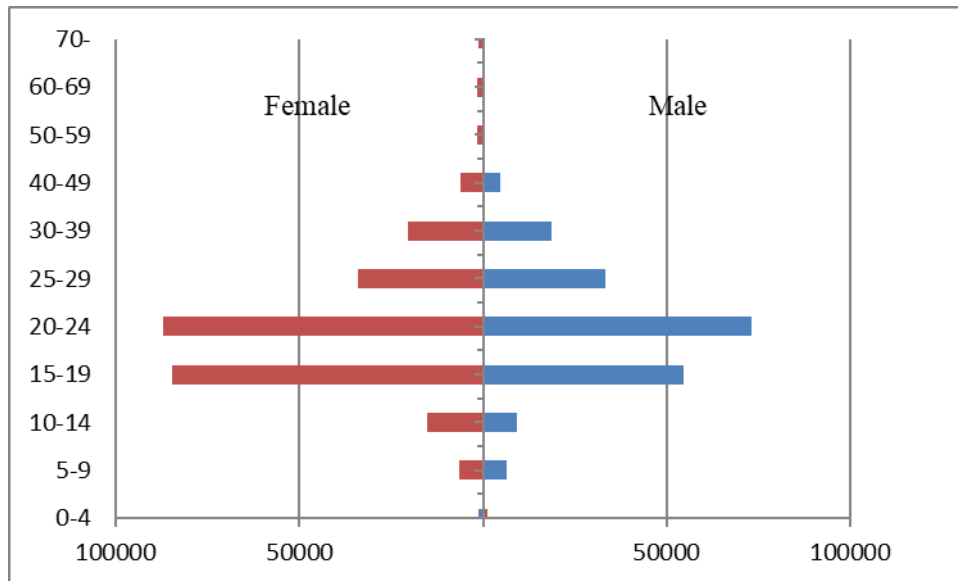
Figure 8 Net migrant numbers of Bangkok during 1985 and 1990

There are several publications about population projection in Thailand. Lexomboon and Punyashingh (2000) use projection models of World Health Organization – WHO – to forecast dentist supplies in Thailand to year 2030. Wongboonsin, Guest, and Prachuabmoh (2005) predicted Thailand population to 2025 and found that demographic structure in the country provides a demographic dividend increasing economic growth. Nevertheless, only the number of total populations was projected in those two studies. Provincial-level population projection by age and sex are officially reported in Population Projections for Thailand 2010-2040 by NESDB (2013). The report offered scenarios of overall fertility for whole country population: increasing, remaining constant, gradually decreasing, and moderately declining. At regional level, the report classified the country into 8 regions: Bangkok (province), vicinity provinces around Bangkok, Northern region, Central region excluding Bangkok and vicinities, Eastern region, Northeastern Region, Western, Southern region. Nonetheless there was only one scenario for regional projection, assumed that fertility would decline approximately 15 percent in all regions, as well as Bangkok. Other studies about Bangkok population projection by age group and sex are seldom found; this counts an originality of this study.

3.2 Examining Fertility Rates of Bangkok

According to Newell (1988), there are mainly two ways to analyze fertility rates: period fertility, and cohort fertility. Though cohort analysis, regarding one group of people experiencing the same time (Caselli, Vallin, and Wunsch, 2006), is less common; it is used in population censuses of each provinces in Thailand decennially. Period fertility considers every age group of people in the same specific year (Halli and Rao, 1992), which its measurements are used in this study e.g. crude birth rate, age-specific fertility rate, and total fertility rate. Crude birth rate is number of births per thousand people (Preston, Heuveline, and Guillot, 2001). General fertility rates (GFR), age-specific fertility rate (ASBR) and total fertility rate (TFR) are calculated as follows (Smith, Tayman, and Swansan, 2001):

$$GFR = \frac{B}{F_{15-49}} \times 1000$$

   ; B is the total number of live birth

    F_{15-49} is the number of females in child-bearing ages, 15-49

$$ASBR_u = \frac{B_u}{F_u} \times 1000$$

   ; $ASBR_u$ is age-specific fertility rate of females in age group u

    B_u is the number of birth given by females in age group u

    F_u is the number of females in age group u

$$TFR = \Sigma ASBR$$

Thailand started a fertility transaction period, which was partly effected by contraceptive use, in the early1960s dropping total fertility rate from over six to only 1.98 in 1944-1995 (Guest, 1999). Phaktoop (2000) stated that migration in Thailand impede timing of first marriage, which should be related with fertility. The country's fertility rate has decreased to approximately 1.6 since 2000 (Zhang, Chmratrithirong, Shah, and Jampaklay, 2008)

As a primate city, Bangkok has different fertility rate from other parts of the country. According to the Ministry of Public health (2010), crude birth rates in 2010 were 9.4 in Northern region, 10.1 in Northeastern region, 12.9 in Central region excluding Bangkok, 15.3 in Southern region, and 17.7 in Bangkok. Country's average fertility rate in 2010 was 12.1. In spite of the province with highest population number and highest density, Bangkok's birth rate was remarkably higher than any other province. There is also a common idea, supported by Montgomery (2008), that fertility rate tends to be lower in urban areas; fast-growing Bangkok should have confirmed this as well. Therefore, fertility in Bangkok and surrounding provinces need to be scrutinized. Since age-specific fertility data are not provided in provincial level (except Bangkok), general fertility rate of the provinces must be analyzed. Figure 9 compares the map of Thailand by crude birth rates and general

fertility rates in 2010
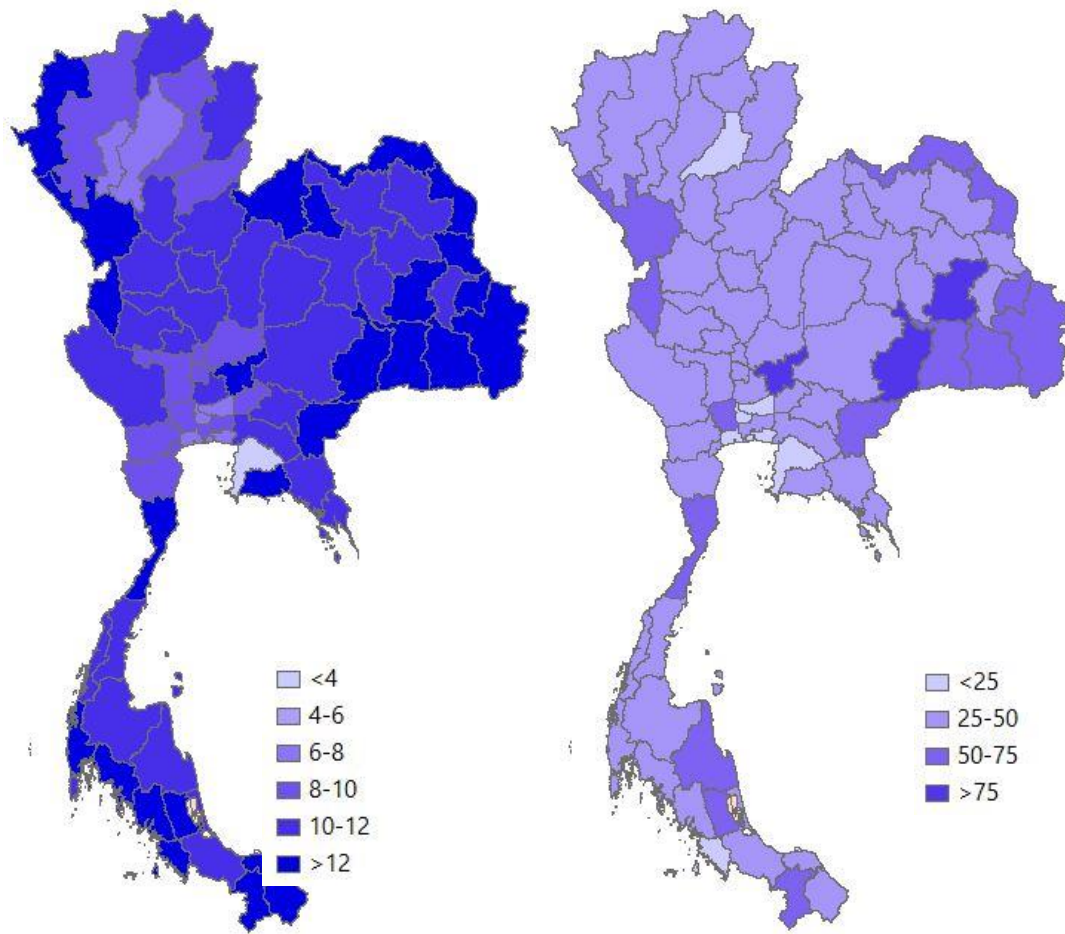
Figure 9 The map of Thailand by crude birth rates (left) and general fertility rates (right) in 2010

Data from *Population and Housing Census* are used for calculating the general fertility rates. According to the calculation result, in 2010 Bangkok had general fertility rate of 34.6, while its adjoining provinces – Patum Thani, Samut Prakan, and Nonthaburi – had 24.1, 17.9, and 25.9 respectively. Even though Bangkok is more developed and urbanized, statistics derived from the Ministry of Public Health (2010) showed that Bangkok had significantly higher general fertility rate than the surrounding provinces. Furthermore, mortality rate of infants under one-year old was 0.13 percent, whereas 5-percent was different between numbers of live birth (725,100) during 2010 and actual under-age-one population (761,689) in the capital city, which took over almost 50 times to the mortality rate. Based on National Statistical Office (NSO, 2010), an annual average out-migrant number, five years old and under from Bangkok was only 6,423; or 0.8 percent of the population aged under one; that means 407 percent of the group were missing. For population dynamic only be caused by death, birth, and migration, the only possibility for that missing gap should be that Bangkok's fertility rate by the Ministry of Public Health does not represent the real fertility. In other words, the gap should be the proportion of infants whose mothers live in the

other provinces but decided to give birth in Bangkok and bring their infants back to their provinces of residence. In order to project Bangkok's real population number and structure in 2030, the actual data on number of populations aged less than one should be used instead of the official age-specific fertility rates reported by the Ministry of Public Health.

Given the birth rate pattern by age group of mothers can represent the real situation, this study calculates a new age-specific fertility rate of Bangkok for the new population projection as follows:

      1. Bangkok's age specific fertility rate graph shape, provided by the Ministry of Public Health (2010) from the population census (NSO, 2010) is multiplied by the original age-specific fertility rate to get a total birth number.

      2. Bangkok's population number of child-bearing female (15 to 49 years old) by age group in 2010 from the population census (NSO, 2010) is multiplied by the original age-specific fertility rate to get a total birth number.

      3. The original total birth number is substituted by the number of populations under one year old from the census (NSO, 2010). Then, the new age-specific birth numbers are calculated using the ratios acquired from the first step.

      4. Lastly, the newly calculated age-specific birth numbers and the child-bearing female population are applied to acquire the new age-specific fertility rate and a new total fertility rate of Bangkok in 2010.

Table 4 shows calculation results of each step together with the new fertility rates which are used in the Bangkok population projection to 2030. According to the table, the new total fertility rate calculated by this study is 0.85 which amount to solely one-third of the official one, 2.24. This level of total fertility rate is not considered uncommon for a primate urbanized economic city with dense population like Bangkok. Jones (2009) asserted that in 2008 Beijing and Shanghai had total fertility rates only 0.7; likewise, which of Busan in South Korea was only 0.98. These have convinced that this study fertility rates are practical for the projection.

Table 4 Calculation of the new age-specific fertility rates and total fertility rate of Bangkok in 2010

Age group of mothers	Official fertility rates	Official numbers of births	Ratios of age-specific births	The new proportionated births	Official numbers of females	The new fertility rates
15-19	49.6	14,194	0.071	5,398	286,186	18.8
20-24	95.7	41,555	0.210	15,803	434,227	36.3
25-29	121.3	60,167	0.304	22,881	496,020	46.1
30-34	113.2	53,150	0.269	20,212	469,525	43.0
35-39	55.9	23,513	0.119	8,941	420,627	21.2

40-45	11.8	4,603	0.023	1,750	390,087	4.4
45-49	0.7	234	0.001	89	334,441	0.2
Total	2.24	197,417	1.000	75,076	2,831,113	0.85

Note. The official fertility rates are derived from the Ministry of Public Health. The official numbers of females are derived from the National Statistical Office.

3.3 Bangkok Population Projection to 2030

This study utilizes 'cohort component method' which is the most well-known method being used widely to predict Bangkok's population by age group and sex to 2030. This method is also used in NESDB's Population Projections for Thailand 2010-2040 (NESDB, 2013). The cohort components include mortality, fertility, and migration. For every sex and age group except the youngest group (0 to 4 years old), in projected year, a five-year interval projection (2015, 2020, 2025, and 2030) is calculated by the following formula:

$$P_{t+5,u+1} = (P_{t,u} \times S_u) + INMIG_u - OUTMIG_u$$

; $P_{t,u}$ is population number of age group u in year t

S_u is survival rate of age group u

$INMIG_u$ is five-year-interval in-migrants of age group u to Bangkok

$OUTMIG_u$ is five-year-interval of out-migrants of age group u from Bangkok

For the youngest age group (u0), 0 to 4 years old in projected year, a special fertility rate is also considered as below

$$P_{t+5,u0} = 5 \times (R \times B \times S_{u0})$$

; R is male-female ratio of births

B is number of projected births

S_{u0} is survival rate of population aged 0-4

Survival rates and male-female birth ratios in 2010 are practiced, which were derived from the Ministry of Public Health. In-migration rates and out-migration rates from 2005 to 2010 were utilized, which are acquired from the National Statistical Office. The new age-specific fertility rates introduced in this paper are used to estimate the birth numbers.

The projection results are shown in Table 5. The results show that there are noticeable changes in Bangkok population number and age structure over 20 years of projection. Total population of Bangkok will continue to grow from 8.3 million to 9.1 million. Females will still outnumber males, but the female proportion will increase from 51.4 percent in 2010 to 52.6 percent in 2030. Age groups with highest numbers for both sexes change from 25-34 group in2010 to 40-44 group. A diminishing proportion was found in young population aged under 15 from 12.8 percent to 9.6 percent; in contrast, the elderly one with 60 years old and over significantly increase from 9.6 percent in 2010 to 22.6 percent in 2030. Hence, a dependency ratio – the ratio of those aged 0-14

and over 60 to total population – would significantly grow to 35.5 percent. This would signify that Bangkok would become a strong aging capital city in 2030. The extremely low fertility in Bangkok impacts future young population numbers, overall population size is compensated by in-migration.

Table 5 Projection results of Bangkok population by age group and sex to 2030

Year	2010		2015		2020		2025		2030	
Age	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0-4	159.51	154.88	188.10	184.50	181.77	178.29	162.67	159.55	139.64	136.97
5-9	173.04	160.96	144.06	140.59	169.50	166.99	163.63	161.19	146.60	144.43
10-14	212.64	199.06	155.87	152.46	136.84	133.25	160.71	157.91	155.01	152.30
15-19	290.79	286.19	191.52	192.09	150.21	147.31	132.00	128.83	154.72	152.33
20-24	391.89	434.23	289.41	304.57	210.51	218.27	166.95	170.11	148.31	150.09
25-29	447.74	496.02	426.24	504.13	366.74	402.22	296.12	327.22	239.45	261.45
30-34	450.33	469.53	451.53	521.95	453.36	520.15	399.24	434.58	334.85	366.35
35-39	421.50	420.63	436.75	475.29	455.48	518.73	454.82	513.15	404.90	436.66
40-44	374.91	390.09	410.99	425.89	437.82	472.70	451.61	509.08	449.24	500.75
45-49	321.12	334.44	350.81	388.00	403.08	421.22	426.46	464.28	438.13	497.42
50-54	259.90	276.67	302.92	331.66	343.35	383.26	391.12	413.85	411.11	452.98
55-59	179.08	200.05	236.73	269.97	289.55	323.21	327.62	372.93	372.18	401.92
60-64	128.42	147.89	164.87	192.71	221.98	259.40	270.90	310.09	305.91	357.14
65-69	76.53	96.07	115.59	140.60	151.36	183.10	203.57	246.18	248.25	294.10
70-74	66.58	83.88	69.46	88.42	101.02	129.14	132.11	168.03	177.42	225.57
75-79	38.65	56.25	59.82	69.80	54.53	73.61	79.17	107.35	103.45	139.64
80-84	25.05	38.65	34.98	43.72	43.37	54.18	39.61	57.17	57.35	83.22
85+	14.90	27.15	22.25	41.14	23.38	31.18	28.98	38.64	26.47	40.77

Note. Unit: thousand

3.4 Discussion and conclusion

In spite of the same projection technique, different component data gives different results. Table 6 compares methods and elements used in this paper and the NESDB's projection. As can be seen from the table, both projections apply cohort component method and start from 2010. However, this study calculates its own age-specific fertility rates, 0.85 in total, and sets the fertility rates throughout the projection, whereas which of NESDBE speculates that total fertility rate in Bangkok would be 1.36 and continuously drops down to 1.14. Another difference is that this study supposes Bangkok unchanged in mortality rates, whereas the projection of NESDB assumes that Bangkok people have better health and tends to live longer; the life expectancy at birth will increase as highest as by 6 percent. Both projections also fix migration rates of Bangkok constant from 2010.

Table 6 The comparison of methods and elements used in projection between this paper and NESDB's

Items	This paper's	NESDB's
Method	Cohort component method	Cohort component method
Launch year	2010	2010
Interval	5-year	1-year
Fertility rate	0.85, fixed	falls to 1.14
Mortality rate	fixed by 2010	decreases by 6 percent
Migration rate	fixed by 2010	fixed by 2010

Projection results of this paper are different to NESDB's in the way they should be. Bangkok population pyramids in 2030 of the two projections are shown in Figure 10. According to the figure, there are remarkable differences of population aged 0-19 between the two projections. The reason is that fertility rates' influence starts from 0 to 4 years old population in 2015 and lasts to 20-24 years old in 2030. Males and females with 15-19 years old of 0.15 million each are found in this paper while over 0.21 million of each sex are found in NESDB's paper. With fixed fertility rates, a contracting pyramid with smoothly reduced base is found in this projection, while NESDB's one is with compact waves in the base. Furthermore, numbers of females over 85 years old are diverse, 40.7 thousand in this projection but 50.7 thousand in NESDB's.
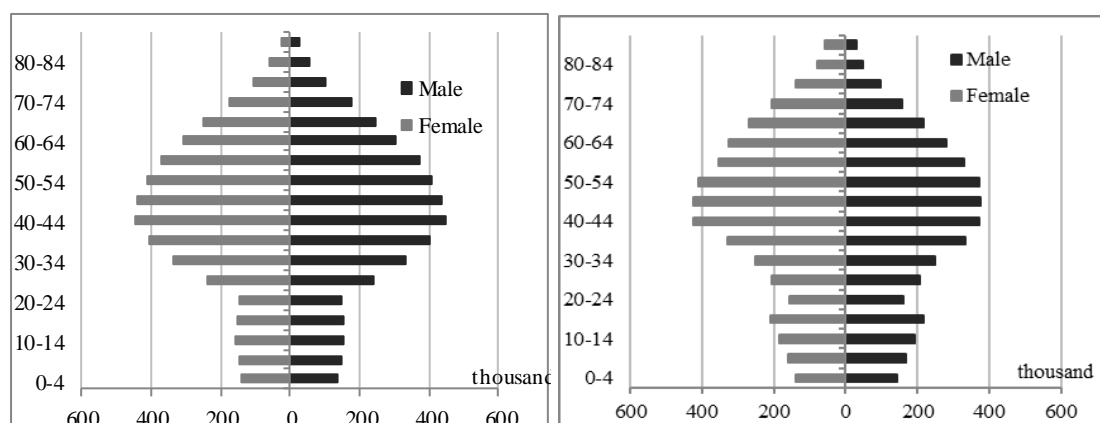
Figure 10 Projected Bangkok population in 2030 of this paper (left) and NESDB's (right)

Population structures of the projection are also compared in Table 7. According to the table, the two projections share the same male and female proportions. Despite resembling aging percentage (people with 60 years old and over), population percentages under 15 years old differ by 2.3 percent. The difference in youth percentages clearly comes from different age-specific fertility rates. This causes difference in dependency ratio between the two projections as well. However, one limitation of this projection is that it presumes little international migration that could not affect overall population number.

Table 7 Projected population structures of this paper's compared with NESDB's

Items	This paper's	NESDB's
Percentage of males	47.3	47.6
Percentage of female	52.6	52.3
Percentage of Population under aged 15	9.6	11.9
Percentage of Population aged 60 and over	22.6	22.9
Dependency ratio	32.2	34.8

According to the actual child-bearing female data and the population under age one in Bangkok, there is a smooth contracting population pyramid of Bangkok in 2030. With the fixed total fertility rate of 0.85, young population percentage under age 15 decreases 3.1 percent and increases dependency ratio by the same proportion. Comparing population structure with the official projection by NESDB (2013) shows that this study gives convincing projection results, as well it can represent a real number of Bangkok residents after eliminating the group of Bangkok-born outsiders.

Comparing population structure of Bangkok to the whole country in Figure 11, it can be seen that both of them have their structural shift upward continuously to 2030. The pyramid shape seems to be less-contracting since death rate and fertility rate are leveling off to constant, in opposite to a sudden change in last 30 years from 1980 to 2010. Although Bangkok and the whole are shifting their population age structure, Bangkok is shifting slower than the rest of the country. The pyramid's peak will be at 60-64 years old for the whole country, despite 40-44 years old for Bangkok. This means young people still migrate to Bangkok, but elderly does not, which is expected to affect agricultural population in the future as well.
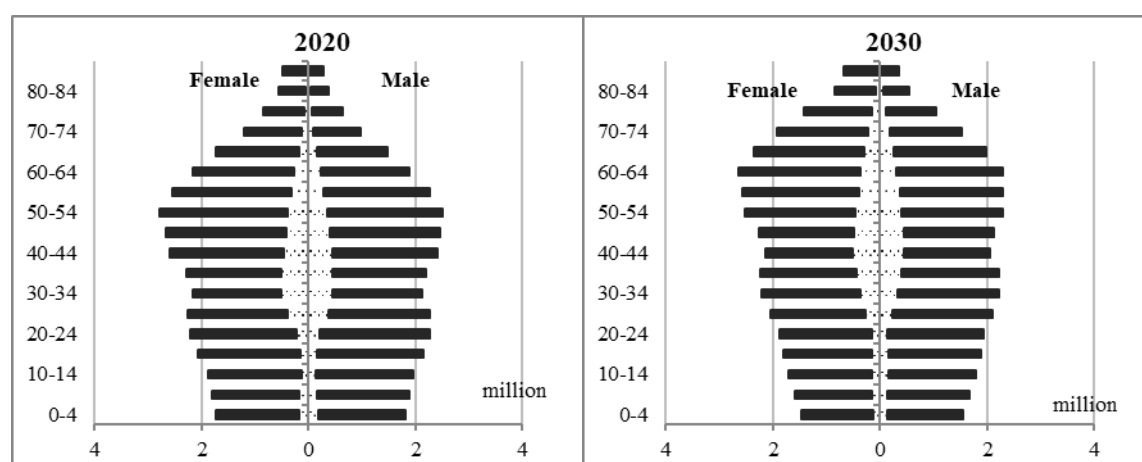
Figure 11 Population pyramids of Bangkok and the whole country in 2020 and 2030

Note. ■ is population of the whole country, ▦ is population of Bangkok

CHAPTER 4

INTER-PROVINCIAL MIGRATION AND AGING AGRICULTURE

Only A few studies in macro-point of view about causations of migration affect agricultural population structure in Thailand are published. As a result, this chapter aims to analyze impacts of inter-provincial migration on agricultural population structures. It focuses on domestic movement of people; international migration is not considered since the internal one plays important roles in urbanization process (Mahinchai, 2010). The reference time period of this analysis is 1980-2010. In order to fulfill the objective, four main steps are considered. First of all, urban provinces and agricultural (expectedly rural) provinces are classified at the beginning of the reference time, 1980. Then, trends and directions of migration are analyzed how much it is caused by the predominant urbanization. The major factor indicating migration directions are also analyzed. The next step is to examine effects of incentive forced movement on changing age structure of agricultural workers in rural provinces, followed by positive discussions economic and social aspects, and lastly by conclusion. Quantitative statistical analysis is mainly used.

4.1 Urban Provinces and Agricultural Provinces

The first interrogation coming up before any analysis is how to identify urban provinces and agricultural provinces. There are several ways to determine whether a province is urban or agricultural. Population density is a useful measurement to find urban areas (Bo Huang, 2010). Francis Ana Naab (2013) mentioned that urban areas are mainly used for residence, industry, commercial, etc.; providing better capacity for human capitals more than agricultural land in operating economic activities. The more people become dense, the more urbanization is implied. Thailand's population data and area of provinces (square kilometer, km^2) are provided in Thailand Population and Housing Census (NSO) Urban area was defined as an area with at least 1500 people per km^2 in China (George C.S Lin, 2013). Using the criterion, Bangkok -- the heart of Central region -- was the only urban province in 1980, with population density of 3026 people per km^2, and left the second densest Nonthaburi, the neighboring province (594 people per km^2) far behind. The most uncrowded province was Mae Hong Son, located on the mountainous part of Northern region (10.45 people per km^2). Figure 12 show the country map in different colors of provinces by population density in 1980.
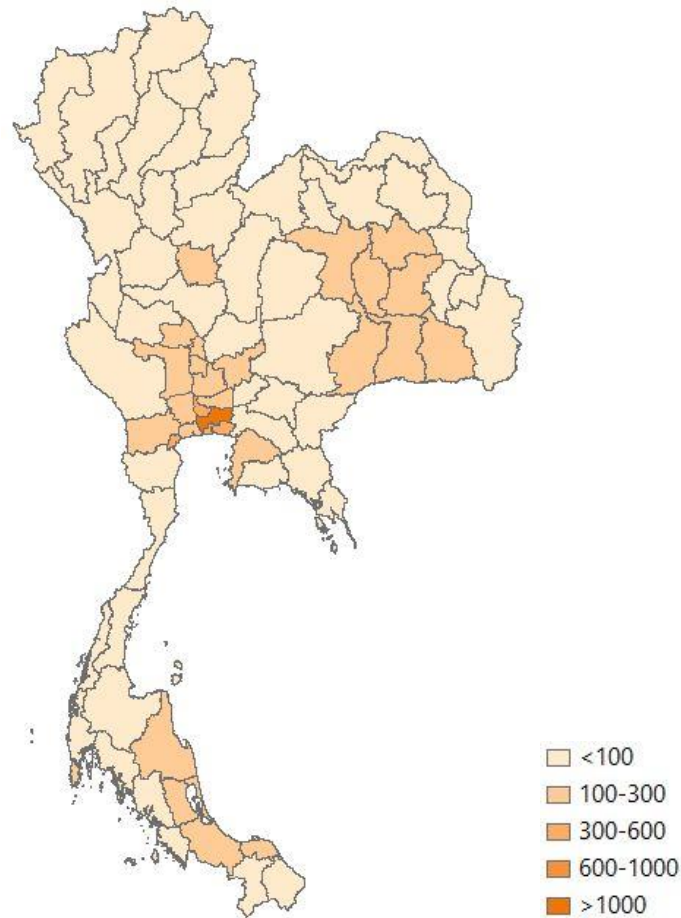
Figure 12 Map of Thailand by population density in 1980 (persons per km^2)

Another useful data for urban-agricultural identification is agriculture share of provincial GDP. It is calculated by total value of agricultural products -- crops and livestock, fisheries, forestry, etc. -- in a province over total GDP of that province. The rest of GDP share is non-agricultural sectors that are known as urban activities; to name a few, manufacturing, construction, transportation, banking, services, etc. Very low GDP share means agriculture is a minor sector in the province. The agricultural sector data and provincial GDP are provided by Thailand's Office of the National Economic and Social Development Board, Office of the Prime Minister. Once more, Bangkok had lowest agriculture GDP share at 1.08 percent, meaning agriculture has been negligible in Bangkok since 1981. Figure 13 shows the country map in different colors of provinces by percent agricultural GDP share.
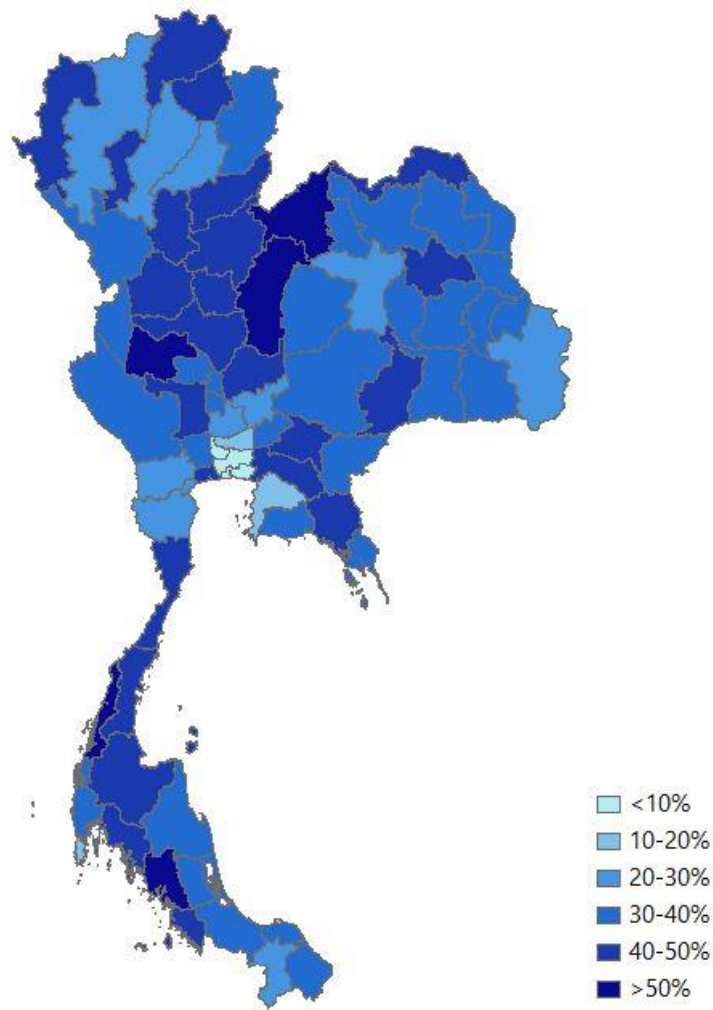
Figure 13 Map of Thailand by agricultural GDP share in 1981

The other indicator introduced on this matter is agricultural worker percentage. Agricultural workers are defined as persons aged fifteen and over who are employed in economic activities related to agriculture. The percentage of agricultural worker is a fraction of number of agricultural workers on total number of 15-years-old-up workers, in given province. Data on number of agricultural workers and total workers by province are provided in Thailand Population and Housing Census (NSO). According to Table 8 below, Thailand had provincial average agricultural worker percentage at 72.27 percent; however, the percentage varied in different regions in 1980. The Region with highest agricultural worker percentage was Northeast region (89.30 percent), while region with lowest one was Central region (61.57 percent). Si Sa Ket, a Northeast province, ranked first with 93.26 percent, whereas Bangkok got the lowest rank merely 4.94 percent. It was clear that agriculture was hardly left in the province, that is to say Bangkok was greatly urbanized. In addition to Table 8, Figure 14 show the country map in different colors of provinces by percent agricultural workers.
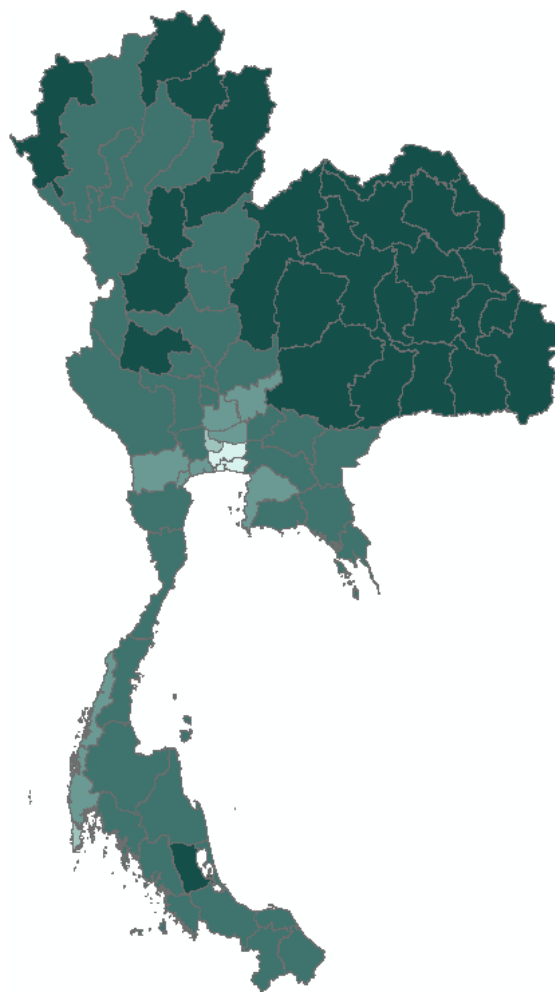
Figure 14 Map of Thailand by agricultural worker percentage in 1980

Table 8 Indicators for urban-agriculture classification

Region	Agricultural worker in 1980 (%)	Agricultural GDP Share in 1981 (%)	Population Density in 1980 (per km^2)
North	79.73	37.97	47
Central	61.57	34.48	319
Northeast	89.30	37.02	94
South	69.3	38.91	91
West	66.88	32.98	55
East	66.37	34.8	76
Whole Country	72.27	36.4	76

There are some associations among the three indicators shown in Table 8. Central region had lowest agricultural worker percentage (61.57 percent), highest population density (319 per km^2), and below-averaged agricultural GDP share (34.48 percent). North region, which was least populated (47 per km^2), had relatively high agricultural worker percentage (79.93 percent) and

agricultural GDP share (37.97 percent). It could be understood that in spite of good indicators to find urban areas, population density and agricultural GDP share are weak to determine agricultural areas. Areas with very low population density may be affected by inappropriate geographical features, finding hard to operate economic activities. Likewise, product values greatly vary among different kinds of agricultural products. For a clear argument, this research uses percentage of agricultural workers to define urban provinces as those with less than thirty percent of agricultural workers; agricultural provinces as those with thirty percent or more. Hence in 1980, there were totally three urban provinces in Thailand: Bangkok Metropolis (Central region, 4.94 percent), Samut Prakan (Central region, 18.32 percent), and Phuket (South region, 29.36 percent). The other seventy provinces were classified as agricultural provinces. Top five ones were all in Northeast region: Si Sa Ket, Maha Sarakham, Surin, Roi Et, and Kalasin; with 93.26 percent, 92.14 percent, 91.9 percent, 91.85 percent, and 91.24 percent agricultural workers respectively.

4.2 Inter-province Migration Trends and Relating Factor

Migration is the most effective component on changing population structure. Unlike birth and death, migration can be occurred more than one time per person in a short time. Thus, tracking population migration supports the existence of urbanization capably. Analyzing changes in population structure upon macro-viewpoint, this paper focuses only on inter-province migration; in-province migration and international migration are not considered. The decennial data concerning provincial migrations are provided, by (NSO), in Thailand Population Census, including numbers of migrants in last five years of the census year. Totally, there are three periods of migrant data which are available from 1980 to 2010 -- numbers of migrants during 1985-90, 1995-2000, and during 2005-10.

As an overview, Table 9 shows trends of in-migrants and out-migrants by region over the three periods. According to the graph, region with highest in-migrants for all three periods was Central region, while that with lowest in-migrants was West region. All regions but Northeast had increases in number of in-migrants along the three periods. (The reason behind the distinctive Northeast will be mentioned later in this section.) Particularly Central region had a jumping number of in-migrants from 1.37 million people (period 1986-90) to 2.04 million (period 2006-2010). Speaking by percentage change, Thailand's overall population growth rate from 2000 to 10 equaled 8.31 percent but the in-migrants in Central region increased by 33.02 percent from two last periods (1996-2000 to 2006-10). It was clear that there was increasing trends in Central region, as well as other regions, over the effect of population growth. Satish Kumar (2014) gave a reason that improving transportation system promoted an ease of migration. The largest number of out-migrants was also found in Central region, yet the number rose from 954,536 people (period 1996-2000) to 1.14 million people during 2006-10. On the contrary to its in-migrants, Northeast region had a rocketing out-migrant number from 779,027 people, during 1996-2000, to over 1.13

million reaching Central's number.

Table 9 In-migrants and out-migrants over three periods

9a) In-migrant

Region	Number of Migrants 1986-1990	Number of Migrants 1996-2000	Number of Migrants 2006-2010
North	149,806	172,911	251,243
Central	1,376,324	1,539,234	2,047,540
Northeast	524,828	426,945	512,122
South	272,994	332,293	367,487
West	108,042	119,546	132,395
East	186,552	3,06,598	473,457
Whole country	2,625,899	2,859,413	3,693,776

9b) Out-migrant

Region	Number of Migrants 1986-1990	Number of Migrants 1996-2000	Number of Migrants 2006-2010
North	145,853	160,490	295,935
Central	747,032	954,536	1,146,453
Northeast	735,756	779,027	1,134,028
South	228,336	257,389	337,577
West	104,182	98,620	146,183
East	128,008	146,478	225,798
Whole country	2,103,600	2,393,332	3,318,343

The subsequent questions are where destinations of out-migrants were and in-migrants were from. This can be described by ranking provinces with highest in-migrants and out-migrants in each 5-year interval of data. As an overview, Figure 15 presents the map of Thailand by provinces with numbers of in-migrants and out-migrants during 1985-1990, Figure 16 presents the map of Thailand by provinces with numbers of in-migrants and out-migrants during 1995-2000, and Figure 17 presents the map of Thailand by provinces with numbers of in-migrants and out-migrants during 2005-2010. Table 10 presents first five provinces with, on average, largest numbers of migrants during 1986-90, 1996-2000, and 2006-10. As can be seen, the four most in-migration provinces -- Bangkok, Samut Prakan, Pathum Thani, and Nonthaburi -- were located next to each other in Central region. The most urbanized Bangkok got the first ranks in both in-migrants and out-migrants, which has been holding country's most populated and dense since 1980.
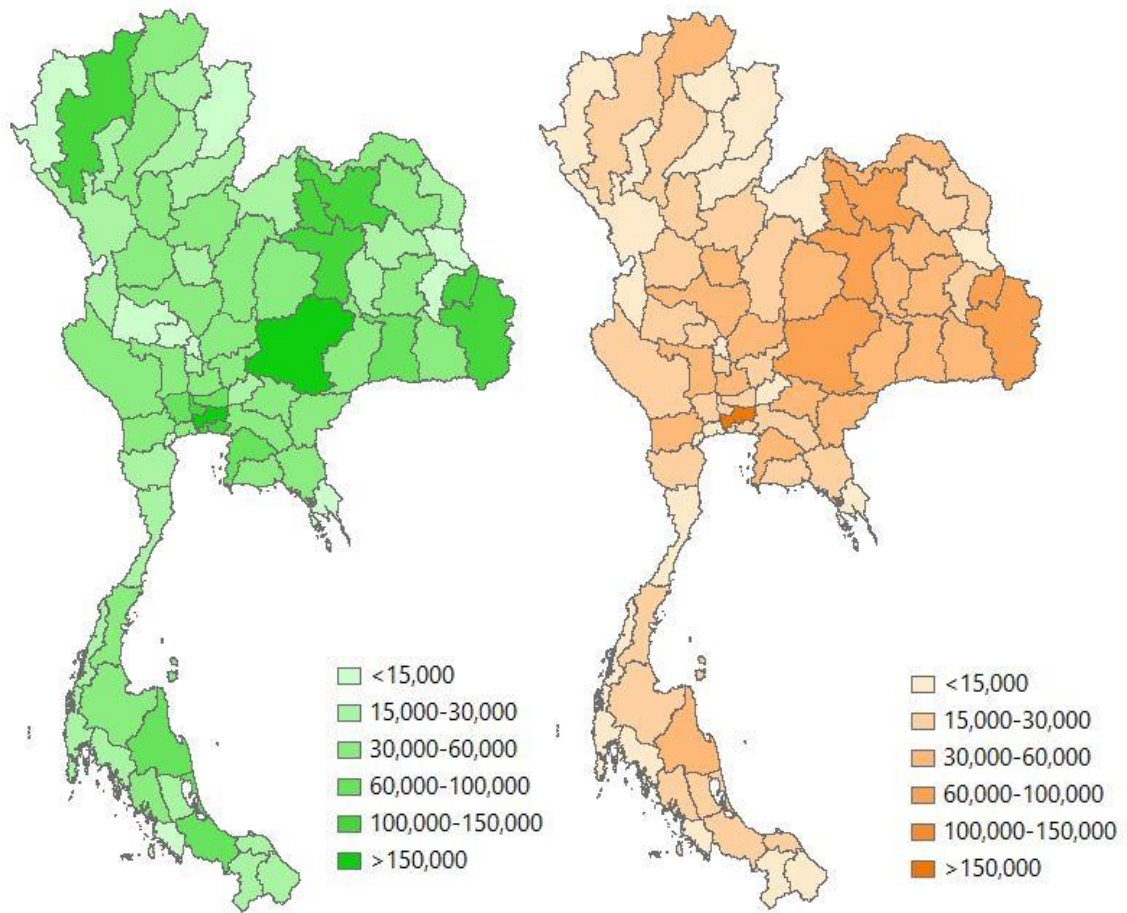
Figure 15 The map of Thailand by provinces with numbers of in-migrants (left) and out-migrants (right) during 1985-1990
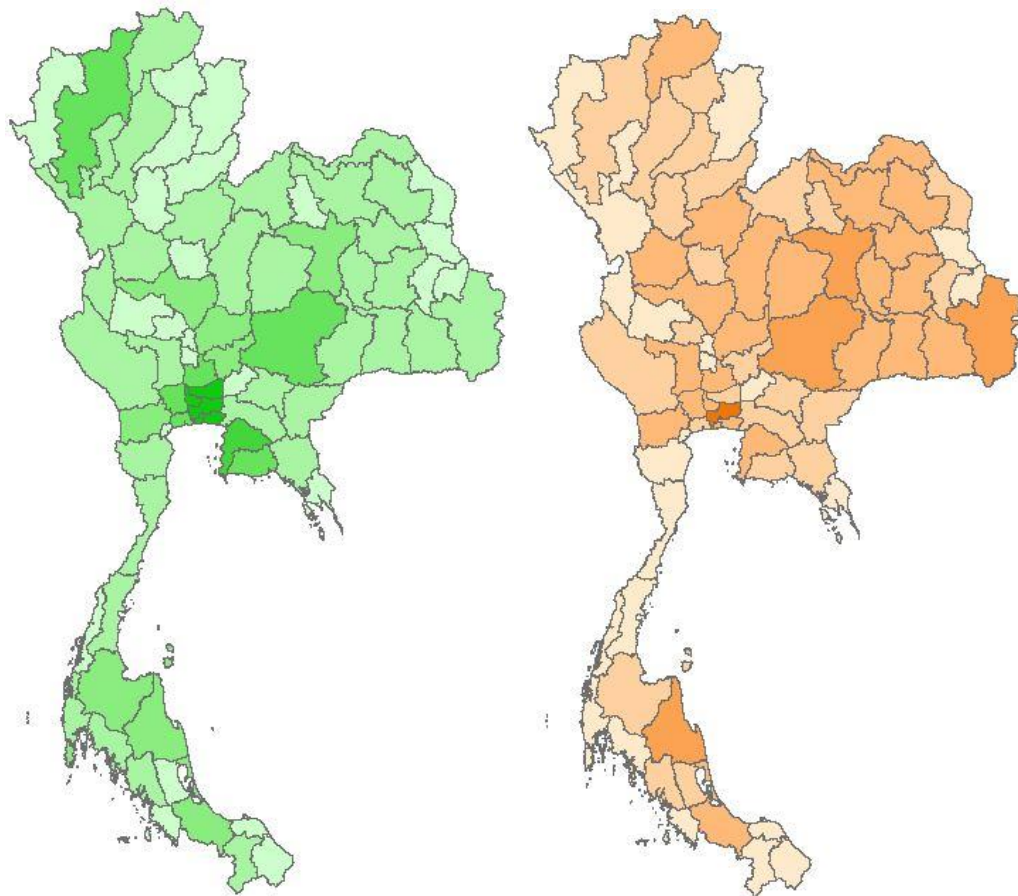
Figure 16 The map of Thailand by provinces with numbers of in-migrants (left) and out-migrants (right) during 1995-2000
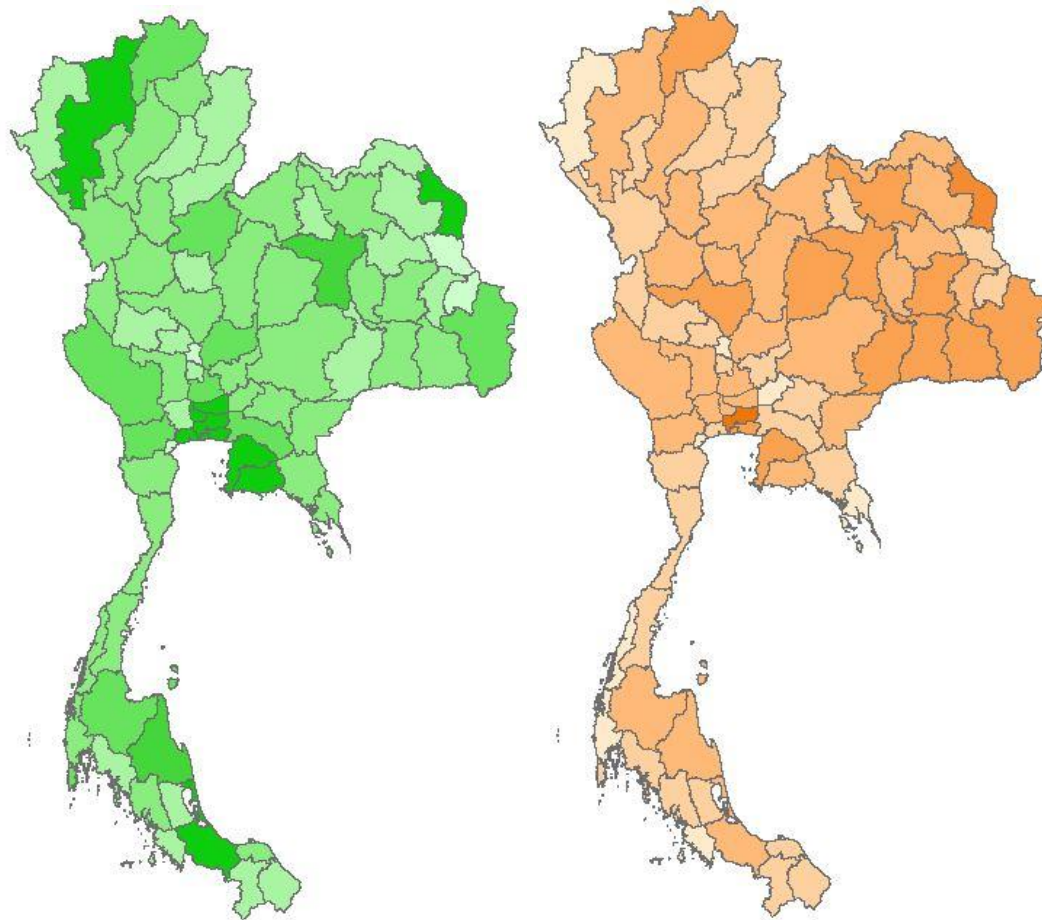
Figure 17 The map of Thailand by provinces with numbers of in-migrants (left) and out-migrants (right) during 2005-2010

Phenomenal numbers of migrants to the second-ranked Samut Prakan province made it even more urban. Owning to small areas of Nonthaburi and Pathum Thani (1552.1 and 1525.8 km^2 respectively), it was hardly possible for over ten thousand people to migrate in the two provinces and be employed in agricultural activities. Hence, non-agricultural sectors in the provinces must have increased due to loads of in-migrants; that is to say, Nonthaburi and Pathum Thani were urbanized. Chonburi, ranked fifth, is located on East-region coast to the Gulf of Thailand which its capes and gulfs are appropriate for sea ports and transportation industry. An industrial boom appeared in the province since 1990s, the Eastern-Seaboard project as an example (Laksana Leuprasert 1995), correspondingly with 137,499 in-migrants during 1996-2000, and 137229 during 2006-10. The total in-migrants between 2006-10 of top five provinces was 1,684,419; it accounted for 45.6 percent of whole country's total in-migrants implying that the top five provinces were good representatives.

Table 10 Number of In-migrants and out-migrants over three periods, top provinces

10a) Top in-migrant provinces

Province	Number of Migrants (Rank) 1986-1990	Number of Migrants (Rank) 1996-2000	Number of Migrants (Rank) 2006-2010
Bangkok	713,880 (1st)	526,373 (1st)	899,958 (1st)
Samut Prakan	109,048 (2nd)	177,639 (2nd)	191,159 (4th)
Pathum Thani	59,090 (6th)	169,801 (3rd)	229,211 (2nd)
Nonthaburi	103,483 (3rd)	153,924 (4th)	137,229 (5th)
Chonburi	58,517 (7th)	137,499 (5th)	226,862 (3rd)

10b) Top out-migrant provinces

Province	Number of Migrants (Rank) 1986-1990	Number of Migrants (Rank) 1996-2000	Number of Migrants (Rank) 2006-2010
Bangkok	256,989 (1st)	408,263 (1st)	427,353 (1st)
Nakhon Ratchasima	83,889 (2nd)	84,830 (2nd)	109,248 (2nd)
Khon Kaen	80,569 (3rd)	68,871 (3rd)	96,002 (3rd)
Ubon Ratchathani	68,707 (4th)	62,656 (4th)	81,977 (6th)
Udon Thani	63,986 (5th)	59,633 (6th)	79,975 (7th)

The highest number of out-migrants over three migration periods was also found in Bangkok due to its urban characteristics such as cost of living and environmental quality. Bangkok brought developed transportation channels to nearby provinces and suburbanized them. It was found that destinations of Bangkok's out-migrants were its neighboring provinces: Pathum Thani, Samut Prakan, and Nontha Buri. Lower pollution, cheaper cost of accommodation, and indifference in transportation to the capital city might have been the incentives of the migrants to leave Bangkok for those provinces (Nabangchang 2000, p. 3). Located in Northeast region, the other four provinces with largest out-migrants were Nakhon Ratchasima, Khon Kaen, Ubon Ratchathani, and Udon Thani. Migrants from the four provinces had got Bangkok for their major destination. The migration origins and the destination confirmed a 'rural-urban migration'.

Regional leveled migration data can be found in the full report of Population Migration Survey since 1994 and are provided annually since 2008. In 1995, Mahidol University's Institute for Population and Social Research published *National Migration Survey of Thailand* using the statistics. According to the survey report, rural-to-rural had been the migration type in the country before 1970 (Institute for Population and Social Research, 1995). In 1995 at the time of survey, Bangkok accounted, as an origin or a destination, more than 55 percent of total regional migration

(Institute for Population and Social Research, 1995).

For a deep-dive analysis on tendency of migration, finding the most related indicator to number of migrants in each province should be done. Ishtiague (2013, 47) mentioned two distinctive kinds of migration factors: factors supporting in-migration, called pull factors, and factors forcing out-migration called push factors. Upon economic aspect, for example, push factors are unemployment, lack of land, poverty; while pull factors are perception of high wages, job opportunities, etc. Besides classifying push-pull factors, there are PEST factors affecting migration: political, economic, social, and technical factors (Ullah, 2004). Rural-urban migrants go for better income, which is an economic factor. Correspondingly, the major reason of overall migrants in Thailand during 2005-2010, reported in *Thailand Population Census 2010* (Thailand National Statistical Office, 2010) was work-related reason at 41.6 percent of total migrants. Of the top five in-migrant provinces, the average 48.8 percent was for reasons of works; it can be implied that economic factors affect most on migration.

GDP per capita by province is a practicable indicator representing economic factors; it shows an average value of products by a person in a province. Provinces with high GDP per capita mean that people can make high values from production, while low GDP per capita is found in provinces where people make small values from production. Finding relation between the economic indicator and migration, this study calculates percentage of in-migrants – number of in-migrant in five-year period divided by total population in last year of the period. Using in-migrant data in percentage form is necessary to cut influence of population growth. Figure 18 shows the GDP per capita by provinces in 1990 and 2010 of the country. In 1990, the region with lowest per-capita GDP was northeast, only 13,606 Baht, and it had very low percentage of in-migrants during 1985-1990 at 2.75 percent. Conversely, Central region had 31455 Baht GDP per capita, or 4.75 times higher than which of Northeast, and had high percentage of in-migrant at 7.57 percent during the period. Furthermore, GDP per capita of Northeast constantly remained the lowest along the reference period, and still maintained the same level of in-migrant percentage (2.69 percent) during 2005-2010. (In 2010 Central region had 217,469 Baht GDP per capita with 11.26 percent in-migrant percentage.) The indicator could answer the doubt mentioned earlier why there has not been an increase in Northeast since 1986.
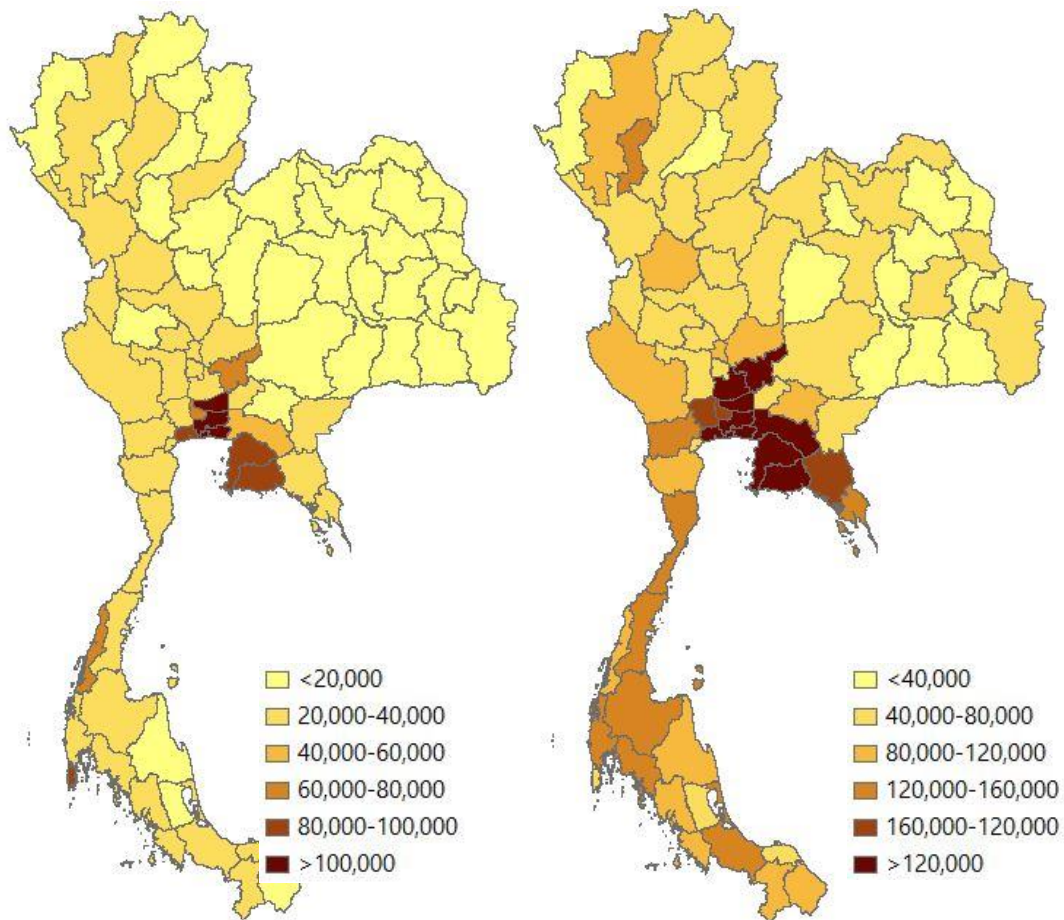
Figure 18 The country map of GDP per capita (in Baht) by provinces in 1990 (left) and 2010 (right)

Per-capita GDP of all 76 provinces in 1990 and 2010, accompanied by in-migrant percentage over last five years of 1990 and 2010 were plotted in Figure 19 respectively in time manner. It was found that there was a linear positive relation between the two variables in both periods. The correlation coefficient between GDP per capita and in-migrant percentage in 1990 and in-migrant percentage over 1985-1990 was 0.838, while which in 2010 and in-migrant percentage over 2005-2010 was 0.767. It can be seen that the relation fitness between the two variables tended to decline gradually, meaning there would be other exogenous effects to some extent. For instance, GDP per capita in each province grow unequally expanding gap between then wider and wider. Particularly Rayong province's GDP per capita rocketed from 82,048 Baht in 1990 to 1,192,412 Baht in 2010 (or for 14.53 times), whereas its in-migrant percentage rose from 6.38 percent (1986-1990 period) to 14.54 percent. That means the growth of GDP per capita excessed capacity of the province to support in-migrants for accommodation or jobs. In which happened in Chonburi, the same industrial boom occurred in Rayong province under the (IEAT) project, centered in Mabtapud district (Aruninta 2012, 1551). Nevertheless, provinces with high per-capita GDP induced people to move in, meanwhile which with low per-capita gives people no incentive to

migrate in. Confirmed by the statistical parameter, it can be concluded that per-capita GDP majorly influences provincial level in-migration in positive way.

Figure 19 Association between per-capita GDP and in-migration of all provinces

19a) Per-capita GDP in 1990 and percent in-migrant during 1986-90
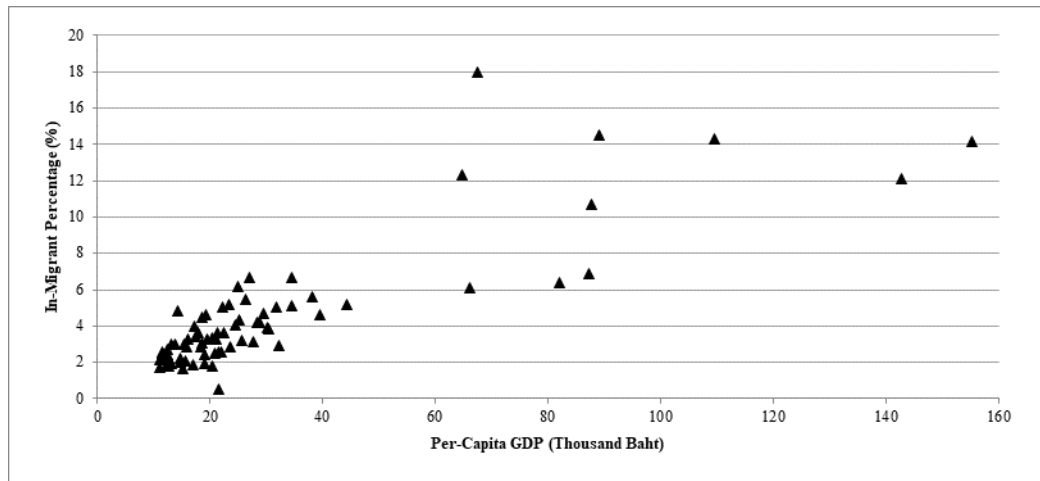
19b) Per-capita GDP in 2010 and percent in-migrant during 2006-10
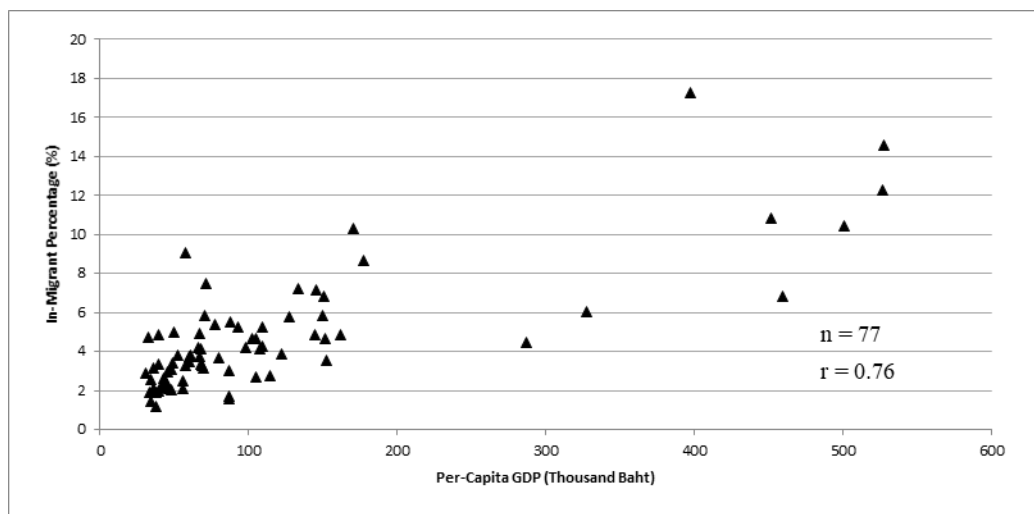
To illustrate the overall thirty-year relations between per-capita GDP and inter-provincial migration, Figure 20 shows per-capita GDP growth of each province together with average three-period net-migration percentage. It shows the same trend with the correlation coefficient of 0.767.
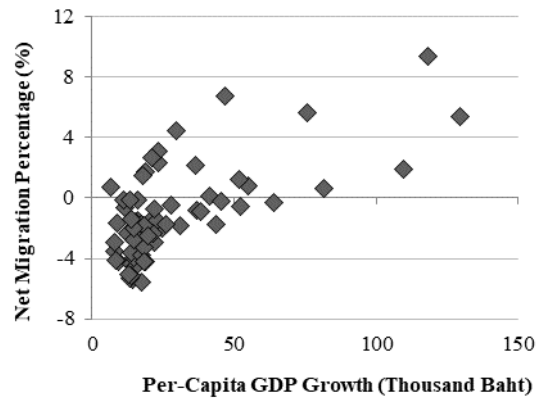
Figure 20 Association between per-capita GDP growth and net migration during 2006-2010 of all provinces

People normally do not migrate evenly by age group. There should be effects of rural-urban migration on population structure in rural area. Figure 21 presents proportion of out-migrant during 1985-1990 by age group from Bangkok, Nakhon Ratchasima, Khon Kaen, Ubon Ratchathani, Udon Thani, and whole country. Based on the figure, out-migrants aged 20-24 to the four Northeast provinces, for both male and female, accounted for highest percentage between 25.9-30.3 percent for both sex. Furthermore, whole country had highest 20.9-23.4 percent out-migrant in the same age group (20-24 years old), meaning there were similar age structures of out-migrants in other provinces as well. Still, age-group proportions between sexes were different. Overall in age group 15-19, male out-migrants accounted for only 11.1 percent of total male out-migrants, while female ones were 15.9 percent of total female out-migrants. Osaki (1999, 451) suggested a reason behind that female workers are preferable for service and commerce sectors, which are increased in urban development.

Bangkok

Nakhon Ratchasima
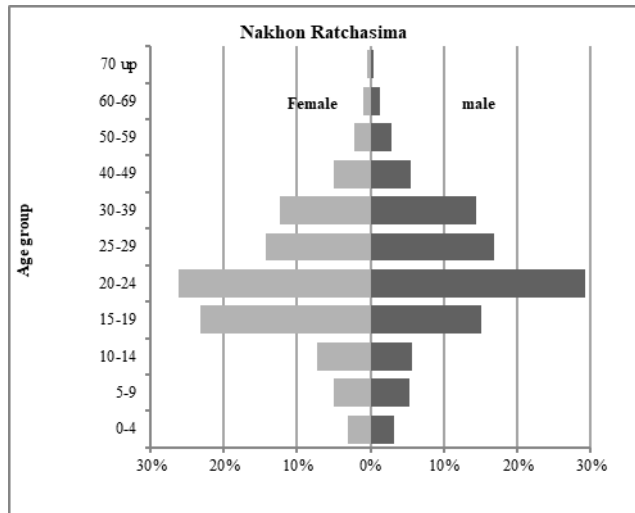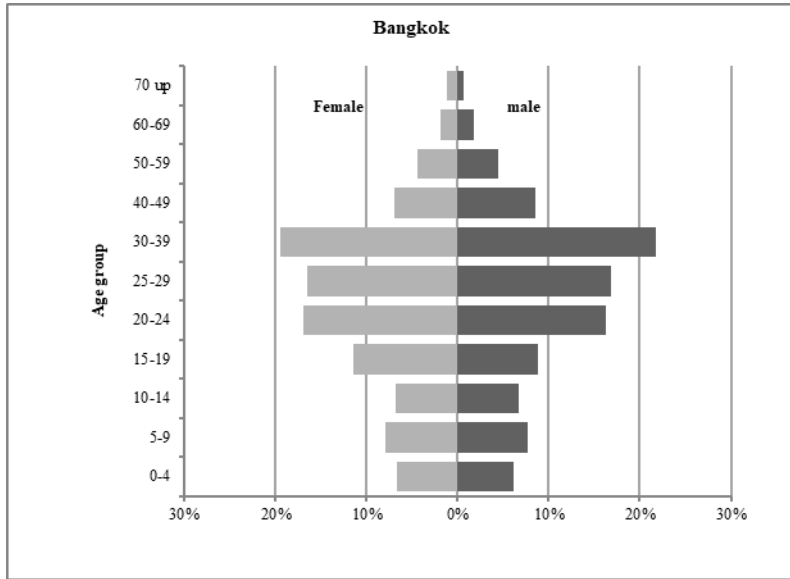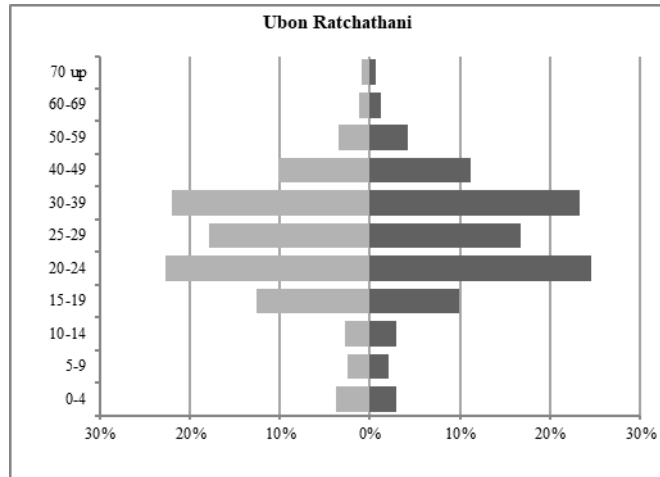
Khon Kaen

Figure 21 Age structure of out-migrants from Bangkok, Nakhon Ratchasima, and Khon Kaen during 1985-1990
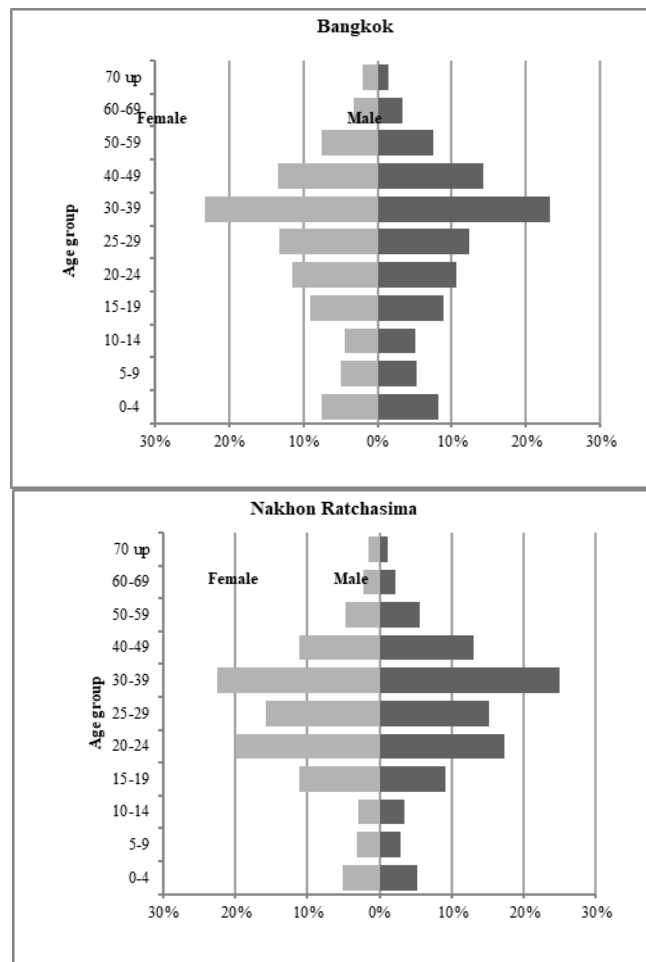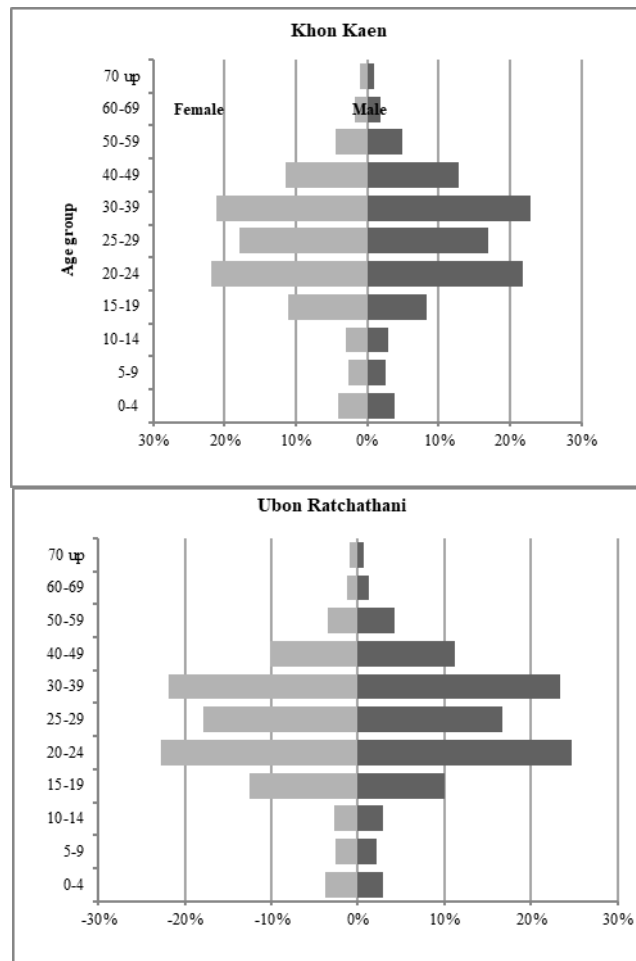
Figure 22 Age structure of out-migrants from Bangkok, Nakhon Ratchasima, and Khon Kaen during 2006-2010

Out-migrants from Bangkok were mainly to suburban provinces nearby; in opposite to in-migration, it was not rural-urban. The age proportion of out-migrants from Bangkok differed from out-migrants from other provinces. These aged 30-39 from Bangkok were 21.7 percent in male and 19.4 percent in female, but overall country were only 16.5 percent and 14.6 percent in male and female respectively. These results are corresponded with the reason mentioned earlier about moving out from Bangkok to suburban for cheaper cost of living, since the age group was appropriate and usually affordable to do so. However, the age proportion in the four provinces -- Nakhon Ratchasima, Khon Kaen, Ubon Ratchathani, and Udon Thani -- changed gradually over periods; the percentage of out-migrants aged 20-24 decreased by 10 percent to around 17.2-22.6 percent, while the percentage of those aged 30-39, together with age group 40-49, increased by 5-7 percent for both sexes. Whole country's average percentages of out-migrants aged 30-39 and 40-49 also increased by 5 percent from period 1986-1990 to 2006-2010; that means out-migrants from many provinces tended to be older.

4.3 Impacts of rural-urban migration on agricultural population

This study found that there were two main impacts of rural-urban migration on agricultural population in Thailand: less agricultural worker percentage, and higher aging agricultural worker proportion.

Out-migrants leave agricultural sector and enter modern sectors in urban provinces via migration (Aemkulwat, 2010). The agricultural worker percentage is a proportion of number of agricultural workers on total number of workers aged 15 and over in given province. Data on agricultural worker numbers and total worker numbers in each province are provided in *Thailand Population and Housing Census* (Thailand National Statistical Office, 1980; 1990; 2000; 2010). Figure 23 compares the map of agricultural worker proportion in 1980 and 2010. It can be seen from the figures that East region has the most dramatic drop in agricultural worker percentage from 1980 to 2010, falling from 66.3 percent to only 37.1 percent. Central region was still the most urbanized region in 2010. In spite of falling by 15.5 percent, Northeast region still had highest percentage in 2010 at 73.8 percent. The decreasing agricultural worker percentage may partly be caused by other factors, e.g. within-province migration, but the effects were little. During the period 1995-2000, 15.1 percent of total migrant moved within province, especially from non-municipal area in the same province. During 2005 and 2010, intra-provincial migration from non-municipal areas was only 11.6 percent of total migrants. Even it does, the within-province migration might have affected only a little. Negative 22.8 percent was the changes in agricultural worker percentages of the whole country, whereas municipal population percentage rose by 27.17 percent. Inter-province migration percentages, from non-municipal area of total Thailand population, were 2.79 percent during 1995-2000 period and 2.62 percent during 2005-2010 (no available data in 1985-1990). Supposed that the percentages were constant, there may have been 17.33 percent of total population who migrated from non-municipal areas across provinces over 30 years. Thus, it is possible that 17.33 percent out of the 22.8 percent fall was because of migration to more-urban provinces, and transfers from agricultural sector to modern sectors.
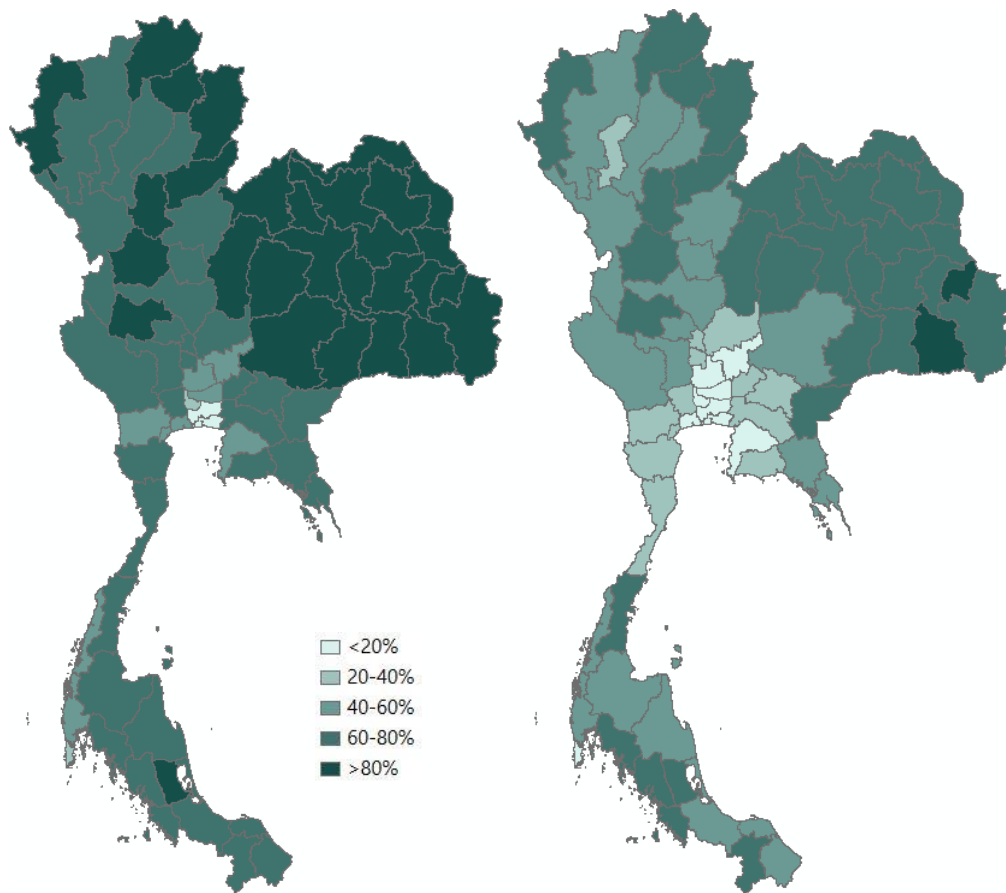
Figure 23 The country map of agricultural worker proportion in 1980 (left) and 2010 (right)

Viewing in provincial level, the highest fall in agricultural worker percentage was found in Rayong, by 45.3 percent from 70.0 percent in 1980. The plunge proves the industrial boom reason mentioned earlier. On the other hand, Bangkok declined by 4.3 percent to 0.6 percent, thanks to its formerly low number. The four Northeastern provinces – Nakhon Ratchasima, Khon Kean, Ubon Ratchathani, and Udon Thani – had significant drops by 32.7 percent, 23.5 percent, 14.4 percent, and 19.4 percent respectively. These were an echo of ex-agricultural out-migrants.

As a consequence, Rural-urban migration changed age structures of agricultural population in rural area. Most of out-migrants who were previously in agricultural sector were young adults. Thus, the move-out ones would make the elderly proportion of agricultural worker; that is to say, it may lead to aging agricultural society in rural areas. This research introduces 'percent aging agricultural worker' to specify how much agricultural working society becomes old. The indicator refers to number of agricultural workers with 60 years old and over (in a specific province) divided by the total number of agricultural workers in the province. Table 11 summarizes the aging percentages of agricultural workers by region and the whole country in 1980 and 2010.

Table 11 Percent aging agricultural workers by region in 1980 and 2010

Region	Year	
	1980	2010
North	4.92	13.89
Central	7.70	18.57
Northeast	4.97	16.91
West	6.75	14.59
East	6.66	15.89
South	7.90	12.72
Whole country	6.63	16.02

In 1980, the average percent aging agricultural worker of Thailand was 6.6 percent. The province with highest aging agricultural percentage, located in Northern region, was Phayao (3.3 percent), while the province with lowest one was Nonthaburi, 12.8 percent, located near Bangkok. Young agricultural workers in Nonthaburi might have been impelled entering modern sectors in the capital city properly. Nakhon Ratchasima, Khon Kaen, Ubon Ratchathani, and Udon Thani got aging agricultural worker proportion, respectively, at 5.9, 4.67, 5.8, and 4.0 percent. From 1980 to 2010, age structure of agricultural population dramatically shifted. There were as many as 48 provinces that the aging agricultural proportions increased more than 8 percent over 30 years. In Northeast region, there were 18 provinces with over 16 percent aging agricultural workers in 2010, causing itself the region with oldest agricultural worker, which equals 12.4 percent increasing from 1980. Thailand's average aging agricultural worker percentage seriously rose from 6.6 percent in 1980 to as high as 16.02 percent in 2010. The increasing percentage might have been affected by decreasing agricultural worker. As an overview, Figure 24 shows the map of Thailand by provinces with percentage of aging agricultural workers in 1980 and 2010.
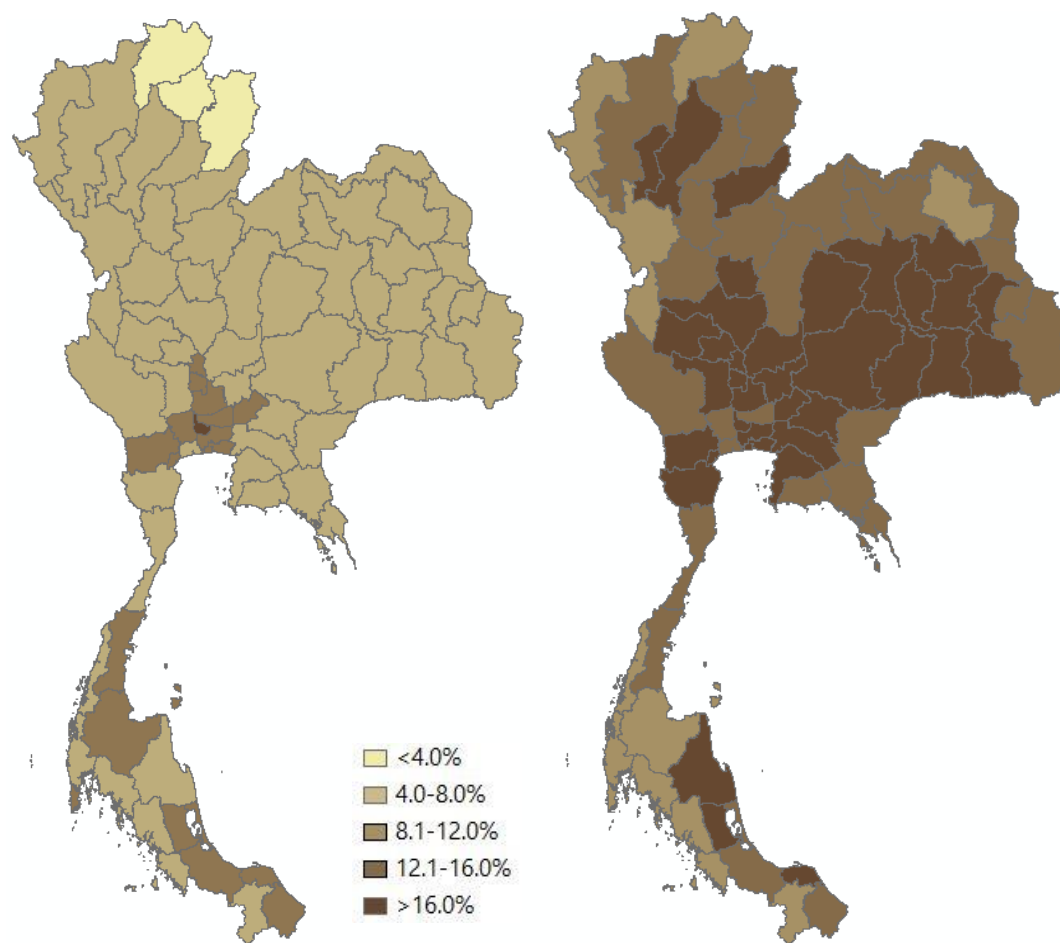
Figure 24 The country map of agricultural worker aging proportion in 1980 (left) and 2010 (right)

Moving to provincial level, Kalasin province in the Northeast region had the highest rise in the percentage, by 20.8 percent. Changes in agricultural worker ages of top four Northeastern provinces with highest out-migration from 1980 to 2010 are shown in Figure 25 and Figure 26. According to the figures, the age group 15-19 years old had highest proportion, 18.2-19.9 percent, in 1980. The second highest age group was age group 20-24, between 15.1-16.4 percent. The percentage of whole state was similar to those four provinces, so the provinces are good representative provinces. (The whole-country percentages were 18.3 percent for 15-19 years old, and 15.5 percent for age group 20-24) The 60-and-older group proportions for the four provinces were 4.0-5.9 percent.

Between 1980 and 2010, noticeable changes occurred in agricultural worker's age structure throughout the country. In 2010, 3.4 percent of total agricultural population was 15-19 years old. Likewise, the proportion in age group 20-24 was 5.2 percent. The age group with the highest percentage in 2010 was 40-49 years old, at 26.8 percent, increased from 1980 by 9.7 percent. The four representative provinces in Northeast region had the same trend over 30 years. 2.4-6.2

percent was found in age group 15-19 of the four provinces. The agricultural aging groups in year 2010 were 14.1-17.9 percent. This means the age-structure moved to older groups, insuppressibly aging group. Agricultural workers aged 50-59 is considered because it is the last age group before elderly states. That nearly-old group's percentages of the four delegates jumped from 8.4-10.8 percent in 1980 to 18.0-24.3 percent in 2010. This implies that aging agricultural worker proportions are going to vastly expand in 2020.
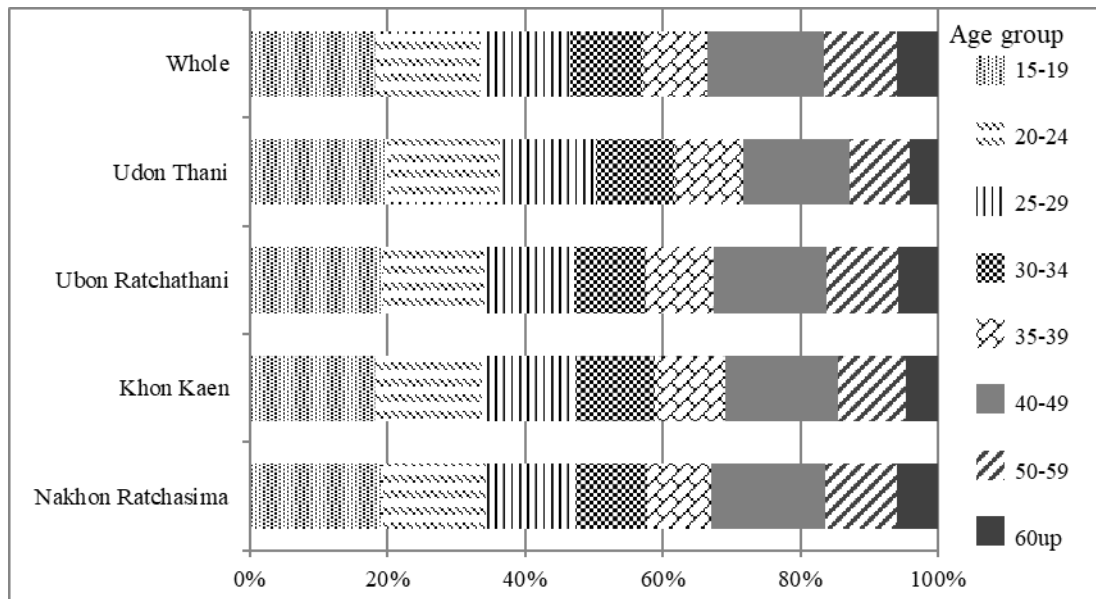
Figure 25 Agricultural worker numbers by age groups of the four representative provinces in 1980
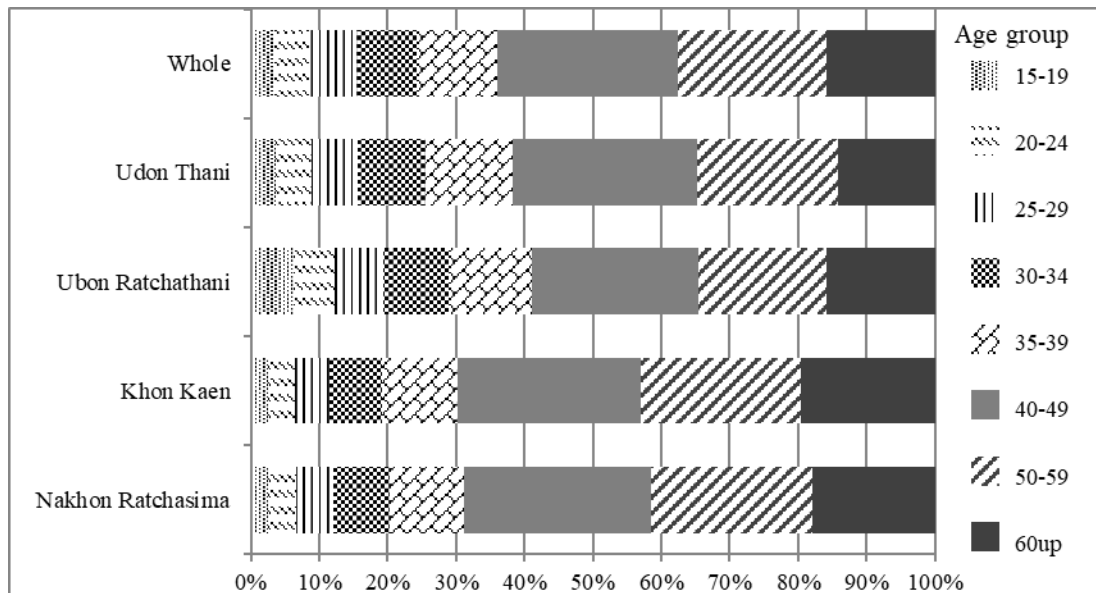
Figure 26 Agricultural worker numbers by age groups of the four representative provinces in 2010

Statistical techniques are important to analyze influence of rural-urban migration on agricultural

age structure. The variables taken into account in the analysis were percent out migration as an independent variable, and percent aging society as a dependent variable. Both parameters are in provincial level. Since there were three periods with each five-year interval (1985-1990, 1995-2000, and 2005-2010), number of out-migrants in each period were summed and then divided by total population in year 2010 for independent variable. Calculation of the dependent one, which had a 30-year interval, the differences of percent aging agricultural worker in 1980 and the one in 2010 were calculated; that is to say the change in percent aging agricultural worker are shown in Figure 27. As can be seen by scatter diagram, a good association between the two variables was found. It is seen that provinces with high average out-migrant percentage also had a huge gap in percent aging workers, and vice versa. Correlation coefficient of the two variables was 0.61, so the positive relation is moderate strong.

What goes wrong when agricultural workers in rural areas grow old? The Office of the National Economic and Social Development Board, Thailand (2012) reported that total agricultural product with constant price of year 1988 has been growing for every region, especially South region that increased by 3.3 times from 1981 to 2009. Leturque and Wiggins (2011) also stated that labor productivity in Thai agriculture has been rising from 1989 to 2007, 2.4 percent year by year. However, the number of agricultural workers has decreased from 20 million in 1990 to 16 million in 2010, as well as indifferent agriculture land area from 17.47 million hectares in 1988 to 18.01 in 2008. Concurrently, still there has been overwhelming inflow of immigrants from neighboring countries namely Myanmar, Cambodia, and Lao, which push Thai government to admit Memorandum of Understanding (MoU) in 2006 for better control over them (Walsh and Ty, 2011). According to Office of Foreign Workers Administration (2012; 2013), in 2012 totally 940,531 immigrants were registered and accepted under the MoU; in 2013 the number shot through 1,155,826. The number yet does not include a large group of unregistered illegal migrants. Registered immigrants are mainly at construction works (27.0 percent) and agriculture-related works (19.3 percent). It must be incoming migrant labor takes part in compensating agricultural shortage in rural area of the country.
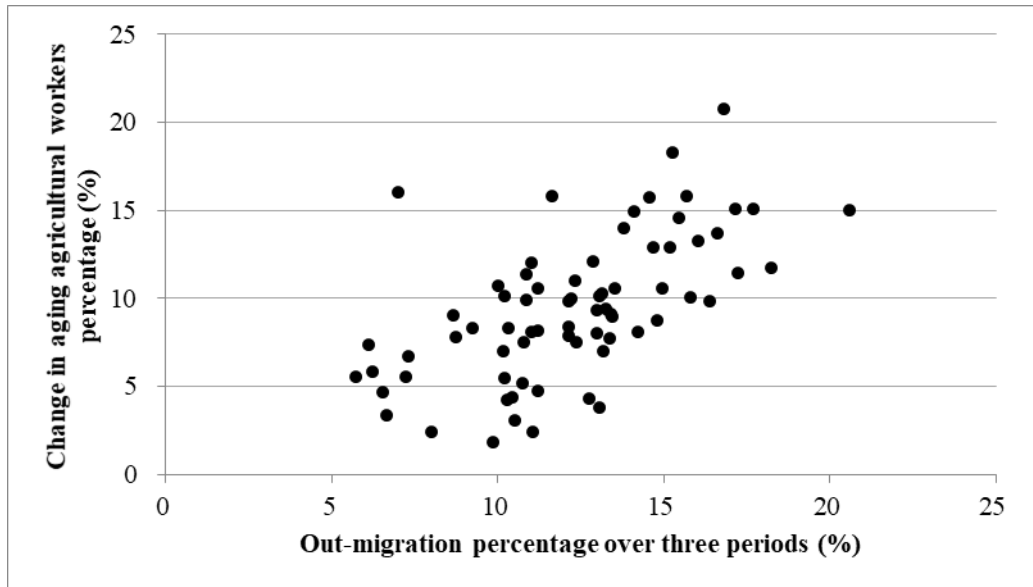
Figure 27 Associations between out-migration and aging proportion of agricultural workers over three periods

4.4 Summary

Predominated urbanization progressively attracted inter-province migration, specifically rural-urban migration. The impending inter-provincial migration to provinces with higher GDP per capita has two-fold impacts on rural agricultural labor percentage and shifting age structure of agricultural workers. Continually young and middle-aged workers have been leaving the agricultural sector in their origin provinces for modern sectors in urbanized provinces, resulting in more percentages of aging agricultural workers. Future consequences are analyzed in the next chapter, as well as impacts to agricultural society.

CHAPTER 5

PROJECTION OF THAILAND'S AGRICULTURAL POPULATION TO 2040

Thailand's governments have taken into practice the *National Economic (and Social) Development Plan* since 1961 to accelerate industries, developing the country towards an advanced economy (Talukder and Chile, 2013). This made the agricultural proportion of the GDP fall to 0.09 percent in 2015; consequently, it is dubious how many agricultural workers will be left in future. Hence, population projection should be an important key to efficient planning for future economic and social challenges.

There are some studies projecting population size in Thailand. Wongboonsin, Guest, and Prachuabmoh (2205) projected population to 2025 and suggested implications of demographic dividend – benefit derived from demographic change. Kachanubarn (2010) adjusts projections of NESDB, and of the United Nations' Population Division, to estimate elderly health variations by area of residence. The future well-beings of people in Thailand are previewed by Knodel and Chayovan (2008) based on the United Nations projections. However, research regarding population size in the agricultural sector is hardly found. Therefore, this chapter predicts Thailand's agricultural population structure in year 2040. This is based on a best-case scenario to emphasize that the real situation will certainly be worse than this chapter's projection result. Also, the projection focuses on population with Thai nationality. After reviewing past population changes in both agricultural and non-agricultural sectors from 1980 to 2010, tendencies of each projection element will be analyzed and extrapolated to the future. Consequences of the predicted agricultural population structure on society are discussed to introduce how the projection results can be applied to various issues.

5.1 Agricultural workers and non-agricultural workers in Thailand from 1980 to 2010

First thing is to review past year statistics of workers from 1980 to the launch year, 2010 (NSO, 1980; 1990; 2000; 2010). Numbers of agricultural workers and non-agricultural workers by age group and sex in 1980 and 2010 are compared in Figure 28 (left side, female; right side, male). A worker is defined as a person aged 15 and older who is engaged in economic activities in the year of the survey (NSO, 2010). An agricultural worker is engaged in agricultural works, and a non-agricultural worker is engaged in industries other than agriculture. In 1980, agricultural workers accounted for 70.75 percent of total workers with an expanding pyramid, age group 15-19 had the highest number of agricultural workers at 2.85 million, whereas the number of non-agricultural workers was the highest in age group 20-24 at 1.08 million. Age structures of workers in both sectors largely shifted between 1980 and 2010. A rapid contracting pyramid of worker population in 2010 was observed. Agricultural worker numbers between 15-19 years old dropped to only 0.58 million. That caused the age group 40-44 to become highest; while which of

non-agricultural workers shifted to 30-34 years old, 1.56 million. Moreover, in 2010 workers in agricultural sector were only 43.63 percent of total workers. For this reason, agricultural workers were older than in non-agricultural sector. This study projects the pyramids of both sectors in 2020, 2030, and 2040, to forecast the future of workers' age structure changes.
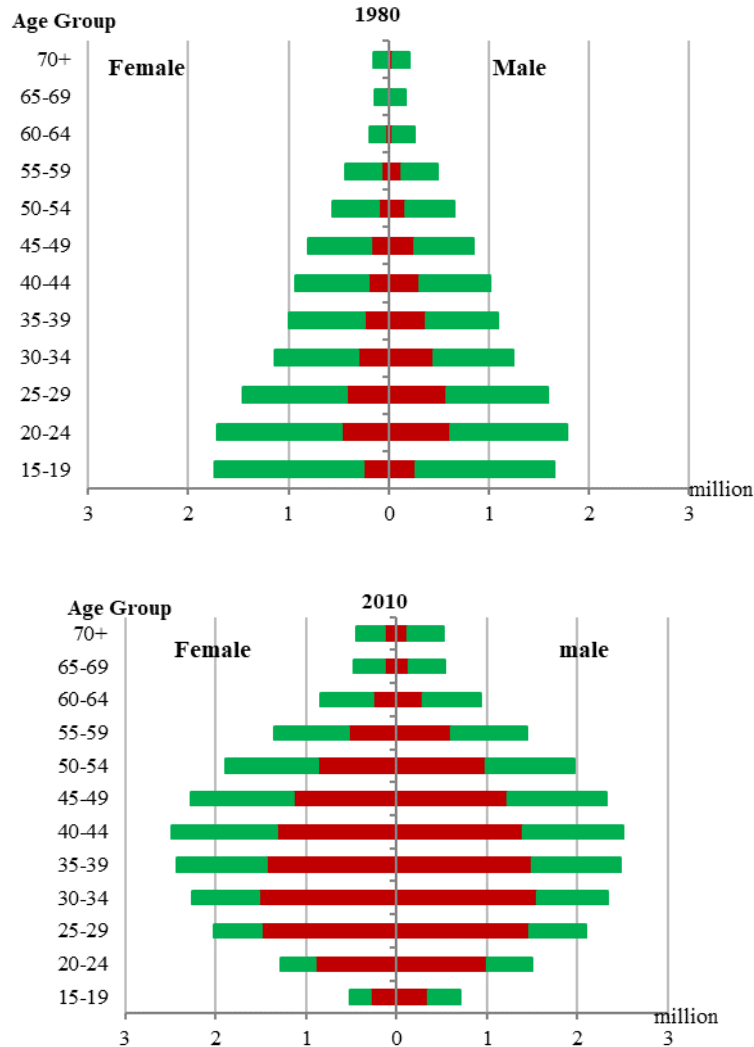
Figure 28 Number of population in 1980 and 2010 by age group, sex, and sector

■ working in agricultural sector, ■ working in non-agricultural sector)

5.2 Methods and Procedure

Agricultural workers always search for available jobs in the non- agricultural sector; therefore, the numbers of workers doing agriculture is highly dependent on the non-agricultural sector. Whole country's population data from 2015 to 2040 were acquired from *Population Projections for Thailand 2010-2040* (NESDB, 2013). The projection used the cohort component method to four fertility scenarios and increased life expectancy at birth from 70.4 to 75.3 years for males and from 77.5 to 81.9 for females. This study uses a scenario in which total fertility rate (TFR) gradually decreases from 1.62 to 1.30 in 2040.

Since the goal is to project numbers of agricultural workers by age and sex, there are adaptations of projection components to the conventional method, as shown in Figure 30. There are three components for the conventional cohort method – Birth, death, and migration. This applies to any cases of general population aspects such as urban population, rural population, ethnic population, etc. When it comes to numbers of workers, as the definition is changed, the components are also changed. A worker means a person ages 15-year-old and over that is engaged in agriculture mainly in a specific year, so birth is not considered. Instead of birth, the youngest age group of workers, 15 to 19 years old, who starts working, is the first component. Death is the only component that remains because some workers die. This projection is at whole-country level, so migration is supposed to be ineffective; but the worker's movement between agricultural sector and non-agricultural sector is considered. The diagram below compares the adaptation of components of this thesis, with the conventional one.

Birth	(In general)	Death
Age 0-4	Population	Any age

Migration

Start working	A (This Thesis)	Death
Age 15-19	Worker numbers	Age 15

Worker movement between agri and non-agri

Age 15 +
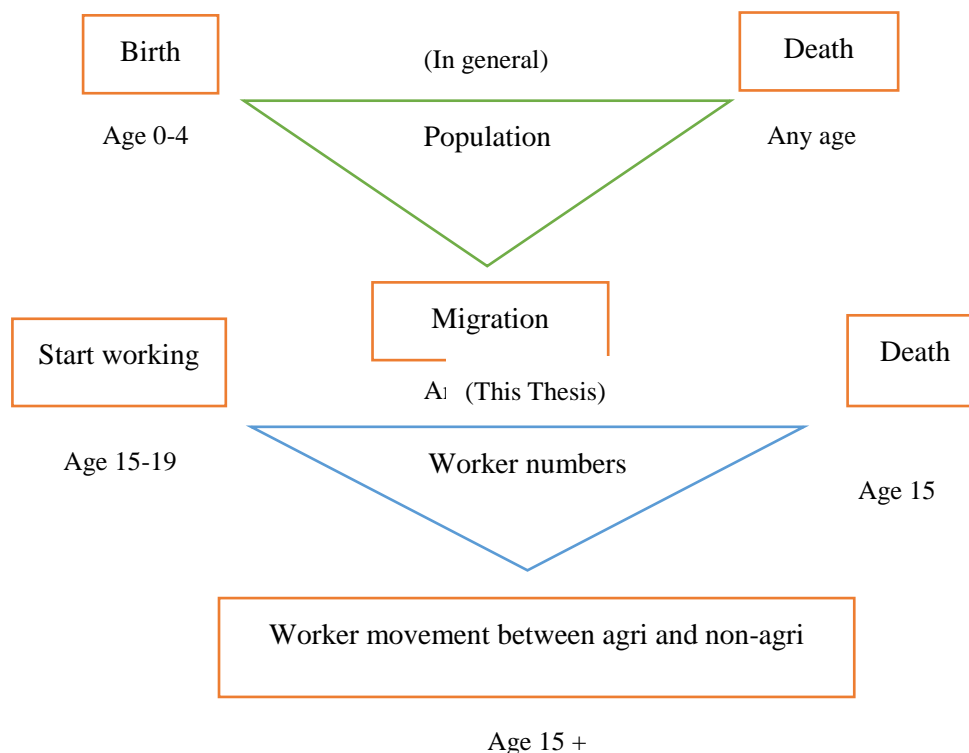
Figure 29 Differences between conventional cohort component projection and this thesis projection

To accomplish an agricultural worker population structure by age and sex to year 2040, there are 5 main elements to consider. Figure 30 presents the conceptual framework of this study. According to the framework, there are three main steps in this study: projecting the numbers of total workers, projecting the number of non-agricultural workers, and calculating the number of agricultural workers in 2040. Elements considered are death rate, survival rate, working population percentage,

worker moving rate (in-out of the agricultural sector), and agricultural sector entry rate. These elements are explained in the following steps.
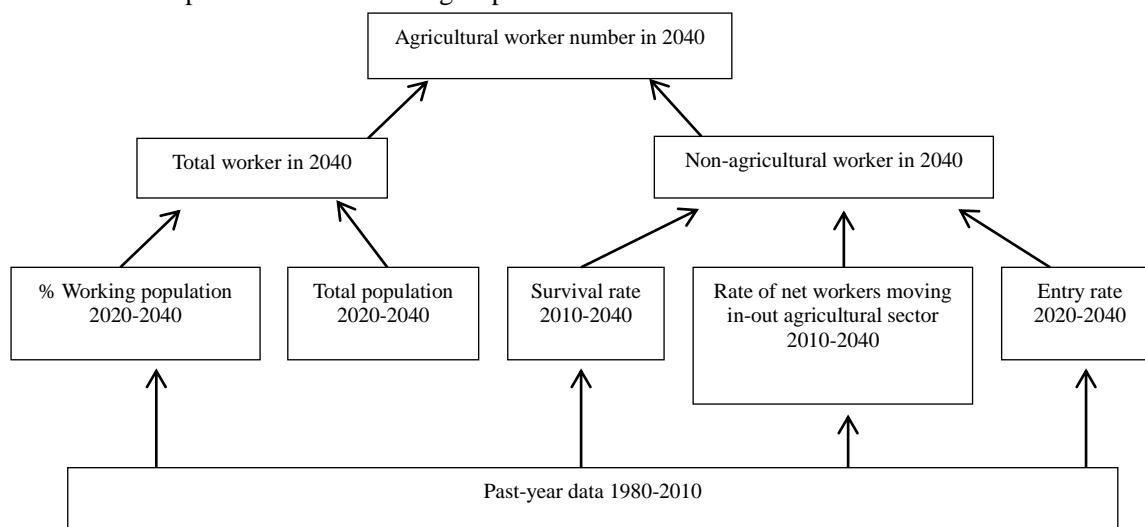
Figure 30 The conceptual framework of agricultural worker projection

5.2.1 Projecting total worker in 2040

The projection requires working population percentage by age group and sex. The percentage is calculated by number of workers divided by the total population in each age group and sex. The decennial worker number and total population data refer to *Thailand National Population Census* (NSO, 1980; 1990; 2000; 2010). Working population percentage trends for every age group from 1980 to 2010 are done by calculating differences in each interval and averaging them. Percent working population in ten-year interval were then extrapolated to year 2040. Consequently, total workers by age group and sex from 2015 to 2040 were calculated. The working population percentage is multiplied by the estimated total population. The total population data from *Population projections for Thailand 2010-2040* are applied (NESDB, 2013).

5.2.2 Projecting Non-agricultural worker in 2040

According to the conceptual framework, the following are detailed procedure needed for finding past trends of workers moving in-out of the non-agricultural sector by age group and sex.

5.2.2.1 Past-year survival rates from death by age group and sex of the whole population are examined. Thailand's Ministry of Public Health provides annual death rate from 1980 to 2010. Because data of the working population are provided every ten years through *Thailand National Population Census*, the survival rates have to be in 10-year intervals as well. Survival rates of each age group and sex from 1980 to 1990, 1990 to 2000, and 2000 to 2010 are calculated.

$$SVR = 1 - \frac{DR}{1000}$$

; SVR_i is annual survival rate from death in year i

DR is annual death rate, number of death per thousand of mid-year populations in year i

$$^{10}_{0}SVR = (SVR_0)(SVR_1)(SVR_2) \dots (SVR_9)$$

; $^{10}_{0}SVR$ refers to ten-year-interval survival rate in a specific age group and sex

5.2.2.2 Percent net workers moving in-out of the non-agricultural sector by age group and sex are calculated from the following formula:

$$^{10}_{0}\%NM = \frac{_5NAW_{x+10} - {_5}SVW_x}{_5NAW_{x+10}}$$

$^{10}_{0}\%NM$ = % net movement in-out non-agricultural sector, 10 years interval

$_nSVW_x$ = number of survived workers age x to x+n

$_nNAW_x$ = number of non-agricultural workers in a specific age x to x+n

5.2.2.3 Differences in rate of net worker moving in-out of the non-agricultural sector were analyzed over three periods: 1980-1990, 1990-2000, and 2000-2010. Variations in the percentage of each age group were analyzed to find convincing future trends. After that, the percent net workers moving in-out of the non-agricultural sector were extrapolated to year 2040. As the projection was in five-year intervals, the percentage needs to be converted from ten-year interval into an identical pair of five-time intervals. Discounting future value is applied to do so. Since $_5NAW_{x+10}$ is the number of non-agricultural workers in year 10, and $_5NAW$ is the number of non-agricultural worker in the start year; a five-year interval rate ($^{5}_{0}\%NM$) is calculated as follows:

$$_{10}NAW_x = {_5}NAW_x(1 + {^5_0}\%NM)^2$$

$$^{5}_{0}\%NM = \sqrt{\frac{_5NAW_{x+10} - {_5}NAW_x}{_5NAW_x} + 1} - 1$$

5.2.2.4 The future whole country's survival rate from death, to year 2040 was calculated. As mentioned earlier, the future rate utilized the projected population data of NESDB (2013) five-year intervals of each age group and sex according to the formula below. This was applicable because only those aged 15 and over were considered; thus, there were no effects from fertility. Therefore, in a specific age group and sex,

$$^{5}_{0}PSVR = \frac{_5POP_{x+5}}{_5POP_x}$$

$_0^5 PSVR$ is future survival rate in five-year interval

$_n POP_x$ is number of population age group x to x+n

5.2.2.5 Numbers of non-agricultural worker in 5-year interval from 2015 to 2040 are estimated. The estimation includes the calculated future survival rate and extrapolated percent net worker moving in-out of the non-agricultural sector with the formula below:

$$_5 NAW_{x+5} \ = \ _5 NAW_x \times {_0^5 PSVR} \times (1 + {_0^5 \% NM})$$

5.2.3 Projecting non-agricultural worker by age group and sex in 2040

There are only two economic sectors in Thailand's economy, which are agricultural sector, and the non-agricultural sector. Therefore, the projected future number of agricultural workers equals the projected total number of workers subtracted by the projected number of non-agricultural workers.

5.3 Projection results

5.3.1 Projected total workers by age group and sex to 2040

Firstly, the percentages of the working population from 1980 to 2010 are presented in Figure 31. In spite of some variations, there was indifferent in trends between male and female. Changes in percent working population among the 12 age groups can be classified in to three types – vast drop, slight increase, and somewhere between. The first type, huge drops, are seen in age group 15-19 and 20-24 for both sexes; while the second type, slight decreases, are found in the males aged 25-59, and females aged 25-54. The third type is somewhere between remaining constant and gradual increase which are found in male groups who are 60 years old plus, and females aged 55 and over.
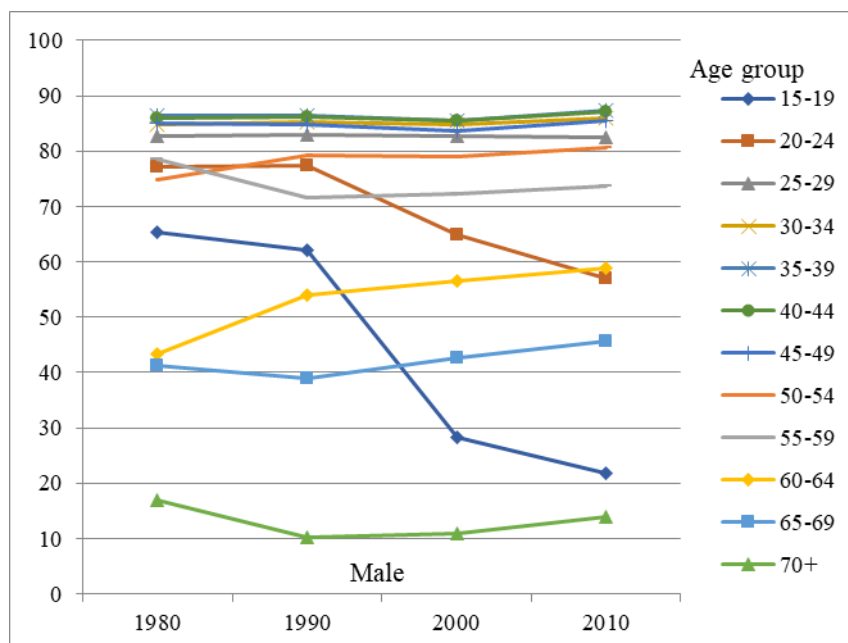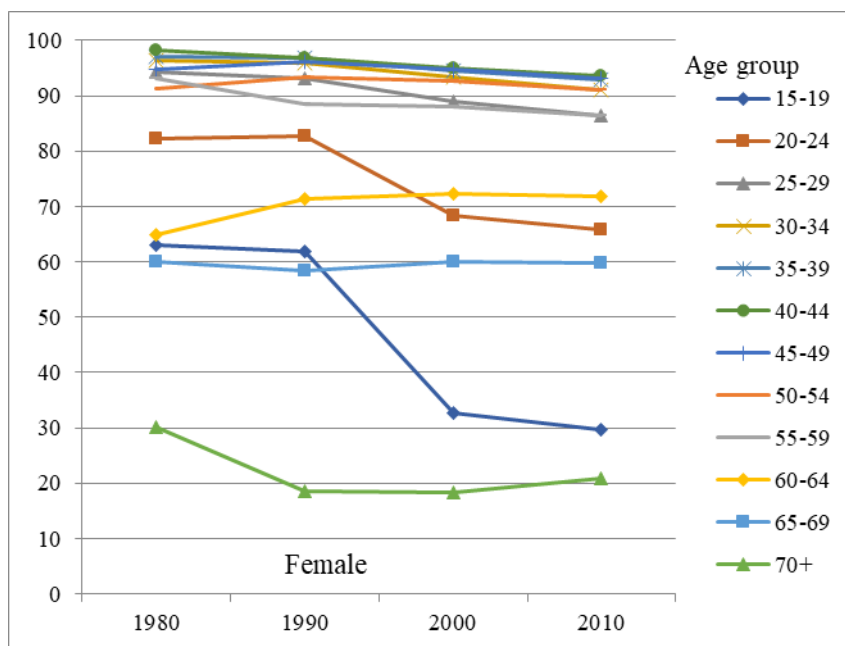
Figure 31 Working population percentage by age group and sex

Extrapolating the average changes in the percentage of working population of each age group from 1980 to 2010 under optimistic conditions, vastly-dropping-type groups (15-24 years old) will remain constant to 2040. The age groups of the rest types (25 years old and over) will decline at the same speed as average changes from 1990 to 2010. In 2040, the percentage of the working population with 15-19 will be 29.61 percent for male and 21.82 percent for females. The highest age group proportions in 2040 will be 45-49 years old males, at 91.61 percent; and of the 35-39 years old females, at 88.37 percent.

The extrapolated working population percentages to 2040 in five-year intervals are multiplied by the population number in every age group and sex derived from NEDDB (2013), to find the number of total workers by age group and sex. Results show that the number of total workers in 2040 will be 35.534 million decreasing from 38.641 million in 2010. Youngest worker number aged 15-19 will decrease from 1.261 in 2010 to 0.841 million in 2040, while the oldest ones will double from 0.976 to 2.842 million. 45-49 years old male will have the highest worker numbers, while the age group 40-44 remains the peak for females. Half of the working population would be older than 45 years old, therefore a huge aging working society in Thailand would be observed in 2040.

5.3.2 Projected non-agricultural worker by age group and sex to 2040

Past-year decennial survival rates together with numbers of non-agricultural workers by age group and sex during 1980-2010 were calculated; it is found that survival rates of almost all age groups and sexes increased over 30 years, probably became of better welfare and public health. Table 12

shows percent net workers moving in-out of the non-agricultural sector from 1980-1990, 1990-2000, and 2000-2010. (Those turning 25-29 and 30-34 years old in 2000 and 2010) Optimistically, net workers moving in-out of the non-agricultural sector between 2000 and 2010 period is extrapolated to 2040. The extrapolation is also converted into five-year intervals using the future discount technique. Also, Figure 32 illustrates past-year net moving rates as well as possible future rates to 2040.

Table 12 The rate of net workers moving in-out non-agricultural sector 1980-2010 by age group and sex

Age group year 0	Age group year 10	Male			Female		
		1980-1990	1990-2000	2000-2010	1980-1990	1990-2000	2000-2010
15-19	25-29	2.60	2.01	3.93	2.28	1.41	3.96
20-24	30-34	0.53	0.45	0.84	0.61	0.52	0.81
25-29	35-39	0.31	0.22	0.36	0.35	0.28	0.31
30-34	40-44	0.26	0.14	0.24	0.30	0.20	0.24
35-39	45-49	0.15	0.04	0.13	0.15	0.07	0.13
40-44	50-54	0.11	-0.04	0.02	0.10	-0.02	0.01
45-49	55-59	-0.08	-0.15	-0.10	-0.17	-0.13	-0.08
50-54	60-64	-0.37	-0.45	-0.35	-0.22	-0.33	-0.26
55-59	65-69	-0.61	-0.56	-0.52	-0.54	-0.41	-0.38
60 and over	70 and over	-0.59	-0.59	-0.52	-0.57	-0.57	-0.45
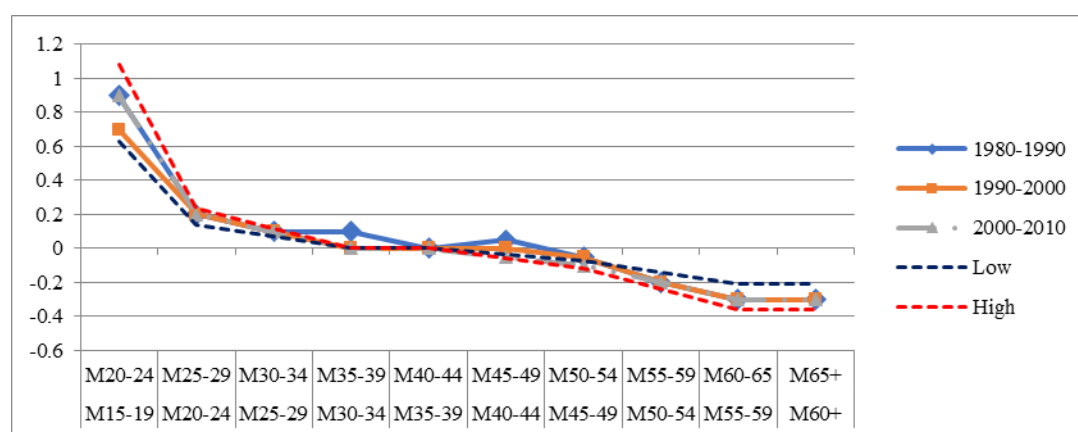
Figure 32 Net movement of workers in-out agricultural sector from 1980 to 2010 and possible scenarios

There were two calculations about workers aged 15-19 that will enter the working sector and the past trends of their entering rates: proportions of non-agricultural worker aged 15-19 of the total

non-agricultural workers – entering rate – in past years. Figure 33 shows entering rates in 1980, 1990, 2000, and 2010. According to the graph, entering rates of females aged 15-19 fell from 10.84 percent to only 2.86 percent, more dramatically than those of males, from 8.36 percent to 3.29 percent. Extrapolation is not practicable in this case because it would become negative. Thus, in 2040 the future entry rates could be either increase to 3.9 or decrease to minimum 2.0 percent. (No middle-income countries below 2.0 percent have been found before) Therefore the optimal scenario, minimum males' rate is fixed at 3.29 percent in 2040 and minimum female rate is fixed at 2.86 percent.
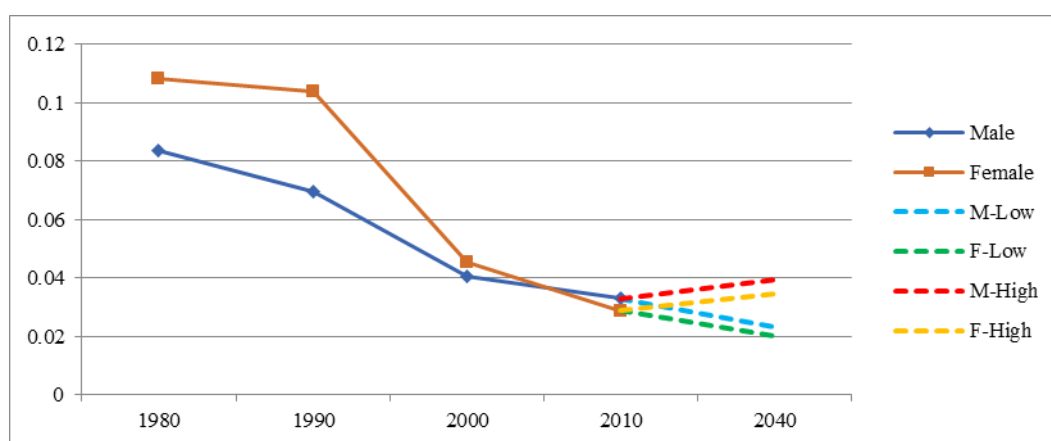
Figure 33 Entry rate from 1980 to 2010 and possible scenarios

The future non-agricultural worker numbers by age group and sex to 2040 are acquired from rates of net workers moving in-out of the non-agricultural sector, and the future entry rates. Considering age structure, from 20.68 in 2010, non-agricultural worker numbers will expand to 22.77 million in 2030 then will decline to 22.56 million in 2040. In 2010 the highest numbers of non-agricultural workers are found in age group 35-39, 1.58 million for males, and 1.33 million in age group 55-59 for females. The peak shifts from the age group 30-34 for both sexes in the launch year. This shapes a remarkable contracting pyramid as shown in Figure 33. Non-agricultural workers aged 50 and over account for at least 38.06 percent of total non-agricultural workers.

5.3.3 Projected Agricultural Worker be Age Group and Sex to 2040

Relied on the projected future total worker and non-agricultural worker, the results of agricultural worker projection by age group and sex under optimal conditions from 2015 to 2040 are presented in Figure 34. As seen in the figure, in 2040, total number of agricultural workers decrease to 12.32 from 16.86 million in 2010. The age groups with highest agricultural worker numbers are 40-44 years old for males and females, while those with the lowest numbers are 15-19 years old for both males and females. Thus, the numbers of agricultural workers aged 49 and younger will be 56.13 percent of total agricultural worker numbers. The aging agricultural worker percentage will be

29.86 percent, almost twice as which of non-agricultural sector (15.51 percent). As an overview, there will be 35.32 percent of workers who will be in the agricultural sector in 2040. It can be concluded that in 2040 Thailand would no longer be an agriculture-based country. On limitation is that there are no international and domestic conflicts whish impact economic and social stability of the country. In this study worst-case or other scenarios are to be continued in sensitivity analysis.
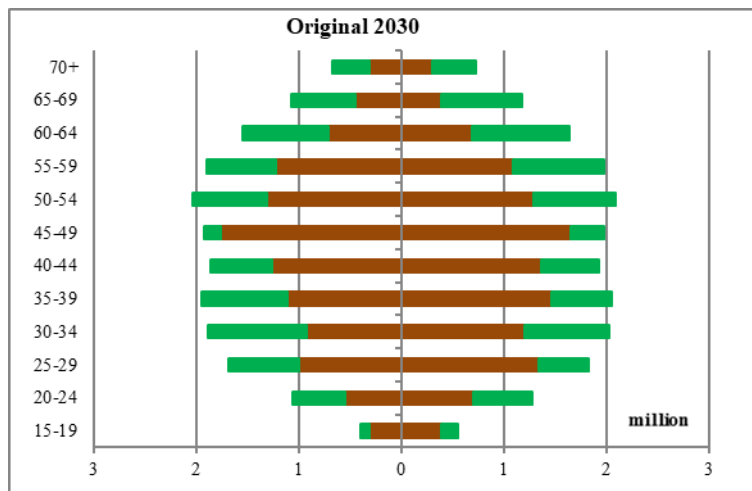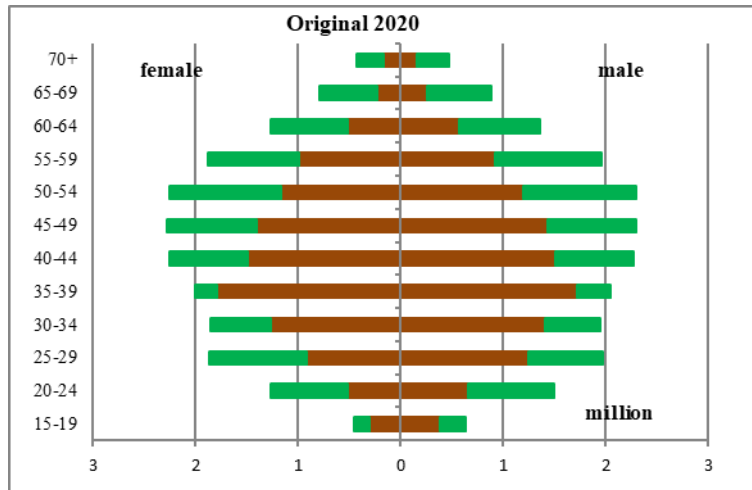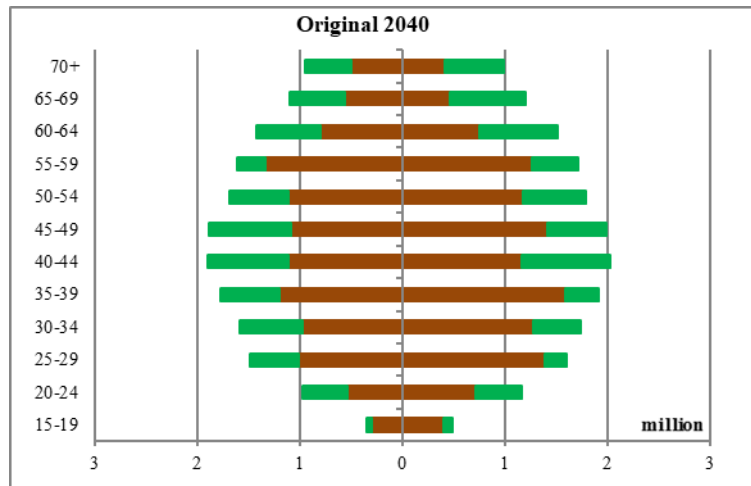
Figure 34 Pyramids of workers in agricultural sector and non-agricultural sector from 2020 to 2040 (Brown color = Non-agricultural workers, Green= Agricultural workers)

5.3.4 Sensitivity Analysis of Agricultural worker projection by age group and sex

The Projection results by scenarios are compared – Original, low entry rate, high entry rate, low net movement rate, high net movement rate. Since the rates are varied in different age groups and sex, when each of them is changed, all projection results change. To be able to compare sensitivity between the two parameters, all age groups and sex are changed in the same percentage. As a result, low net movement rate scenario changes all rates of all age groups and sex to be 70 percent from their original rates. High net movement rate scenario changes all rates of all age groups and sex to be 120 percent from their original rates. Low entry rate scenario changes rates of age group 15-19 of both male and female to be 70 percent from their original rates. High entry rate scenario changes rates of age group 15-19 of both sexes to be 120 percent from their original rates.

The original scenario predicts agricultural workers to be 35.32 percent in 2040 dropping from 43 percent in 2010. For the highest entry and net-movement scenario, the percentage will be only 27 percent with almost no young farmers left, while the lowest one will be as high as 45 percent, full of young farmers, so the original scenario would be most reasonable. In 2040, aging agricultural population will be 29.8 percent, almost as twice as which of 2010. Each scenario, low entry rate, low net movement rate, low entry and net movement rate, high entry rate, high net movement rate, high entry and net movement rate, is presented in Figure 35-37 as follows. The results can be denoted that the high scenarios are not plausible in 2030 and 2040.
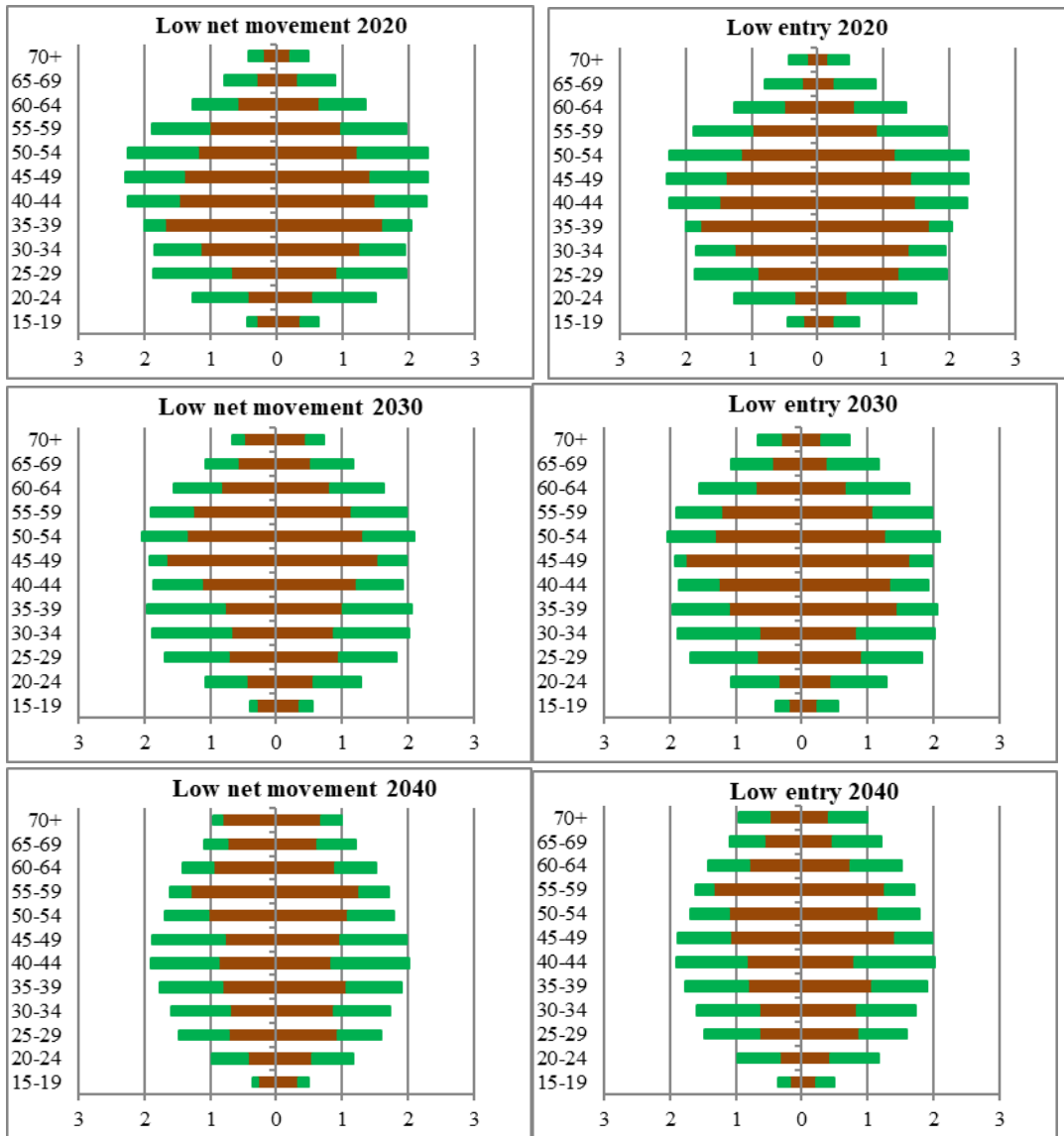
Figure 35 Agricultural and non-agricultural worker pyramid from 2020 to 2040, low scenarios
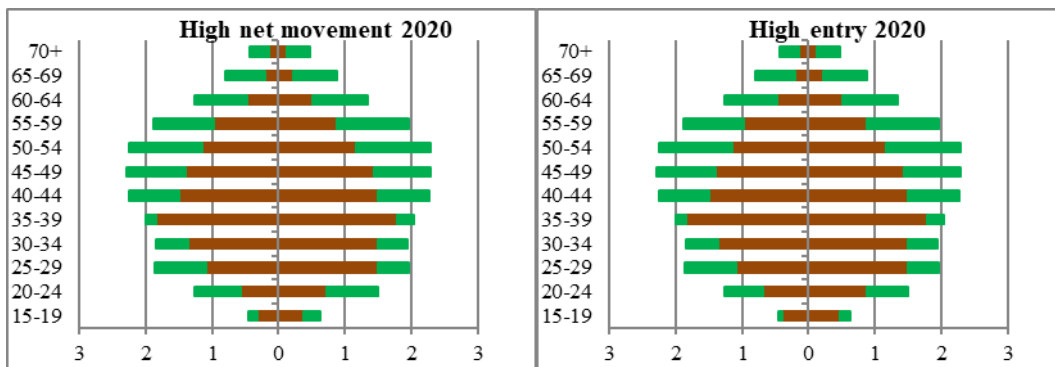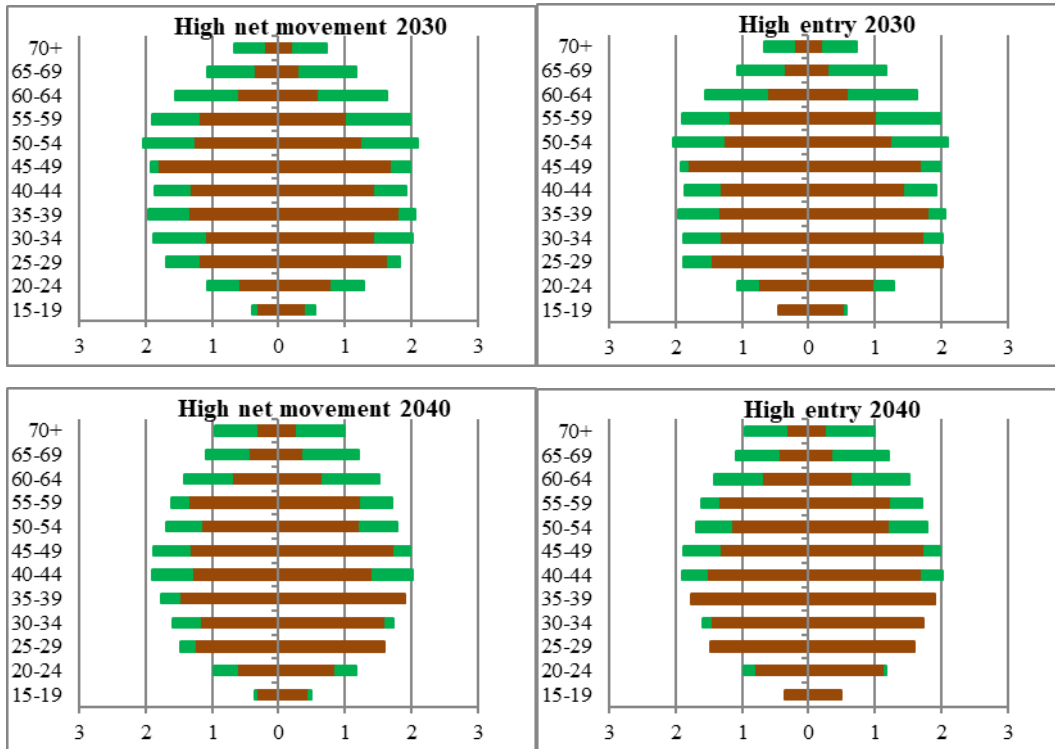
Figure 36 Agricultural and non-agricultural worker pyramid from 2020 to 2040, high scenarios
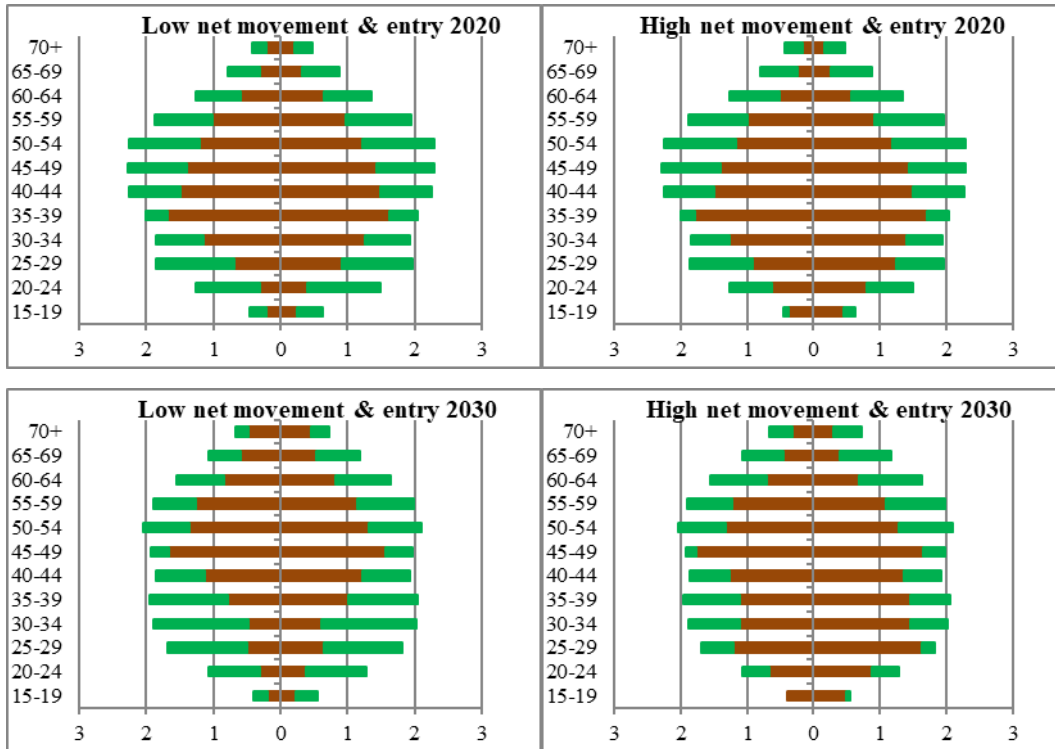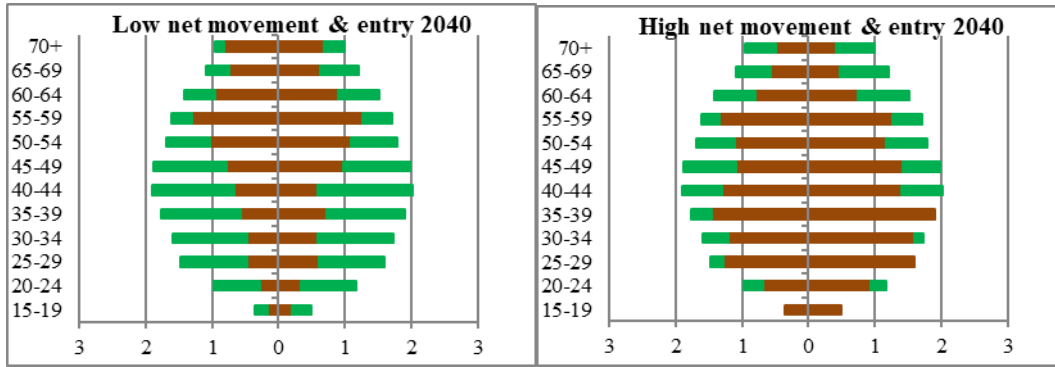
Figure 37 Agricultural and non-agricultural worker pyramid from 2020 to 2040, low and high combined scenarios

Regarding sensitivity of the components, it can be seen from the pyramids that net movement affects structures of all age groups, while the entry rate affects only younger age groups. It is clearer to analyze how each parameter is sensitive in terms of both worker proportions and numbers. To compare the sensitivity between two different components, the rates of all age groups are varied at the same proportion. For example, index 110 means the rates of all age groups are increased by 10 percent. The graphs below range from lowest scenario (index is 70), and highest scenario (index is 120). According to the graphs, the percentage of total agricultural workers is sensitive to entry rate gradually higher than net movement rate. On the other hand, aging agricultural percentage is more sensitive to net movement rate than entry rate. This is because net movement rate affects all age groups.
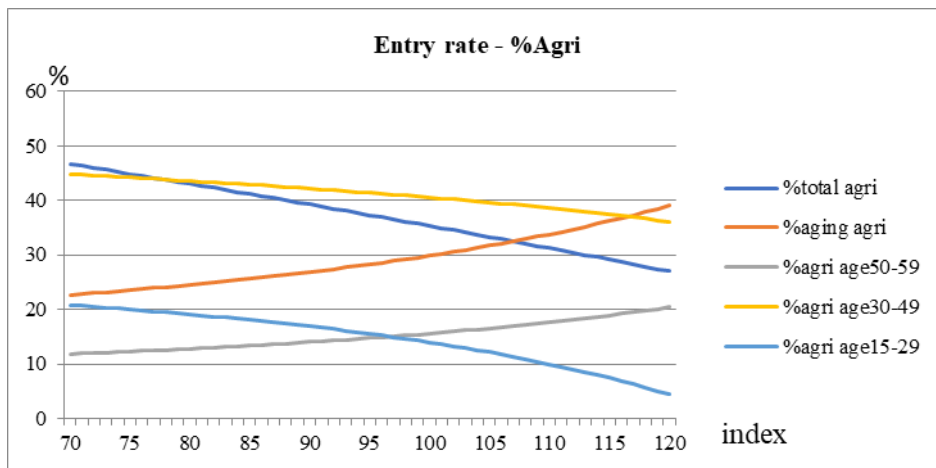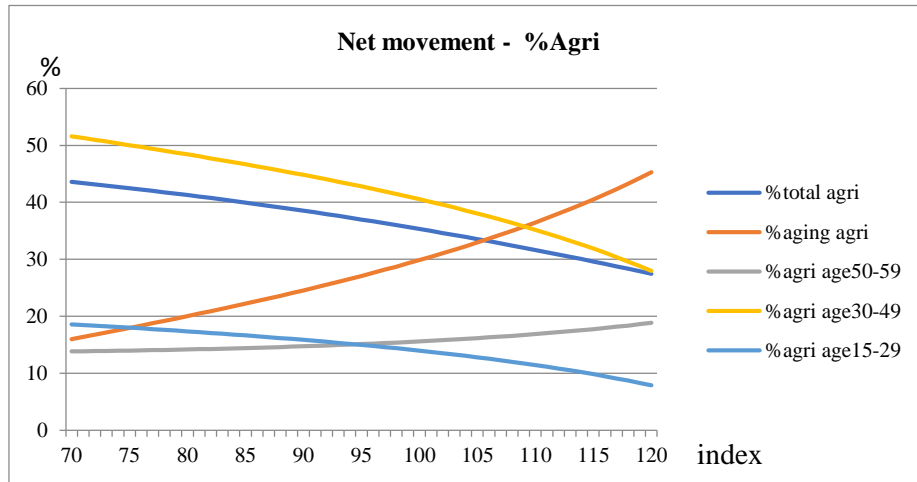
Figure 38 Sensitivity graph of net movement rate and entry rate
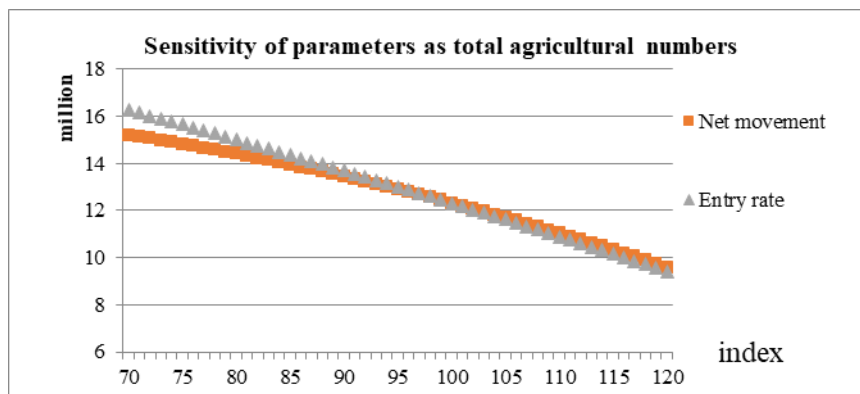
Figure 39 Sensitivity graph of net movement rate and entry rate to total agricultural worker numbers

The total number of agricultural workers may be as low as 9.4 million based on high entry rate scenario, or as high as 16.2 million based on low net movement scenario. The results of sensitivity analysis can be implied that this agricultural worker projection is feasible for a wide range of scenarios which can be utilized by other studies.

REFERENCES

Aemkulwat, C. 2010. Labor force structure change and Thai labor market, 1990-2008. The Second Annual Conference of the Academic Network for Development in Asia (ANDA) Proceedings. Nagoya University, Nagoya. 20 pp.

Allen, Robert C.. Economic structure and agricultural productivity in Europe, 1300-1800. 2000. *European Review of Economic History*, 3, 1-25.

Aruninta, Ariya. 2012. Green design and planning resolutions for an eco-industrial town: A case study of polluted industrial estate in Rayong province, Thailand, *Journal of Environmental Protection*, 3(11): 1551-1558. doi: 10.4236/jep.2012.311171

Bäckman, Stefan, Islam, K. & Sumelius, J. 2011. Determinants of Technical Efficiency of Rice Farms in North-Central and North-Western Regions in Bangladesh, *Journal of Developing Areas*, 45, 73-94. doi:10.1353/jda.2011.0001.

Bertinelli, Luisito and Black,Duncan. 2004. Urbanization and growth, *Journal of Urban Economics,* 56: 80-96. doi: 10.1016/j.jue.2004.03.003

Burholt, Vanessa and Christine Dobbs. 2012. Research on rural ageing: Where have we got to and where are we going in Europe?, *Journal of Rural Studies,* 28: 432-446. doi: 10.1016/j.jrurstud.2012.01.009

Butso, Orawan, and Isvilanonda,Somporn. 2010. Changes in the efficiency of rice production in Thailand. *Kasetsart Journal of Social science*, 31: 436 – 444.

Caselli, G., and Vallin, J., Wunsch, G. 2006. Demography analysis and synthesis: A treatise in population. Burlington, MA: Elsevier.

Center for Applied Economics Research, Kasetsart University. 2011. Population age structure change and its impacts on securities of food production of Thailand agriculture. (Published in Thai)

Chang, S., Gunnell, D., Sterne, J.A.C., Lu, T., and Cheng, A.T.A. 2009. Was the economic crisis 1997–1998 responsible for rising suicide rates in East/Southeast Asia? A time–trend analysis for Japan, Hong Kong, South Korea, Taiwan, Singapore and Thailand. *Social Science & Medicine*, 68, 1322–1331. http://dx.doi.org/10.1016/j.socscimed.2009.01.010

Changkid, Nantawan. 2007. Labour use efficiency of rice farming in Thailand with emphasis on The Central Plain. *Suratthani Rajabhat Journal*, 1 (2): 74-82.

Colman, David, and Young, Trevor. 1989. Principles of agricultural economics: markets and prices in less developed countries.

Cohen, J.E. 1995. Population growth and earth's human carrying capacity. *Science*, 269, 341-346.

Cohen, J.E. 2005. Human population grows up. Scientific American [PDF document]. Retrieved

from

http://www.rockefeller.edu/labheads/cohenje/PDFs/324CohenHumanPpnGrowsUpSciAm2005.pdf

Donner, R.F. (2009). The politics of uneven development: Thailand's economic growth in comparative perspective. New York, NY: Cambridge University Press.

Duangmanee, K., and Fransen, E. 2013. Investigation of the similarity of land selected for area-yield crop insurance for Thai rice. *European Scientific Journal*, 9(31): 37-52.

Fan,Shenggen, and Chan-Kang,Connie. 2003. Is Small Beautiful? Farm Size, Productivity and Poverty in Asian Agriculture. International Association of Agricultural Economists, Durban.

Fong, J. 2012. Political vulnerabilities of a primate city: the May 2010 red shirts uprising in Bangkok, Thailand. *Journal of Asian and African Studies*, 48(3), 332-347. http://dx.doi.org/10.1177/0021909612453981

Fongmul, Saisakul and Bangon MeKa. 2013. Agricultural labor force crises: A case study in Chiang Mai and Lamphun provinces, *Journal of Agricultural Research & Extension,* 30(3): 59-64.

Frondel, Manuel, Vance, Colin. (2010) Fixed, Random, or Something in Between? – A Variant of HAUSMAN's Specification Test for Panel Data Estimators, Ruhr Economic Papers, No. 160, ISBN 978-3-86788-179-1, Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI), Essen.

Gopal, Lallanji, and Srivastava,V.C. 2008. History of agriculture in India up to c. 1200 AD. Centre for Studies in Civilization. p. 785

Guest, P. 1999. Fertility preferences in Thailand. *Journal of Population and social studies*, 8(1), 1-19.

Halli, S.S., and Rao, K.V. 1992. Advanced techniques of population analysis. New York, NY: Plenum Publishers.

Hill, R.D. 1995. The impact of urbanization on rural-urban linkages in Thailand and Malaysia, *Asian Geographer,* 14(1): 28-44.

Huang, Bo, Li Zhang, and Bo Wu. 2009. Spatiotemporal analysis of rural–urban land conversion, *International Journal of Geographical Information Science* 23(3): 379-398. doi: 10.1080/13658810802119685

Institute for Population and Social Research. 1995. National Migration Survey of Thailand. Mahidol University of Salaya, Nakhon Pathom. 87 pp.

Intarakumnerd, P., Chairatana, P., and Tangchitpiboon., T. 2002. National innovation system in less successful developing countries: the case of Thailand. *Research Policy*, 31, 1445–1457. http://dx.doi.org/10.1016/S0048-7333(02)00074-4

International Labour Organization. 2006. The Mekong Challenge-underpaid, overworked and

overlooked: the realities of young migrant workers in Thailand. ILO. ISBN 9221193942.

Ishtiaque,Asif, and Ullah, Md. Sofi. 2013. The influence of factors of migration on the migrationstatus of rural-urban migrants in Dhaka, Bangladesh. *Journal of Studies and Research in Human Geography*, 7.2: 45–52.

Islam, M., Nath, L.K., Patel, D.P. et al. 2014 Productivity and socio-economic impact of system of rice intensification and integrated crop management over conventional methods of rice establishment in eastern Himalayas, India. *Paddy Water Environment* 12: 193. https://doi.org/10.1007/s10333-013-0377-z

Jones, G.W. 2009. Recent fertility trends, policy responses and fertility prospects in low fertility countries of East and Southeast Asia, United Nations Expert Group Meeting on Recent and Future Trends in Fertility (pp. 1-20). New York, NY: United Nations Department of Social and Economic Affairs.

Karcharnubarn, R. 2010. Variations in Health Status of the Elderly in Thailand (Unpublished doctoral dissertation). University of Leeds, United Kingdom.

Katewongsa, Piyawat, Sawangdee, Yothin, Walsh, Stephen J., and Chamratrithirong, Aphichat. 2013. Effect of population dynamics and mechanization on agricultural land use: evidence from Nang Rong, Thailand. *Journal of Population and Social Studies*, 21 (2): 154-170.

Knodel, J., and Chayovan, N. 2008. Population ageing and the well-being of older persons in Thailand. Population Studies Center Research Report 08-659. Retrieved from http://www.psc.isr.umich.edu/pubs/pdf/rr08-659.pdfurnal of Economics, 1(1), 49-66.

Lin, George C.S. 2013. Understanding land development problems in globalizing China. *Eurasian Geography and Economics*, 51(1): 80-103.

Leturque, Henri and Steve Wiggins. 2011. Thailand's progress in agriculture: Transition and sustained productivity growth. London: ODI publications.

Leuprasert, Laksana, Narong Ratananakintr, Areerat Phothisuwan, and Orapin Phurkphong. 1995 Environmental and occupational health in the Eastern Seabord area role of regional medical sciences center 3 Chonburi, *Bulletin of the Department of Medical Sciences* 56(1): 169-178.

Lexomboon, D., and Punyashingh, K. 2000. Supply projections for dentists, Thailand (2000 -2030). *Human Resource for Health Development Journal*, 4(2): 94-105.

Mahinchai, Montira. 2010. Determinants of migration: A case study of Nang Rong, Thailand. Durham: Duke University.

McFalls, J.A. 2007. Population: A lively introduction. *Population Bulletin*, 62(1): 1-31.

Ministry of Public Health. (2010). Public Health Statistics. Bangkok, Thailand: Ministry of Public Health.

Montgomery, M.R. (2008). The urban transformation of the developing world. Science, 319: 761-764. http://dx.doi.org/10.1126/science.1153012

Naab, Francis Zana, Romanus Dogkubong Dinye, and Raphael Kasim Kasanga. 2013. Urbanisation and its impact on agricultural lands in growing cities in developing countries: A case study of tamale in Ghana, *Modern Social Science Journal* 2(2): 256-287.

Nabangchang, O. S. and W. Wonghanchao. 2000. Evolution of Land-use in Urban-Rural Fringe Area: The Case of Pathum Thani Province, The conference of Chao Phraya Delta: Historical Development, Dynamics and Challenges of Thailand's Rice Bowl, Bangkok 2000, Volume 1. pp. 1-16.

National Economic and Social Development Board. 2012. National Income of Thailand. Bangkok: Office of the National Economic and Social Development Board.

National Statistic Office. (1980). The 2010 population and housing census: Bangkok. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (1980). The 2010 population and housing census: whole kingdom. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (1990). The 2010 population and housing census: Bangkok. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (1990). The 2010 population and housing census: whole kingdom. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (1994). 1993 Agricultural Census Whole Kingdom: Bangkok. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (1994). 1993 Agricultural Census Changwat Series: Bangkok. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (2000). The 2010 population and housing census: whole kingdom. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (2000). The 2010 population and housing census: Bangkok. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (2004). 2003 Agricultural Census Whole Kingdom: Bangkok. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (2004). 2003 Agricultural Census Changwat Series: Bangkok. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (2010). The 2010 population and housing census: Bangkok. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (2010). The 2010 population and housing census: whole kingdom. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (2014). 2013 Agricultural Census Whole Kingdom: Bangkok. Bangkok, Thailand: National Statistical Office of Thailand.

National Statistic Office. (2014). 2013 Agricultural Census Changwat Series: Bangkok. Bangkok, Thailand: National Statistical Office of Thailand.

Newell, C. (1988). Methods and models in demography. New York, NY: The Guildford Press.

Nishiura, H., Barua, S., Lawpoolsri, S., Kittitrakul, C., Leman, M.M., Maha, M.S., and Muangnoicharoen, S. (2004). Health inequalities in Thailand: Geographic distribution of medical supplies in the provinces. *The Southeast Asian Journal of Tropical Medicine Public Health*, 35(3): 735-740.

Nyanguru, Andrew C. 2007. Migration and aging: The case of Zimbabwe, *Journal of Aging & Social Policy*, 19(4): 57-85. doi: 10.1300/J031v19n04_04

Office of Foreign Workers Administration. 2012. Statistics of Accepted Immigrant Statistics, Whole country. Ministry of Labor: Bangkok.

Office of Foreign Workers Administration. (2013). Statistics of Accepted Immigrant Statistics, Whole country. Ministry of Labor: Bangkok.

Office of the National Economic and Social Development Board. (2013a). National Income of Thailand 2013. Bangkok: Office of the National Economic and Social Development Board.

Office of the National Economic and Social Development Board. (2013b). Population projection for Thailand 2010-2040. Bangkok, Thailand: Office of the National Economic and Social Development Board.

Olujenyo, Fasoranti Olayiwola. 2008. The Determinants of Agricultural Production and Profitability in Akoko Land, Ondo-State, Nigeria, Journal of Social Sciences 4 (1): 37-41.

Osaki, Keiko. 1999. Economic interactions of migrants and their households of origin: Are women more reliable supporters?, *Asian and Pacific Migration Journal*, 8(4): 447-471.

Panudulkitti, Panupong. 2011. Evidence of urbanization on infrastructure and transportation provincial expenditures in Thailand, *Journal of Society for Transportation and Traffic Studies,* 2(2): 16-29.

Phaktoop, M. (2000). Impact of migration on age at first marriage of Thai. *Journal of Population and social studies*, 8(2): 35-65.

Phiromswad, P. (2015). Measuring monetary policy with empirically grounded restrictions: An application to Thailand. *Journal of Asian Economics*, 38: 104-113. http://dx.doi.org/10.1016/j.asieco.2015.04.005

Poapongsakorn,Nipon, Ruhs,Martin, and Tangjitwisuth,Sumana. 1998. Problems and Outlook of Agriculture in Thailand. TDRI Quarterly Review Vol. 13 No. 2.

Pookpakdi,Aphiphan. 1992. Sustainable agriculture for small-scale farmers: A farming systems perspective.

Poungchompu, Supaporn et al. 2012. Aspects of the Aging Farming Population and Food Security in Agriculture for Thailand and Japan. International Journal of Environmental and Rural Development, 3-1.

Praneetvatakul, S., Kuwattanasiri,D., and Waibel, H. 2002. the productivity of pesticide use in rice production of Thailand: A damage control approach. International SymposiumSustaining Food Security and Managing Natural Resources in Southeast Asia- Challenges for the 21st Century. Chiang Mai, Thailand.

Preston, S.H., Heuveline, P., and Guillot, M. (2001). Demography: Measuring and modeling population processes. Oxford, UK: Blackwell Publishing.

Royal Irrigation Department. (2018) Irrigation Project Information, 2018. Royal Irrigation Department: Bangkok.

Samuel, John, and George, Susan. 2002. Globalization, migration and development, Special Issue on Migration and Globalization, *Canadian Studies in Population,* 29(1): 31-52.

Sanglestsawai, Santi, and Artachinda, Orachos N. 2012. Mechanization and labor productivity in rice production of Thailand. Extended abstracts of the 2nd national rice research conference. Bangkok.

Seubsman, S., Kelly, M.J., Yiengprugsawan, V., Sleigh, A.C., and the Thai Cohort Study Team. (2011). Gender, socioeconomic status, and self-rated health in a transitional middle-income setting: evidence from Thailand. *Asia-Pacific Journal of Public Health*, 23(5): 754-765. http://dx.doi.org/10.1177/1010539509356807

Smith, S.K., Tayman, J., and Swanson, D.A. (2001). State and local population analysis: Methodology and Analysis. New York, NY: Kluwer Academic/Plenum Publishers.

Songsrirote, Nitiphong, and Singhapreecha, Charuk. 2007. Technical efficiency and its determinants on conventional and certified organic Jasmine rice farms in Yasothorn province. *Thammasat Economic Journal*, 25 (2): 96-133.

Srisompun, Orawan, Chitchamnong, Suparat, Simla, Sakunkarn, Sinsiri,Naris, and Sinsiri,Wantana. 2013. Effect of management factors on glutinous rice production efficiency in Maha Sarakham. *Khon Kaen Agricultural Journal*, 41: 699-705.

Sternstein, L. (1984). The growth of the population of the world's pre-eminent "primate city": Bangkok at its bicentenary. *Journal of Southeast Asian Studies*, 15(1): 43-68.

Suphannachart,Waleerat. 2016. What Drives Labor Productivity in the Aging Agriculture of Thailand? (Paper prepared for presentation at the 5th International Conference on Social Science and Business during 25-27 August, 2016, Tokyo, Japan).

Talukder, D., and Chile, L. (2013). A survey on agricultural trade liberalisation in Thailand. *Southeast Asian Joournal of Economics*, 1(1): 49-66.

Taylor, J. Edward and Martin,Philip L. 2001.   Human Capital: Migration and Rural Population Change. Handbook of Agricultural Economics, Bruce L. Gardner and Gordan C. Rausser, eds., to be published by Elsevier Science, New York.

Udomwitid, Sommai, Praneetvatakul, Suwanna. 2009. An assessment of the rice production function for Thailand. *Kasetsart University Journal of Economics*, 16 (1): 75-97. ISSN 0858-9291

Ullah, AKM Ahsan. 2004. Bright City Lights and Slums of Dhaka city: Determinants of rural-urban migration in Bangladesh, *Migration Letters*, 1(1): 26-41.

Walsh,Stephen J., Evans,Tom P., Welsh,William F., Entwlsle,Barbara, and Rindfuss,Ronald R.. 1999. Scale-dependent relationships between population and environment in Northeastern Thailand. *Photogrammetric Engineering & Remote Sensing*, Vol. 65, No. 1.

Walsh, J., M. Ty. 2011. Cambodian migrants in Thailand: Working conditions and issues. Asian Social Science 7(7): 23-29. http://dx.doi.org/10.5539/ass.v7n7p23

Wattanutchariya, Sarun and Jitsanguan,Thanwa. (1992). Increasing the scale of small-farm operations: I. Thailand.

Wooldridge, Jeffrey. M. (2002) Econometric Analysis of Cross Section and Panel Data, The MIT Press.

Wongboonsin, K., Guest, P., and Prachuabmoh, V. (2005). Demographic change and the demographic dividend in Thailand. *Asian Population Studies*,1(2): 245-256. http://dx.doi.org/10.1080/17441730500317493

Zhang, H., Chamratrithirong, A., Shah, I., and Jampaklay, A. (2008). The place of fertility intentions: analysis of subsequent childbearing behavior among married Thai women. *Journal of Population and social studies*, 16(2): 52-72.

APPENDIX

Number of inter-provincial migrants from 1985 to 1990

Province 1985-1990	In-Migrant	Out-Migrant	Net Migrant	Total Population	%Out-Migrant	%Net Migrant
Amnat Charoen	-	-	-	-	-	-
Ang Thong	9,440	23006	-13,566	261282	8.805045889	-5.192091304
Bangkok Metropolis	713,880	256989	456,891	5890763	4.362575782	7.756058086
Buri Ram	31,257	55232	-23,975	1358629	4.065274626	-1.764646567
Chachoengsao	28,620	21067	7,553	552931	3.810059483	1.365993225
Chai Nat	6,490	18334	-11,844	357473	5.128778957	-3.313257225
Chaiyaphum	30,304	36551	-6,247	999769	3.655944523	-0.624844339
Chanthaburi	26,064	17163	8,901	391126	4.388099998	2.27573723
Chiang Mai	52,935	26528	26,407	1370141	1.936151097	1.927319889
Chiang Rai	19,363	31964	-12,601	1053706	3.033483723	-1.195874371
Chon Buri	58,517	33226	25,291	851936	3.90005822	2.968650227
Chumphon	20,482	15523	4,959	374228	4.148006028	1.325127997
Kalasin	15,208	51129	-35,921	847075	6.03594723	-4.240592628
Kamphaeng Phet	28,169	25734	2,435	655001	3.928848964	0.371755158
Kanchanaburi	29,731	27248	2,483	641862	4.245149269	0.386843278
Khon Kaen	64,827	80569	-15,742	1625422	4.956805064	-0.968486953
Krabi	11,202	9836	1,366	276269	3.560298115	0.494445631
Lampang	23,643	20531	3,112	730692	2.809802215	0.425897642
Lamphun	9,853	10572	-719	410740	2.573891026	-0.17504991
Loei	17,786	14855	2,931	537227	2.765125357	0.545579429
Lop Buri	26,353	31953	-5,600	722001	4.425617139	-0.775622194
Mae Hong Son	5,755	3390	2,365	158516	2.138585379	1.491962956
Maha Sarakham	17,012	33133	-16,121	880205	3.76423674	-1.831505161
Mukdahan	5,672	7871	-2,199	265097	2.969101876	-0.82950769
Nakhon Nayok	11,425	11353	72	221545	5.124466813	0.032499041
Nakhon Pathom	42,184	26018	16,166	630185	4.128628895	2.56527845
Nakhon Phanom	15,629	19170	-3,541	623805	3.073075721	-0.567645338
Nakhon Ratchasima	82,105	83889	-1,784	2379447	3.525567075	-0.074975404
Nakhon Sawan	34,771	48035	-13,264	1041435	4.612385795	-1.273627255
Nakhon Si Thammarat	27,123	59244	-32,121	1402281	4.224830829	-2.29062506
Nan	6,936	10145	-3,209	417169	2.43186814	-0.769232613
Narathiwat	17,982	7003	10,979	547060	1.280115527	2.006909663
Nong Bua Lam Phu	-	-	-	-	-	-
Nong Khai	29,082	30111	-1,029	599009	5.026802602	-0.171783729

Nonthaburi	103,483	18037	85,446	575072	3.136476824	14.85831339
Pathum Thani	59,090	15014	44,076	412785	3.63724457	10.67771358
Pattani	16,974	17457	-483	515363	3.38732117	-0.093720349
Phangnga	11,767	8103	3,664	209545	3.86694982	1.748550431
Phatthalung	9,073	20068	-10,995	441829	4.542028703	-2.488519314
Phayao	10,598	13229	-2,631	475658	2.781199938	-0.553128508
Phetchabun	26,116	29298	-3,182	872227	3.35898797	-0.364813288
Phetchaburi	11,694	15407	-3,713	401972	3.83285403	-0.923696178
Phichit	15,579	31023	-15,444	551239	5.627867404	-2.80168856
Phitsanulok	33,704	28731	4,973	757958	3.790579425	0.656104956
Phra Nakhon Si Ayutthaya	21,878	31359	-9,481	701295	4.471584711	-1.351927506
Phrae	9,824	14777	-4,953	484425	3.050420602	-1.022449296
Phuket	17,867	7619	10,248	166463	4.576993086	6.156323027
Prachin Buri	36,196	30260	5,936	786884	3.845547755	0.754367861
Prachuap Khiri Khan	20,898	14607	6,291	411910	3.546162997	1.527275376
Ranong	14,448	5560	8,888	116881	4.756975043	7.6043155
Ratchaburi	28,887	35204	-6,317	736257	4.781482553	-0.857988447
Rayong	28,813	15827	12,986	451258	3.507306242	2.877732916
Roi Et	20,056	51791	-31,735	1124462	4.605847063	-2.822238546
Sa Kaeo	-	-	-	-	-	-
Sakon Nakhon	22,933	29966	-7,033	945576	3.169073665	-0.743779453
Samut Prakan	109,048	22308	86,740	770954	2.893557852	11.25099552
Samut Sakhon	46,629	11759	34,870	321483	3.657736179	10.84660775
Samut Songkhram	5,437	9042	-3,605	190713	4.741155558	-1.890274916
Saraburi	31,139	25936	5,203	508025	5.105260568	1.024162197
Satun	8,779	6384	2,395	208974	3.054925493	1.146075588
Si Sa Ket	28,028	43939	-15,911	1288095	3.411161444	-1.235234979
Sing Buri	5,638	11520	-5,882	1095646	1.051434496	-0.536852231
Songkhla	51,125	27172	23,953	1095646	2.479998102	2.186198827
Sukhothai	16,227	21358	-5,131	561234	3.805542786	-0.914235417
Suphan Buri	20,512	33017	-12,505	798872	4.132952463	-1.565332118
Surat Thani	31,388	19594	11,794	747703	2.620559233	1.577364274
Surin	31,384	43162	-11,778	1222004	3.532066998	-0.963826632
Tak	16,832	11716	5,116	335477	3.492340757	1.524992771
Trang	13,717	15307	-1,590	528753	2.894924473	-0.300707514
Trat	8,312	10465	-2,153	162292	6.448253765	-1.326621152

Ubon Ratchathani	50,634	68707	-18,073	1872357	3.669545925	-0.965253955
Udon Thani	53,802	63986	-10,184	1774040	3.606795788	-0.574056955
Uthai Thani	9,132	17208	-8,076	295201	5.829248546	-2.73576309
Uttaradit	10,899	14717	-3,818	440783	3.338831126	-0.866185856
Yala	21,067	9466	11,601	340,953	2.776335741	3.402521755
Yasothon	9,109	21695	-12,586	530041	4.093079592	-2.374533291

Number of inter-provincial migrants from 1995 to 2000

Province 1995-2000	In-Migrant	Out-Migrant	Net Migrant	Total Population	%Out-Migrant	%Net Migrant
Amnat Charoen	9060	10472	-1412	359360	2.914069457	-0.392920748
Ang Thong	14225	12579	1646	269419	4.668935747	0.610944291
Bangkok Metropolis	526373	408263	118110	6355144	6.424134528	1.858494473
Buri Ram	23635	57325	-33690	1493359	3.838661702	-2.255988011
Chachoengsao	28329	22404	5925	635153	3.527339082	0.932846102
Chai Nat	10086	18063	-7977	359829	5.019884445	-2.216886354
Chaiyaphum	21261	42142	-20881	1095360	3.847319603	-1.906313906
Chanthaburi	20563	16800	3763	480064	3.499533396	0.783853819
Chiang Mai	69688	27660	42028	1500127	1.843843888	2.801629462
Chiang Rai	24108	35870	-11762	1129701	3.17517644	-1.041160449
Chon Buri	137499	38220	99279	1040865	3.67194593	9.538124541
Chumphon	16628	14837	1791	446206	3.325145785	0.401384114
Kalasin	15249	34119	-18870	921366	3.703088675	-2.048046053
Kamphaeng Phet	21330	30744	-9414	674027	4.561241612	-1.396679955
Kanchanaburi	24065	24755	-690	734394	3.370806406	-0.093955016
Khon Kaen	53255	68871	-15616	1733434	3.973096178	-0.900870757
Krabi	21304	12072	9232	336210	3.59061301	2.745902858
Lampang	18528	21190	-2662	782152	2.709192075	-0.340343054
Lamphun	16094	10285	5809	413299	2.488513159	1.405519975
Loei	18172	19852	-1680	607083	3.270063566	-0.276733165
Lop Buri	37464	30629	6835	745506	4.108484707	0.91682696
Mae Hong Son	8182	4964	3218	210537	2.357780343	1.52847243
Maha Sarakham	15943	34443	-18500	947313	3.635862698	-1.952892022
Mukdahan	7919	10664	-2745	310718	3.432050927	-0.883437715
Nakhon Nayok	9012.7	11793	-2780.3	241081	4.891716892	-1.153263841
Nakhon Pathom	78880	30399	48481	815122	3.729380387	5.947698627
Nakhon Phanom	11513	23823	-12310	684444	3.480635377	-1.798540129

Nakhon Ratchasima	69254	84830	-15576	2556260	3.318520025	-0.60932769
Nakhon Sawan	37167	46560	-9393	1090379	4.270074901	-0.86144359
Nakhon Si Thammarat	37633	62234	-24601	1519811	4.094851268	-1.618688113
Nan	7090	12271	-5181	458041	2.679017817	-1.13112145
Narathiwat	13023	9223	3800	662350	1.392466219	0.573714803
Nong Bua Lam Phu	9135	15737	-6602	482207	3.263536199	-1.36912156
Nong Khai	24346	37559	-13213	883704	4.250178793	-1.495183908
Nonthaburi	153924	32423	121501	816614	3.970419317	14.87863299
Pathum Thani	169801	27219	142582	677649	4.016681202	21.04068625
Pattani	14463	14389	74	595985	2.414322508	0.01241642
Phangnga	15720	11014	4706	234188	4.703059081	2.009496644
Phatthalung	13429	23601	-10172	498471	4.734678647	-2.040640278
Phayao	11338	15489	-4151	502780	3.080671467	-0.825609611
Phetchabun	17237	36980	-19743	965784	3.829013527	-2.044245918
Phetchaburi	17243	14883	2360	435377	3.418416683	0.542058951
Phichit	10608	27899	-17291	572989	4.869028899	-3.017684458
Phitsanulok	24445	30550	-6105	792678	3.854023954	-0.770174018
Phra Nakhon Si Ayutthaya	60735	31051	29684	727277	4.269487417	4.081526021
Phrae	7764	16105	-8341	492561	3.26964579	-1.693394321
Phuket	38333	7962	30371	249446	3.191873191	12.17538064
Prachin Buri	27275	17662	9613	406732	4.34241712	2.363472754
Prachuap Khiri Khan	23621	14312	9309	449467	3.184215971	2.071119793
Ranong	10861	6317	4544	161210	3.918491409	2.818683704
Ratchaburi	30449	31953	-1504	791217	4.038462268	-0.190086917
Rayong	65389	20870	44519	522133	3.997065882	8.526371633
Roi Et	26577	55241	-28664	1256458	4.396565584	-2.281333717
Sa Kaeo	17108	21188	-4080	485632	4.362974433	-0.84014233
Sakon Nakhon	16589	37630	-21041	1040766	3.615606198	-2.021684029
Samut Prakan	177639	44651	132988	1028401	4.341788855	12.93153157
Samut Sakhon	92235	17529	74706	466281	3.759321096	16.02166934
Samut Songkhram	8289	8895	-606	204177	4.356514201	-0.296801305
Saraburi	37570	24982	12588	575053	4.344295221	2.189015621
Satun	9598	7709	1889	247875	3.1100353	0.76207766
Si Sa Ket	22187	48455	-26268	1405500	3.44752757	-1.868943436
Sing Buri	6505	10875	-4370	232766	4.6720741	-1.87742196
Songkhla	56540	33876	22664	1255662	2.697859774	1.804944324
Sukhothai	12312	24316	-12004	593264	4.098681194	-2.023382508

Suphan Buri	24822	34442	-9620	855949	4.023837869	-1.123898737
Surat Thani	45029	23464	21565	869410	2.698841743	2.480417755
Surin	21083	53118	-32035	1327901	4.000147601	-2.41245394
Tak	24168	12717	11451	486146	2.615880826	2.355465231
Trang	22419	19709	2710	595110	3.311824705	0.455377997
Trat	10435	9334	1101	219345	4.255396749	0.501948984
Ubon Ratchathani	23121	62656	-39535	1691441	3.704297105	-2.337356136
Udon Thani	25372	59633	-34261	1467158	4.064524748	-2.335194982
Uthai Thani	8575	13694	-5119	304122	4.502798219	-1.683206082
Uttaradit	10119	16656	-6537	464474	3.585991896	-1.407398477
Yala	17313	10982	6331	415537	2.642845282	1.523570705
Yasothon	13274	22457	-9183	561430	3.999964377	-1.635644693

Number of inter-provincial migrants from 2005 to 2010

Province	In-Migrant	Out-Migrant	Net Migrant	Total Population	%Out-Migrant	%Net Migrant
Amnat Charoen	8257	20,172	-11,915	283,729	-4.199429738	7.109601063
Ang Thong	12496	16,805	-4,309	254,292	-1.694508675	6.608544508
Bangkok Metropolis	899958	427353	472,605	8,305,218	5.690458697	5.145596419
Buri Ram	15566	84,683	-69,117	1,274,912	-5.421315354	6.642262368
Chachoengsao	43464	29,531	13,933	715,603	1.947029289	4.126729485
Chai Nat	9644	19,333	-9,689	305,587	-3.170619169	6.326512581
Chaiyaphum	20581	62,777	-42,196	963,907	-4.377600744	6.512765236
Chanthaburi	23579	24,853	-1,274	485,611	-0.262349906	5.11788242
Chiang Mai	91742	51,714	40,028	1,737,041	2.304384295	2.977131801
Chiang Rai	29582	63,702	-34,120	1,172,928	-2.908959459	5.431023899
Chon Buri	226862	63,393	163,469	1,555,358	10.51005621	4.07578191
Chumphon	18307	21,982	-3,675	467,801	-0.785590454	4.699006629
Kalasin	16116	53,287	-37,171	824,534	-4.508122164	6.462680738
Kamphaeng Phet	24153	40,176	-16,023	797,391	-2.009403166	5.038431585
Kanchanaburi	21514	34,449	-12,935	801519	-1.613848206	4.29796424
Khon Kaen	63877	96,002	-32,125	1,741,969	-1.84417748	5.511119888
Krabi	21116	18,169	2,947	362,203	0.813604526	5.016247795
Lampang	30802	41,483	-10,681	743,143	-1.437273849	5.582101964
Lamphun	29490	20,473	9,017	412,741	2.184663021	4.960253525
Loei	16222	32,780	-16,558	546,031	-3.032428562	6.003322156
Lop Buri	42306	36,522	5,784	769,925	0.751242004	4.74357892

Mae Hong Son	6663	14,117	-7,454	209,153	-3.563898199	6.749604357
Maha Sarakham	40283	52,944	-12,661	827,639	-1.529773247	6.396991925
Mukdahan	7504	20,137	-12,633	357,339	-3.535298414	5.635265112
Nakhon Nayok	18559	14,291	4,268	246,867	1.728866151	5.788947085
Nakhon Pathom	81641	39,520	42,121	943,892	4.462480877	4.18691969
Nakhon Phanom	11281	34,301	-23,020	583,727	-3.943624331	5.876205829
Nakhon Ratchasima	106282	109,248	-2,967	2,525,987	-0.117439243	4.324962876
Nakhon Sawan	32862	53,667	-20,805	992,749	-2.095695891	5.405898168
Nakhon Si Thammarat	24782	66,777	-41,995	1,450,466	-2.895290203	4.603830769
Nan	10978	27,494	-16,516	452,814	-3.647413728	6.071808734
Narathiwat	10673	22,085	-11,412	670,002	-1.703278498	3.296258817
Nong Bua Lam Phu	22957	26,121	-3,164	485,974	-0.651063637	5.374978908
Nong Khai	17688	48,991	-31,303	821,526	-3.81034806	5.963414426
Nonthaburi	137229	47,136	90,093	1,334,083	6.753178026	3.533213451
Pathum Thani	229211	44,490	184,721	1,327,147	13.91865408	3.352303852
Pattani	23425	24,462	-1,037	609,015	-0.170274952	4.016649836
Phangnga	17748	14,613	3,135	258,534	1.212606466	5.652254636
Phatthalung	17911	27,419	-9,508	480,976	-1.976813812	5.700700243
Phayao	20890	27,324	-6,434	417,380	-1.541520916	6.546552302
Phetchabun	20134	59,714	-39,580	940,076	-4.210297891	6.352039622
Phetchaburi	20134	27,046	-6,912	472,589	-1.462581651	5.722943192
Phichit	17891	35,624	-17,733	548,242	-3.234520522	6.497860434
Phitsanulok	53279	39,709	13,570	912,827	1.486590559	4.350112343
Phra Nakhon Si Ayutthaya	59492	38,682	20,810	870,671	2.390110616	4.442780338
Phrae	14417	26,881	-12,464	427,398	-2.916251363	6.289453858
Phuket	47805	19,292	28,513	525,709	5.42372301	3.66971081
Prachin Buri	28923	27,519	1,404	546,996	0.256674637	5.030932585
Prachuap Khiri Khan	33891	19,224	14,667	467,466	3.137554389	4.112384644
Ranong	6941	12,703	-5,762	249,017	-2.313898248	5.101258147
Ratchaburi	37150	36,123	1,027	796,748	0.128898974	4.533804917
Rayong	119392	35,150	84,242	821,072	10.26000156	4.280988756
Roi Et	24624	84,761	-60,137	1,084,988	-5.542641946	7.812160134
Sa Kaeo	19200	32,039	-12,839	555,961	-2.309334648	5.762814298
Sakon Nakhon	13460	52,308	-38,848	941,811	-4.124819099	5.553980576
Samut Prakan	191159	60,718	130,441	1,828,694	7.133014053	3.320293062
Samut Sakhon	108955	25,773	83,182	887,191	9.375884111	2.905011435
Samut Songkhram	10042	10,350	-308	185,564	-0.16598047	5.577590481

Saraburi	31853	27,042	4,811	717,052	0.670927631	3.771274608
Satun	12790	14,770	-1,980	274,863	-0.72035887	5.373586114
Si Sa Ket	20372	76,917	-56,545	1,055,979	-5.354746638	7.283951669
Sing Buri	8418	11,899	-3,481	199,982	-1.740656659	5.950035503
Songkhla	85280	46,080	39,200	1,481,021	2.646822699	3.111367091
Sukhothai	19651	36,927	-17,276	629,707	-2.743498167	5.864155869
Suphan Buri	28173	42,912	-14,739	845,561	-1.7431031	5.074973893
Surat Thani	35687	37,649	-1,962	1,009,351	-0.194431868	3.730020578
Surin	22048	79,652	-57,604	1,122,900	-5.129931428	7.093418826
Tak	19707	29,341	-9,634	526,381	-1.830233234	5.574099369
Trang	24716	27,503	-2,787	598,877	-0.465371019	4.592428829
Trat	12037	13,313	-1,276	247,876	-0.514773516	5.370830577
Ubon Ratchathani	46511	81,977	-35,466	1,746,793	-2.030349332	4.693000258
Udon Thani	26101	79,975	-53,874	1,288,365	-4.181578978	6.207480023
Uthai Thani	10434	17,810	-7,376	297,493	-2.47938607	5.986695485
Uttaradit	16679	22,747	-6,068	438,578	-1.383562331	5.186534664
Yala	20307	24,073	-3,766	433,167	-0.869410643	5.557440895
Yasothon	12393	36,995	-24,602	487,976	-5.041641392	7.581315475

GDP Growth and Migration

Province	GDP per Capita 1990	%Net Migrant 1990	GDP per Capita 2000	% Net Migrant 2000	GDP per Capita 2010	% Net Migrant 2010
Amnat Charoen	-	-	15667.64814	-0.392920748	30392	-4.19943
Ang Thong	22556	-5.192091304	42159.9624	0.610944291	67241	-1.69451
Bangkok Metropolis	142675	7.756058086	276093.2685	1.858494473	451757	5.69046
Buri Ram	12414	-1.764646567	16455.75638	-2.255988011	37262	-5.42132
Chachoengsao	44292	1.365993225	124388.2906	0.932846102	327384	1.94703
Chai Nat	20417	-3.313257225	41354.24337	-2.216886354	69547	-3.17062
Chaiyaphum	13834	-0.624844339	19123.41443	-1.906313906	36077	-4.37760
Chanthaburi	26997	2.27573723	73444.02127	0.783853819	162107	-0.26235
Chiang Mai	30405	1.927319889	43103.84683	2.801629462	93139	2.30438
Chiang Rai	17002	-1.195874371	24223.77629	-1.041160449	56136	-2.90896
Chon Buri	87377	2.968650227	215234.25	9.538124541	527652	10.51006

Chumphon	26398	1.325127997	56678.73672	0.401384114	121844	-0.78559
Kalasin	12111	-4.240592628	16846.55801	-2.048046053	39214	-4.50812
Kamphaeng Phet	25151	0.371755158	50115.39943	-1.396679955	86590	-2.00940
Kanchanaburi	39413	0.386843278	42679.74543	-0.093955016	104720	-1.61385
Khon Kaen	17161	-0.968486953	35394.44423	-0.900870757	79639	-1.84418
Krabi	24524	0.494445631	51124.91198	2.745902858	149417	0.81360
Lampang	25523	0.425897642	35790.18978	-0.340343054	68245	-1.43727
Lamphun	19037	-0.17504991	93300.59792	1.405519975	145928	2.18466
Loei	16025	0.545579429	21244.06251	-0.276733165	45544	-3.03243
Lop Buri	21208	-0.775622194	59010.36641	0.91682696	87317	0.75124
Mae Hong Son	18007	1.491962956	22870.0769	1.52847243	35622	-3.56390
Maha Sarakham	13166	-1.831505161	17245.01762	-1.952892022	39179	-1.52977
Mukdahan	12750	-0.82950769	22629.28995	-0.883437715	46123	-3.53530
Nakhon Nayok	23270	0.032499041	38489.83896	-1.153263841	71582	1.72887
Nakhon Pathom	34479	2.56527845	113494.7162	5.947698627	177482	4.46248
Nakhon Phanom	11596	-0.567645338	18105.90268	-2.1425324	37798	-3.94362
Nakhon Ratchasima	17544	-0.074975404	38643.29023	-0.60932769	66252	-0.11744
Nakhon Sawan	20448	-1.273627255	32539.94579	-0.86144359	68793	-2.09570
Nakhon Si Thammarat	19079	-2.29062506	47138.3389	-1.618688113	86986	-2.89529
Nan	15164	-0.769232613	22591.88798	-1.13112145	44442	-3.64741
Narathiwat	19427	2.006909663	23900.17548	0.573714803	86986	-1.70328
Nong Bua Lam Phu	-	-	14522.53165	-1.36912156	32544	-0.65106
Nong Khai	14340	-0.171783729	18538.03793	-1.495183908	44612	-3.81035
Nonthaburi	67595	14.85831339	88448.71747	14.87863299	170270	6.75318
Pathum Thani	109561	10.67771358	216156.5283	21.04068625	397066	13.91865
Pattani	21100	-0.093720349	49471.05959	0.01241642	60860	-0.17027
Phangnga	38222	1.748550431	66498.94166	2.009496644	150644	1.21261
Phatthalung	15614	-2.488519314	25420.55812	-2.040640278	60248	-1.97681
Phayao	14820	-0.553128508	21956.72717	-0.825609611	49932	-1.54152
Phetchabun	15388	-0.364813288	23173.27723	-2.044245918	55533	-4.21030
Phetchaburi	32278	-0.923696178	66351.17749	0.542058951	109069	-1.46258
Phichit	15933	-2.80168856	26273	-3.017684458	57897	-3.23452
Phitsanulok	18675	0.656104956	36631.35187	-0.770174018	70743	1.48659
Phra Nakhon Si	27783	-1.351927506	215531.0229	4.081526021	459724	2.39011

Ayutthaya					
Phrae	14609	-1.022449296	22365.31945	-1.693394321	39427	-2.91625
Phuket	87704	6.156323027	196818	12.17538064	57897	5.42372
Prachin Buri	19179	0.754367861	66351.17749	2.363472754	109069	0.25667
Prachuap Khiri Khan	31754	1.527275376	78474.07965	2.071119793	133591	3.13755
Ranong	64832	7.6043155	71734.47295	2.818683704	114156	-2.31390
Ratchaburi	30231	-0.857988447	65164.5381	-0.190086917	151405	0.12890
Rayong	82048	2.877732916	458482.2728	8.526371633	-	10.26000
Roi Et	12698	-2.822238546	17298.22217	-2.281333717	41325	-5.54264
Sa Kaeo	-	-	25511.22589	-0.84014233	48717	-2.30933
Sakon Nakhon	12519	-0.743779453	16991.01049	-2.021684029	34266	-4.12482
Samut Prakan	155297	11.25099552	280564.2278	12.93153157	500614	7.13301
Samut Sakhon	89181	10.84660775	293023.4412	16.02166934	527128	9.37588
Samut Songkhram	23564	-1.890274916	47842.10751	-0.296801305	77349	-0.16598
Saraburi	66149	1.024162197	117969.7291	2.189015621	286648	0.67093
Satun	28708	1.146075588	72065.47602	0.76207766	102362	-0.72036
Si Sa Ket	11061	-1.235234979	13879.58039	-1.868943436	32975	-5.35475
Sing Buri	21482	-0.536852231	50479.77638	-1.87742196	98480	-1.74066
Songkhla	29452	2.186198827	78381.28615	1.804944324	127343	2.64682
Sukhothai	18411	-0.914235417	24098.75407	-2.023382508	48014	-2.74350
Suphan Buri	21494	-1.565332118	37983.11663	-1.123898737	67905	-1.74310
Surat Thani	28397	1.577364274	60369.49993	2.480417755	152636	-0.19443
Surin	11425	-0.963826632	16813.53033	-2.41245394	36052	-5.12993
Tak	22239	1.524992771	30613.27639	2.355465231	66826	-1.83023
Trang	22046	-0.300707514	48872.03449	0.455377997	107814	-0.46537
Trat	34576	-1.326621152	76265.11427	0.501948984	144408	-0.51477
Ubon Ratchathani	12403	-0.965253955	20238.69516	-2.337356136	42579	-2.03035
Udon Thani	13060	-0.574056955	23542.62748	-2.335194982	48040	-4.18158
Uthai Thani	18662	-2.73576309	33429.48813	-1.683206082	60458	-2.47939
Uttaradit	20902	-0.866185856	27144.49162	-1.407398477	52426	-1.38356
Yala	24894	3.402521755	40057.55623	1.523570705	105233	-0.86941
Yasothon	11180	-2.374533291	15936.19535	-1.635644693	33846	-5.04164

Percent agricultural workers and percent aging agricultural workers 1980

Province 1980	Total Worker 15 up	No. Agri worker	% Agri worker	% Aging Agri	PopDen80
Amnat Charoen	-	-	-	-	-
Ang Thong	130936	86292	65.90395308	9.882723775	265.0902752
Bangkok Metropolis	1978864	97918	4.948192498	9.915439449	3026.209789
Buri Ram	522156	475403	91.04616245	4.45811238	106.3899288
Chachoengsao	219429	153955	70.16164682	7.923743951	83.23285367
Chai Nat	187210	136561	72.94535548	6.642452823	128.7857132
Chaiyaphum	420328	380185	90.44960126	4.732695924	63.98306753
Chanthaburi	160242	112246	70.0478027	6.960604387	46.95976649
Chiang Mai	653690	427439	65.38863988	5.40755523	57.43505875
Chiang Rai	479976	409032	85.21926096	3.416114143	77.31978669
Chon Buri	320363	161331	50.35881172	7.099069615	150.3763474
Chumphon	146036	110940	75.96756964	9.130160447	51.65709536
Kalasin	351574	320797	91.24593969	4.124103405	104.0171902
Kamphaeng Phet	269820	230084	85.27314506	4.550511987	58.96399531
Kanchanaburi	240654	167114	69.44160496	6.054549589	24.72783146
Khon Kaen	617872	516488	83.59142347	4.69923793	115.1548812
Krabi	92055	72716	78.99190701	5.986302877	45.90983309
Lampang	345174	257177	74.50648079	6.063917069	38.0875575
Lamphun	196880	150012	76.19463633	5.72020905	74.35397248
Loei	231137	208822	90.34555264	4.798345002	38.97193122
Lop Buri	299438	209392	69.92833241	6.050374417	92.21544794
Mae Hong Son	67929	55644	81.9149406	5.506433757	10.45077622
Maha Sarakham	358383	330246	92.14890215	4.192329354	138.54647
Mukdahan	-	-	-	-	-
Nakhon Nayok	103596	75307	72.69296112	9.040328256	97.11922714
Nakhon Pathom	263450	161610	61.34370848	8.851556216	242.5492096
Nakhon Phanom	372171	334102	89.77109984	5.582726233	77.50491297
Nakhon Ratchasima	955010	772273	80.86543596	5.939220975	96.75401834
Nakhon Sawan	600300	377396	62.86789938	6.311937593	98.155835
Nakhon Si Thammarat	539587	421571	78.12845751	7.966392375	122.1521504
Nan	192534	169423	87.99640583	3.998866742	31.52080984
Narathiwat	180590	135704	75.14480315	8.027766315	88.8942515
Nong Bua Lam Phu	-	-	-	-	-
Nong Khai	286667	252105	87.94350239	4.75595486	84.32793074

Nonthaburi	164355	50208	30.5485078	12.79079031	594.2073234
Pathum Thani	158565	74257	46.83063728	8.811290518	209.5046977
Pattani	190675	147103	77.1485512	10.10312502	215.9047103
Phangnga	70428	36594	51.95944795	6.853582555	40.83032539
Phatthalung	193607	165984	85.73243736	8.387555427	119.8172682
Phayao	225264	195601	86.83189502	3.269921933	22.13601528
Phetchabun	350944	304104	86.65314124	4.471167758	53.70342596
Phetchaburi	181804	118948	65.42650327	7.611729495	58.6184739
Phichit	282809	224731	79.46387845	5.590238997	127.2733039
Phitsanulok	326550	255358	78.19874445	4.544208523	58.45289702
Phra Nakhon Si Ayutthaya	287773	153272	53.2614248	10.45070202	250.2286062
Phrae	231404	178788	77.26227723	5.21567443	64.31745766
Phuket	54862	16109	29.36276476	8.436277857	241.2298309
Prachin Buri	285047	218391	76.61578617	5.844105297	47.41576416
Prachuap Khiri Khan	162692	105523	64.86059548	6.348379026	53.77582205
Ranong	34080	15683	46.01819249	7.249888414	25.33167376
Ratchaburi	307070	183558	59.77724949	8.540079975	122.2541414
Rayong	169745	118890	70.04035465	6.130877282	95.49436937
Roi Et	470118	431820	91.85353464	5.321198648	114.252645
Sa Kaeo	-	-	-	-	-
Sakon Nakhon	391196	354519	90.62439289	4.636987016	82.31498817
Samut Prakan	217717	39903	18.32792111	8.851464802	482.8531648
Samut Sakhon	116371	53523	45.9934176	7.596734114	283.3367914
Samut Songkhram	77880	36490	46.85413457	11.00027405	404.1304802
Saraburi	218253	129639	59.39849624	7.817863452	121.0336067
Satun	69564	55409	79.65183141	6.444801386	63.12482931
Si Sa Ket	526245	490822	93.26872464	5.441891358	120.3343765
Sing Buri	100610	67683	67.27263691	8.192603756	193.2866289
Songkhla	377016	263980	70.01824856	9.177968028	110.6761273
Sukhothai	269232	227156	84.37184287	4.98600081	75.82368469
Suphan Buri	378890	296330	78.21003457	6.747882428	132.405924
Surat Thani	273573	214331	78.34508522	8.480341155	42.86601025
Surin	496100	455960	91.90888934	5.521536977	123.0659907
Tak	136458	102251	74.93221357	5.226354754	16.6080827
Trang	198972	146102	73.42842209	7.057398256	90.8295423
Trat	74925	45733	61.03837171	6.008790152	52.48634267
Ubon Ratchathani	762480	666796	87.45094953	5.842866484	85.57889629

Udon Thani	676147	577047	85.34342384	4.041785158	65.51178214
Uthai Thani	121741	101381	83.27597112	6.396662096	33.52630015
Uttaradit	214855	176882	82.32622001	5.723024389	51.17819629
Yala	122128	85885	70.32375868	7.351691215	58.67538671
Yasothon	196908	179084	90.94805696	5.518639298	96.11588057

Percent agricultural workers and percent aging agricultural workers 2010

Province 2010	Total Worker 15 up	No. Agri worker	% Agri worker	% Aging Agri	PopDen10
Amnat Charoen	-	-	-	-	-
Ang Thong	140,517	42,768	30.43617498	24.8667	262.5974316
Bangkok Metropolis	4,828,957	29,482	0.610525213	16.9086	5350.852055
Buri Ram	714,043	518,404	72.6012299	19.0087	123.5034586
Chachoengsao	383,557	118,989	31.02250774	18.0420	133.7325734
Chai Nat	174,785	85,316	48.81196899	18.3846	123.7321571
Chaiyaphum	590,042	450,535	76.35642886	17.6264	75.43319382
Chanthaburi	296,443	155,689	52.51903401	14.8019	76.61896497
Chiang Mai	1,002,927	413,795	41.25873568	12.7785	86.38961933
Chiang Rai	684,632	422,533	61.71680552	11.5828	100.4359427
Chon Buri	963,425	80,625	8.368580844	16.1439	337.2540482
Chumphon	299,559	203,658	67.98593933	13.8850	77.82611075
Kalasin	529,062	409,969	77.48978381	24.9238	118.6935581
Kamphaeng Phet	466,232	317,965	68.19887953	12.9149	92.63920144
Kanchanaburi	476839	254255	53.32093222	13.5895	41.13909108
Khon Kaen	1,037,437	622,959	60.04788725	19.6177	160.0193313
Krabi	209,754	135,329	64.51795913	8.3670	76.92515173
Lampang	416,720	206,964	49.66500288	16.6077	43.61208023
Lamphun	269,178	96,610	35.89074887	16.4724	91.59809143
Loei	325,485	238,186	73.17879472	12.3152	48.21630975
Lop Buri	439,437	171,456	39.017197	18.1790	124.186399
Mae Hong Son	120,981	85,376	70.56975889	10.6880	16.49307849
Maha Sarakham	498,125	382,793	76.84677541	19.9121	156.4037377
Mukdahan	218,666	167,146	76.43895256	14.2702	-
Nakhon Nayok	133,570	44,878	33.59886202	21.9774	116.3369463

Nakhon Pathom	558,626	129,753	23.22716809	15.8285	435.308881
Nakhon Phanom	340,756	260,027	76.30885443	14.9861	105.8882922
Nakhon Ratchasima	1,428,314	688,034	48.17106043	17.9466	125.4432188
Nakhon Sawan	570,038	324,271	56.88585673	16.8979	103.4363836
Nakhon Si Thammarat	815,655	450,596	55.24345465	17.2924	145.8854119
Nan	256,468	174,689	68.11337087	12.1015	39.47098658
Narathiwat	338,988	187,698	55.3701016	13.5665	149.7067321
Nong Bua Lam Phu	281,048	223,966	79.68959039	13.5842	-
Nong Khai	455,653	320,383	70.3129355	12.8250	112.0423661
Nonthaburi	847,249	28,985	3.4210722	19.5342	2143.783655
Pathum Thani	757,387	53,276	7.034184637	13.5145	869.7721148
Pattani	281,958	122,368	43.39937154	18.3994	313.8676614
Phangnga	154,771	85,111	54.99156819	10.6285	61.98525736
Phatthalung	270,480	166,195	61.44446909	17.1606	140.4525601
Phayao	238,964	167,730	70.19048894	12.2369	22.09113225
Phetchabun	543,178	373,009	68.67159568	13.6190	74.20871487
Phetchaburi	277,909	102,253	36.79369866	17.4626	75.91791165
Phichit	345,648	187,746	54.31710873	17.0022	129.750733
Phitsanulok	493,836	264,461	53.55239391	14.4271	84.39712666
Phra Nakhon Si Ayutthaya	563,457	70,274	12.47193663	26.2857	361.8923439
Phrae	246,337	127,222	51.64551001	15.8164	65.36538873
Phuket	303,177	15,825	5.219723132	11.7599	968.0959203
Prachin Buri	329,202	108,461	32.94664066	19.8551	114.8581313
Prachuap Khiri Khan	266,981	99,094	37.11649893	14.6346	73.41298633
Ranong	142,131	63,584	44.73619407	9.0620	75.50442762
Ratchaburi	466,092	156,704	33.62083022	16.5707	153.3250893
Rayong	502,267	124,101	24.70817314	13.9185	231.1576577
Roi Et	655,546	502,388	76.6365747	20.4254	130.7301244
Sa Kaeo	306,135	190,470	62.21764908	14.7630	-
Sakon Nakhon	543,281	434,379	79.95475638	8.9558	96.21837004
Samut Prakan	1,163,196	29,579	2.542907644	24.8622	1821.24148
Samut Sakhon	650,159	47,187	7.257763101	13.4338	1017.016164
Samut Songkhram	112,582	28,458	25.27757546	29.2993	445.3104939
Saraburi	412,894	76,024	18.4124739	19.1795	200.4906492
Satun	151,437	92,064	60.79359734	9.4934	110.8775918
Si Sa Ket	617,759	516,102	83.54423003	18.7416	119.4549623
Sing Buri	110,091	37,165	33.7584362	23.2477	243.1457133

Songkhla	779,755	322,043	41.30053671	14.7021	200.3033857
Sukhothai	366,305	233,766	63.81731071	15.2340	95.46667936
Suphan Buri	491,239	266,036	54.1561236	16.8579	157.8125677
Surat Thani	624,723	362,988	58.10383162	10.8896	73.5354308
Surin	614,691	456,067	74.19451399	21.3637	138.2191359
Tak	281,091	163,791	58.26974183	10.6953	32.08339301
Trang	354,183	217,314	61.35641745	11.4526	121.7843795
Trat	146,633	70,340	47.97010223	13.7432	87.9304718
Ubon Ratchathani	1,114,960	814,011	73.00808998	15.8489	110.9437689
Udon Thani	732,011	482,725	65.94504727	14.1120	69.79018174
Uthai Thani	171,672	116,427	67.81944639	16.2059	44.20401189
Uttaradit	244,724	152,504	62.31673232	16.7419	55.95111979
Yala	224,476	134,994	60.13738662	11.5516	95.81055669
Yasothon	300,182	237,281	79.04571227	19.2379	117.2550211

Relation between migration and aging proportion

Province	SumOutMig/Pop10	Dif% Aging Agri
Amnat Charoen	-	-
Ang Thong	20.60229972	14.98399901
Bangkok Metropolis	13.15564504	6.993182761
Buri Ram	15.47087172	14.5506144
Chachoengsao	10.20146646	10.11825993
Chai Nat	18.23703233	11.74214092
Chaiyaphum	14.67672711	12.8936816
Chanthaburi	12.111752	7.841340516
Chiang Mai	6.096689715	7.370994535
Chiang Rai	11.21432859	8.166649807
Chon Buri	8.669322433	9.044806354
Chumphon	11.18894573	4.754882124
Kalasin	16.80161158	20.7997323
Kamphaeng Phet	12.12128053	8.364431482
Kanchanaburi	10.78602004	7.534957009
Khon Kaen	14.08991779	14.91842551
Krabi	11.06478963	2.380713801

Lampang	11.19623007	10.54380215
Lamphun	10.0135436	10.75220581
Loei	12.35955468	7.516820457
Lop Buri	12.87190311	12.12863361
Mae Hong Son	10.74380956	5.18158161
Maha Sarakham	14.56190441	15.719738
Mukdahan	-	-
Nakhon Nayok	15.16484585	12.93703259
Nakhon Pathom	10.16398062	6.976979541
Nakhon Phanom	13.2414639	9.403409822
Nakhon Ratchasima	11.00429258	12.0074212
Nakhon Sawan	14.93448999	10.5859657
Nakhon Si Thammarat	12.97893229	9.326038095
Nan	11.02218571	8.102639363
Narathiwat	5.718042633	5.538707489
Nong Bua Lam Phu	-	-
Nong Khai	14.20052439	8.069007763
Nonthaburi	7.315586811	6.743451537
Pathum Thani	6.534543649	4.7032376
Pattani	9.245749284	8.296293127
Phangnga	13.0466399	3.774890851
Phatthalung	14.77994744	8.77300897
Phayao	13.42709282	8.967006464
Phetchabun	13.40232066	9.147806583
Phetchaburi	12.13231793	9.85083884
Phichit	17.24530408	11.41198742
Phitsanulok	10.84433304	9.882871462
Phra Nakhon Si Ayutthaya	11.61081511	15.83497974
Phrae	13.51503751	10.60077241
Phuket	6.633517783	3.323595761
Prachin Buri	13.79187416	14.01095781
Prachuap Khiri Khan	10.29871691	8.286210353
Ranong	9.870812033	1.812139769
Ratchaburi	12.96269335	8.030652106
Rayong	8.750389734	7.787624584
Roi Et	17.6769697	15.10424941
Sa Kaeo	-	-

Sakon Nakhon	12.73121677	4.318786628
Samut Prakan	6.981867934	16.01076854
Samut Sakhon	6.206217151	5.837050615
Samut Songkhram	15.24379729	18.29904425
Saraburi	10.87229378	11.36160619
Satun	10.50086771	3.048594512
Si Sa Ket	16.03355749	13.29975274
Sing Buri	17.14854337	15.05507551
Songkhla	7.233388318	5.524105919
Sukhothai	13.11737046	10.24803665
Suphan Buri	13.05299085	10.10998643
Surat Thani	7.995930058	2.409275031
Surin	15.66764627	15.84221002
Tak	10.21579426	5.468982596
Trang	10.43937236	4.395154272
Trat	13.35829205	7.734456934
Ubon Ratchathani	12.21323878	10.00605939
Udon Thani	15.80250938	10.07018335
Uthai Thani	16.37416679	9.809200805
Uttaradit	12.33988025	11.01883156
Yala	10.2780221	4.199933302
Yasothon	16.62930144	13.71931064

Bangkok Population 2030 by Net migration

Age group	Total 2030		Survived		Net Migration 2010-2015		Net Migration 2015-2020		Net Migration 2020-2025		Net Migration 2025-2030	
	male	female	male	female	male	female	male	female	male	female	male	female
0-4	139642	136969	139642	136969	-	-	-	-	-	-	-	-
5-9	146423	144248	144448	142221	0	0	0	0	0	0	1975	2028
10-14	154853	152146	151042	148414	0	0	0	0	1989	2033	1822	1699
15-19	154719	152325	148419	146164	0	0	2192	2247	1988	1867	2119	2047
20-24	148312	150095	116860	114112	1993	2096	1791	1730	1915	1883	25753	30273
25-29	239451	261451	126692	125155	1826	1790	1914	1933	25701	31146	83318	101426
30-34	334850	366351	152989	155698	2185	2184	28518	35003	92610	114511	58548	58955

Age												
35-39	404903	436658	210334	221570	25403	31967	83683	102399	53245	53433	32238	27289
40-44	449237	500749	280619	337682	63100	79078	48079	40974	29291	21652	28149	21363
45-49	438128	497416	322526	391214	43754	46996	29554	24115	28069	23365	14226	11726
50-54	411112	452984	321599	372323	29646	27781	29061	25850	14348	12564	16457	14466
55-59	372177	401916	303513	337390	29762	28284	14947	13409	16897	15251	7058	7581
60-64	305905	357137	260722	312129	14015	13278	15829	14916	6430	7212	8909	9602
65-69	248252	294099	218652	262243	13621	13095	5559	6267	7626	8309	2793	4184
70-74	177422	225571	162261	205978	4177	4957	5722	6549	2086	3279	3175	4807
75-79	103454	139645	95334	127773	3506	4302	1303	2145	1978	3137	1333	2287
80-84	57350	83224	53489	76694	729	1296	1142	1890	768	1355	1223	1990
Over	26469	40774	24887	38005	547	1001	399	717	635	1051	0	0

Bangkok Projection survival rate

Age group	Bangkok's		Other provinces	
	Male	Female	Male	Female
0-4	0.989	0.991	0.989	0.991
5-9	0.997	0.998	0.997	0.998
10-14	0.997	0.998	0.997	0.998
15-19	0.991	0.997	0.991	0.997
20-24	0.990	0.997	0.990	0.997
25-29	0.989	0.996	0.989	0.996
30-34	0.985	0.995	0.985	0.995
35-39	0.981	0.993	0.981	0.993
40-44	0.977	0.990	0.977	0.990
45-49	0.969	0.987	0.969	0.987
50-54	0.961	0.981	0.961	0.981
55-59	0.946	0.971	0.946	0.971
60-64	0.930	0.957	0.930	0.957
65-69	0.895	0.930	0.895	0.930
70-74	0.83	0.87	0.79	0.84
75-79	0.76	0.86	0.74	0.79
80-84	0.76	0.80	0.67	0.71
Over	0.50	0.50	0.50	0.50

Bangkok Net migrant from 1985-2010 by age and sex

Age group	1985-1990		1995-2000		2005-2010	
	M	F	M	F	M	F

Total	334357	379523	249656	267609	437,160	462,798
0-4	7211	7072	7331	6925	8,002	7,914
5-9	16664	16071	8241	8563	4,612	4,579
10-14	18406	23579	8338	8788	5,134	5,028
15-19	66301	98623	26693	35105	40964	48,329
20-24	94928	107738	63739	70293	98,406	118258
25-29	56099	54158	44954	46969	75,580	80521
30-39	47927	44135	55351	55047	111,688	104454
40-49	15950	14558	22525	21535	58,195	53,447
50-59	6492	7089	7924	7944	23,272	24,156
60-69	2912	3883	3185	4062	7,347	9,493
70-	1467	2617	1369	2373	3,960	6,620

Agricultural worker numbers by age and sex

	1980	1990	2000	2010
Total Worker 15 up	21949104	30486625	33779155	38641607
No. Agri worker	15654430	20348895	18265260	16859982
% Agri worker	70.75967	66.74696	54.07258	43.63168
M15-19	1374726	1370541	541913	351405
M20-24	1158452	1434344	863735	490354
M25-29	1005798	1357884	1083198	624691
M30-34	796114	1224065	1209195	773887
M35-39	720115	1084085	1187001	968429
M40-44	703437	884805	1075326	1101626
M45-49	591698	783025	924074	1087723
M50-54	487334.7	708103	746106	985480
M55-59	363426.3	590229	615595	829271
M60-64	214269.6	412354	488165	637692
M65-69	143053.4	229505	326307	395863
M70+	167612	173606	241208	399072
F15-19	1482250	1298357	404834	223736
F20-24	1249368	1420692	763536	384244
F25-29	1036635	1352787	1071307	522078
F30-34	826097	1266415	1230070	738496
F35-39	752298	1117896	1187896	993001
F40-44	729534.5	920785	1108000	1154552
F45-49	633336.5	812998	949514	1,125,803

F50-54	463256.2	719396	754595	1021213
F55-59	359345.8	567198	603442	825919
F60-64	158234.6	337240	442690	582923
F65-69	113998.5	166795	270291	332736
F70+	124039.9	115750	177262	309791
% Aging Agri	5.884647	7.053209	10.65368	15.7656

Non-agricultural worker numbers by age group and sex

	1980	1990	2000	2010
Total Worker 15 up	21949104	30486625	33779155	38641607
No. Non-Agri worker	5571187	9979518	14204751	20686796
%Non-Agri worker	25.3823	32.7340858	42.05182	53.53503
M15-19	273751	385579	303970	352264
M20-24	622149	832396	868194	1005745
M25-29	578016	971789	1138352	1472041
M30-34	445179	930195	1174088	1562883
M35-39	369341	739382	1143420	1505214
M40-44	308063.5	546986	1012699	1403053
M45-49	259128.5	409959	731955	1231542
M50-54	173610.3	325238	494521	984236
M55-59	129468.7	218502	324177	612898
M60-64	46321.03	97377	162692	289559
M65-69	30925.43	42513	83970	136224
M70+	36234.53	37320	60383	122913
F15-19	249264	461936	303096	287211
F20-24	463947	720314	843406	892992
F25-29	424306	810038	1108150	1497644
F30-34	303387	739261	1085148	1515482
F35-39	245149	567749	1029908	1432820
F40-44	195158.5	391415	877957	1327706
F45-49	169424.5	277278	599946	1142683
F50-54	98781	209741	372557	864910
F55-59	76624	133635	230454	529719
F60-64	29132.65	71515	133085	259619
F65-69	20988.32	32240	72551	131314
F70+	22837.03	27160	50072	126124
% Aging Agri	1.309559	1.3118369	1.800158	2.499454

5-year interval survival rate

Male		2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
15-19	20-24	0.990956	0.991721	0.992997	0.993354	0.99362	0.994969
20-24	25-29	0.987671	0.989135	0.990334	0.991067	0.991765	0.993044
25-29	30-34	0.983348	0.985206	0.98638	0.987578	0.988615	0.989621
30-34	35-39	0.98019	0.982175	0.984045	0.985301	0.986523	0.987524
35-39	40-44	0.977528	0.979386	0.981397	0.982833	0.984177	0.984973
40-44	45-49	0.9727	0.975426	0.977301	0.979196	0.980592	0.981626
45-49	50-54	0.96462	0.967705	0.969931	0.972551	0.974032	0.97526
50-54	55-59	0.95159	0.955734	0.959078	0.961458	0.963526	0.965099
55-59	60-64	0.934884	0.939651	0.943097	0.946147	0.94902	0.951329
60-64	65-69	0.909756	0.914801	0.919321	0.923293	0.926007	0.928834
65+	70+	0.748625	0.750413	0.757551	0.762812	0.761774	0.755899
Female		2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
15-19	20-24	0.996927	0.997307	0.997578	0.997862	0.997786	0.998253
20-24	25-29	0.995415	0.995597	0.99595	0.9966	0.996786	0.997227
25-29	30-34	0.993112	0.993551	0.99425	0.995029	0.995127	0.995701
30-34	35-39	0.992393	0.993065	0.993973	0.994217	0.99455	0.995593
35-39	40-44	0.990839	0.991568	0.99258	0.993004	0.993736	0.994521
40-44	45-49	0.987801	0.988905	0.98995	0.990765	0.991545	0.992346
45-49	50-54	0.982351	0.983769	0.985041	0.986333	0.987572	0.988631
50-54	55-59	0.973102	0.975535	0.977403	0.979499	0.980998	0.982472
55-59	60-64	0.96166	0.964333	0.967085	0.969908	0.972093	0.974173
60-64	65-69	0.944444	0.948662	0.952381	0.955835	0.958759	0.961324
65+	70+	0.794145	0.796706	0.805297	0.812668	0.815453	0.811711

Percent working population

Age group	Male				Female			
	1980	1990	2000	2010	1980	1990	2000	2010
15-19	63.03351	61.90147	32.68877	29.612	65.42779	62.19185	28.25579	21.82406
20-24	82.20263	82.74878	68.41624	65.75145	77.11617	77.43279	64.90314	57.06977
25-29	94.21691	93.09728	88.88553	86.41633	82.78056	82.95068	82.82434	82.38957
30-34	96.40597	95.96552	93.37109	91.1089	84.74426	85.35728	84.8739	85.88692
35-39	97.09228	96.91016	94.63792	92.95305	86.36257	86.44392	85.5533	87.37028
40-44	98.15506	96.93623	94.9755	93.50266	85.89687	86.15585	85.43083	87.08568
45-49	94.79029	96.26332	94.66224	93.20396	85.00569	84.85524	83.55039	85.42487

50-54	91.20419	93.45021	92.69152	90.99473	74.75872	79.27575	79.08081	80.74524
55-59	93.13785	88.44433	88.09321	86.37325	78.52595	71.61458	72.22594	73.58898
60-64	64.885	71.38014	72.23296	71.77611	43.22805	54.04591	56.52264	58.7733
65-59	60.03058	58.41281	59.92294	59.72172	41.35422	39.03579	42.55361	45.61972
70+	30.11141	18.50996	18.36782	20.89732	16.92452	10.24198	10.97127	13.89623

Projected Total worker numbers

SEXAge	2010	2020	2030	2040
M15-19	729878	634289	557001.7	493039.8
M20-24	1552587	1496503	1277551	1170376
M25-29	2186016	1907655	1712032	1459108
M30-34	2432541	1903904	1949475	1636431
M35-39	2560047	2018276	1995082	1827788
M40-44	2574392	2227994	1863166	1921831
M45-49	2379060	2280736	1951661	1957869
M50-54	2012484	2288580	2092393	1789378
M55-59	1465945	1906964	1878768	1585008
M60-64	941002	1355992	1648410	1527732
M65-69	539093	888133.5	1204745	1247889
M70+	530730	501465.6	811005.3	1160519
F15-19	531587	450448.6	394360.8	348312
F20-24	1329853	1268090	1065493	978175.9
F25-29	2111615	1859881	1685285	1474334
F30-34	2340410	1860797	1908004	1612658
F35-39	2499419	2009349	1967741	1796724
F40-44	2541796	2263158	1870927	1922619
F45-49	2318033	2287997	1930919	1892003
F50-54	1918817	2306812	2140438	1810092
F55-59	1376016	1903184	1949535	1673395
F60-64	854783	1322393	1678323	1589966
F65-69	470192	849596	1231484	1337999
F70+	445314	486795.1	848917	1321553

Probable scenario (every parameter 100%)

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	256814.9	140954	377474.1	309494.6	165434.8	81548.7	391566.9	312812.1	96255.4	46244.99	396784.4	302067
20-24	836066.1	748964.9	660436.9	519125.5	577127.3	522795.2	700423.3	542697.5	453424.7	444359.4	716951.1	533816.6
25-29	720355.1	939209	1246481	923619.1	480604.6	693701.4	1341052	996932.6	209118	472901.2	1394769	1008463
30-34	532275.2	580822.7	1409255	1271758	826657.6	965214.9	1201426	926015.1	458797.3	621954.3	1278649	969530.4
35-39	328397	214466.7	1720288	1787186	590291.1	847998	1465830	1104728	328789.7	581118.6	1584184	1195119
40-44	765226.6	761635.5	1500343	1491271	564126.3	598804.7	1362964	1255249	855038.9	780803.9	1167424	1115922
45-49	858518.3	880318	1435231	1403943	320897.2	167079.5	1653163	1757543	575638.6	793359.3	1416130	1089405
50-54	1098428	1086753	1191909	1164425	808609.4	725487.5	1286999	1314137	617146.5	574639.1	1176360	1110514
55-59	1038422	889705.1	919659.9	988285.6	898144.7	676078.3	1084121	1222517	460922.8	269642.6	1258769	1339012
60-64	789019.2	751825.2	563242.7	519441.3	947159.3	846905.1	692207	706473.2	760183.9	615030.7	755009.7	803756.8
65-69	621663	555618.5	256843.5	236796.1	786515.8	628532.4	392390.9	447636.9	739910.1	540097.1	468260.2	559794.5
70+	312739.2	260847.8	161629.9	169379.4	429993	358576.9	297860.5	313583.8	575863.2	449223.1	414878.6	498499.8

Low scenario (Optimistic): Net movement 70%, entry rate 100%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	268758.3	148591.2	365530.7	301857.4	198030.4	99351.2	358971.3	295009.6	155784.5	76967.39	337255.2	271344.6
20-24	929578.1	817941.1	566924.9	450149.2	703034.2	608712.3	574516.4	456780.4	619240.2	546299.3	551135.6	431876.6
25-29	1049447	1169088	917389	693740.6	865893.4	960304.6	955762.9	730329.3	662812.4	767004.9	941074.7	714359.6
30-34	669677.6	704819.1	1271853	1147762	1152631	1204686	875453.5	686544	847149.5	893771.1	890297.1	697713.5
35-39	420951.4	310620.3	1627734	1691033	1035337	1167596	1020784	785130.1	844675.7	947825.8	1068298	828411.9
40-44	765226.6	761635.5	1500343	1491271	697015.3	721191.6	1230075	1132863	1171786	1017665	850676.5	879061.3
45-49	858518.3	880318	1435231	1403943	409840.1	261638.2	1564220	1662984	1005595	1108524	986173.5	774240.2
50-54	1060492	1049691	1229845	1201486	767646.5	683660.8	1327962	1355964	698050.6	651014.8	1095455	1034138
55-59	976089.3	858249.7	981992.4	1019741	824665.3	637167.7	1157601	1261428	447920.3	306095.4	1271771	1302560
60-64	701364.5	670987.1	650897.4	600279.4	813974.2	710975	825392.1	842403.3	614915.1	460382.6	900278.5	958404.8
65-69	551371.7	490813.7	327134.7	301600.9	645254.9	487879.4	533651.7	588289.8	571336.4	364202.8	636833.9	735688.8
70+	268505.4	214493.2	205863.7	215734.1	270345.6	189910.4	457507.9	482250.2	296397.6	120181.5	694344.2	827541.4

Net movement 90% Entry rate 100%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	261109.3	143703.7	373179.7	306744.9	177729.6	88403.22	379272.1	305957.6	119133.1	58387.12	373906.7	289924.9
20-24	867224.3	771948.8	629278.7	496141.6	621315.8	552672.9	656234.9	512819.8	514646.5	481598.9	655729.3	496577
25-29	835645.9	1019484	1131190	843344.1	618488.1	788435.7	1203168	902198.2	377868.2	580727.8	1226019	900636.7
30-34	578858.9	622861.4	1362672	1229720	942360.7	1049973	1085723	841257.4	601231.9	720629.6	1136215	870855
35-39	359532.8	246813.3	1689152	1754840	749946.7	962270.7	1306175	990455	517396	714261	1395578	1061977
40-44	765226.6	761635.5	1500343	1491271	609179.8	640297.7	1317910	1213757	967467.3	864637.8	1054995	1032088
45-49	858518.3	880318	1435231	1403943	350818.1	198889.6	1623242	1725733	729880.9	906047	1261888	976717.2
50-54	1085849	1074463	1204488	1176714	795026.4	711618	1300582	1328007	644026.8	600014.8	1149479	1085138
55-59	1017871	879274.7	940210.3	998716	873919.3	663175.8	1108347	1235420	456086.6	281548.7	1263605	1327106
60-64	760505	725528.4	591756.9	545738	904441	803306.3	734925.3	750072	713589.8	565428.2	801603.9	853359.3
65-69	599176.1	534886.8	279330.4	257527.8	742625.6	584203.4	436281.1	491965.9	687533.8	484661.2	520636.5	615230.4
70+	298588.3	246018.5	175780.8	184208.8	382416.8	308331.1	345436.8	363829.5	495745.4	354539.7	494996.4	593183.2

Net movement 80% Entry rate 100%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	265090.4	146249.4	369198.6	304199.2	188586.6	94334.91	368415	300025.9	138932.6	68615.48	354107.2	279696.5
20-24	898394.9	794940.8	598108.1	473149.5	663221.5	581276.2	614329.2	484216.5	569714.2	515471.7	600661.6	462704.2
25-29	945343.1	1096110	1021493	766717.9	746756.3	877216.6	1074900	813417.4	528453.9	678434	1075433	802930.5
30-34	624659.7	664193.5	1316871	1188387	1050952	1129751	977131.6	761478.6	730284.2	811013.7	1007162	780470.9
35-39	390384.3	278864.5	1658301	1722789	898156.2	1068710	1157965	884015.9	688948.8	836252.6	1224025	939985.1
40-44	765226.6	761635.5	1500343	1491271	653476.1	681093.3	1273614	1172961	1072986	943547.1	949476.9	953179.1
45-49	858518.3	880318	1435231	1403943	380465.7	230409.1	1593594	1694213	873065.2	1011010	1118703	871754.4
50-54	1073203	1062110	1217134	1189068	781372.1	697675.8	1314236	1341949	670999.7	625477.9	1122506	1059675
55-59	997093.9	868789.5	960987.8	1009201	849426.1	650205.6	1132840	1248390	451751.5	293700.8	1267940	1314954
60-64	731286.8	698582.4	620975.1	572684	860057.1	758007.6	779309.2	795370.7	665179	513891.8	850014.6	904895.6
65-69	575745.7	513285.2	302760.8	279129.4	695580.1	537338.8	483326.6	538830.5	631391.9	426054.4	576778.4	673837.2
70+	283843.7	230567	190525.4	199660.3	329338.1	252254.8	398515.4	419905.8	403104.6	245432.6	587637.2	702290.3

Net movement 100% Entry rate 90%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	297799.9	174136.8	336489.1	276311.8	216563.3	120666	340438.4	273694.8	159436.2	91364.95	333603.6	256947.1
20-24	904130.6	802253.8	592372.4	465836.6	659811.9	585132.3	617738.8	480360.4	556473.5	517021.1	613902.3	461154.9
25-29	720355.1	939209	1246481	923619.1	626211.9	800588.7	1195444	890045.3	391238.7	599010	1212648	882354.4
30-34	532275.2	580822.7	1409255	1271758	950476.3	1060271	1077608	830958.5	609741.2	733319.6	1127705	858165.1
35-39	328397	214466.7	1720288	1787186	590291.1	847998	1465830	1104728	500795.7	709254.7	1412178	1066983
40-44	765226.6	761635.5	1500343	1491271	564126.3	598804.7	1362964	1255249	975353.3	874824.4	1047109	1021902
45-49	858518.3	880318	1435231	1403943	320897.2	167079.5	1653163	1757543	575638.6	793359.3	1416130	1089405
50-54	1098428	1086753	1191909	1164425	808609.4	725487.5	1286999	1314137	617146.5	574639.1	1176360	1110514
55-59	1038422	889705.1	919659.9	988285.6	898144.7	676078.3	1084121	1222517	460922.8	269642.6	1258769	1339012
60-64	789019.2	751825.2	563242.7	519441.3	947159.3	846905.1	692207	706473.2	760183.9	615030.7	755009.7	803756.8
65-69	621663	555618.5	256843.5	236796.1	786515.8	628532.4	392390.9	447636.9	739910.1	540097.1	468260.2	559794.5
70+	312739.2	260847.8	161629.9	169379.4	429993	358576.9	297860.5	313583.8	575863.2	449223.1	414878.6	498499.8

Net movement 100% Entry rate 80%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	338033.4	206804.3	296255.6	243644.3	264783	157904.4	292218.6	236456.4	216502.9	132699.9	276536.9	215612.1
20-24	971733.8	855229.6	524769.2	412860.7	739502.2	645575.7	538048.5	419917	651657.6	584935.5	518718.2	393240.5
25-29	720355.1	939209	1246481	923619.1	769149.5	905816	1052507	784817.9	562998.4	719061.5	1040889	762302.9
30-34	532275.2	580822.7	1409255	1271758	1073456	1154770	954628	736460.3	755218.8	841301.9	982227.8	750182.8
35-39	328397	214466.7	1720288	1787186	590291.1	847998	1465830	1104728	669647.8	835400.9	1243326	940836.8
40-44	765226.6	761635.5	1500343	1491271	564126.3	598804.7	1362964	1255249	1094852	968292.7	927610.2	928433.5
45-49	858518.3	880318	1435231	1403943	320897.2	167079.5	1653163	1757543	575638.6	793359.3	1416130	1089405
50-54	1098428	1086753	1191909	1164425	808609.4	725487.5	1286999	1314137	617146.5	574639.1	1176360	1110514
55-59	1038422	889705.1	919659.9	988285.6	898144.7	676078.3	1084121	1222517	460922.8	269642.6	1258769	1339012
60-64	789019.2	751825.2	563242.7	519441.3	947159.3	846905.1	692207	706473.2	760183.9	615030.7	755009.7	803756.8
65-69	621663	555618.5	256843.5	236796.1	786515.8	628532.4	392390.9	447636.9	739910.1	540097.1	468260.2	559794.5
70+	312739.2	260847.8	161629.9	169379.4	429993	358576.9	297860.5	313583.8	575863.2	449223.1	414878.6	498499.8

Net movement 100% Entry rate 70%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	377527.9	238963.9	256761.1	211484.8	310192.3	193318	246809.4	201042.8	267819	170439.5	225220.8	177872.6
20-24	1038880	907895.2	457622.5	360195.2	816270.5	704164.7	461280.1	361328	739337	648286.5	431038.8	329889.4
25-29	720355.1	939209	1246481	923619.1	909461.4	1009407	912194.9	681226.9	724747	833229.9	879140.1	648134.5
30-34	532275.2	580822.7	1409255	1271758	1195605	1248714	832478.9	642515.6	895362.3	945971.3	842084.3	645513.3
35-39	328397	214466.7	1720288	1787186	590291.1	847998	1465830	1104728	835398.2	959585.5	1077576	816652.2
40-44	765226.6	761635.5	1500343	1491271	564126.3	598804.7	1362964	1255249	1213544	1061214	808918.2	835512.7
45-49	858518.3	880318	1435231	1403943	320897.2	167079.5	1653163	1757543	575638.6	793359.3	1416130	1089405
50-54	1098428	1086753	1191909	1164425	808609.4	725487.5	1286999	1314137	617146.5	574639.1	1176360	1110514
55-59	1038422	889705.1	919659.9	988285.6	898144.7	676078.3	1084121	1222517	460922.8	269642.6	1258769	1339012
60-64	789019.2	751825.2	563242.7	519441.3	947159.3	846905.1	692207	706473.2	760183.9	615030.7	755009.7	803756.8
65-69	621663	555618.5	256843.5	236796.1	786515.8	628532.4	392390.9	447636.9	739910.1	540097.1	468260.2	559794.5
70+	312739.2	260847.8	161629.9	169379.4	429993	358576.9	297860.5	313583.8	575863.2	449223.1	414878.6	498499.8

Net movement 110% Entry rate 100%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	252207.2	138000.3	382081.8	312448.3	151675.7	73762.8	405326	320598	70150.53	32141.63	422889.2	316170.4
20-24	804920.4	725989.3	691582.5	542101.1	530465.6	491535.8	747085.1	573956.9	385408.5	403422.1	784967.3	574753.8
25-29	599470.7	855285.1	1367365	1007543	332591.4	592737.2	1489065	1097897	20089.24	353886.6	1583798	1127478
30-34	484908.5	538077.5	1456622	1314503	703645.5	875343.8	1324438	1015886	301683.4	514270.8	1435763	1077214
35-39	296976.9	181824.7	1751708	1819828	418764.9	725607.1	1637357	1227119	121814	436044.3	1791160	1340193
40-44	765226.6	761635.5	1500343	1491271	518315.6	556614.4	1408774	1297440	735508.2	691912.3	1286954	1204814
45-49	858518.3	880318	1435231	1403943	290703.1	134978.9	1683357	1789644	409928.2	672666.1	1581840	1210098
50-54	1110942	1098978	1179396	1152200	822121.1	739284.1	1273487	1300341	590373	549364.3	1203133	1135789
55-59	1058745	900080.7	899336.5	977910	922102.4	688913	1060164	1209683	466257.4	257986	1253434	1350669
60-64	816829.3	777472.6	535432.6	493793.9	988245.5	888838	651120.8	664540.3	804997.7	662737.9	710195.9	756049.6
65-69	643206.4	575480.4	235300.1	216934.2	827372.6	670384.5	351534.1	405784.8	788666.7	592435.4	419503.7	507456.2
70+	326296.3	275055	148072.8	155172.3	472463.4	403413.5	255390.1	268747.1	644867.2	531057.9	345874.6	416665

Net movement 120% Entry rate 100%

Age group	2020 Agri Male	2020 Agri Female	2020 Non-Agri Male	2020 Non-Agri Female	2030 Agri Male	2030 Agri Female	2030 Non-Agri Male	2030 Non-Agri Female	2040 Agri Male	2040 Agri Female	2040 Non-Agri Male	2040 Non-Agri Female
15-19	247286.3	134842.7	387002.7	315605.9	136424.1	65035.92	420577.6	329324.9	40650.85	16019.45	452388.9	332292.6
20-24	773787.3	703021.9	722715.7	565068.5	481139.2	458787.6	796411.4	606705.1	309926.8	358445.6	860449	619730.3
25-29	472992.6	767712.3	1493843	1095116	173904.4	485251.4	1647752	1205383	0	222531.2	1603887	1258833
30-34	436759	494625.8	1504772	1357955	573127	780225	1454957	1111005	128487	396807.9	1608960	1194677
35-39	265272.4	148887.3	1783413	1852766	234937.3	594809.2	1821184	1357916	0	278206.1	1912974	1498032
40-44	765226.6	761635.5	1500343	1491271	471747.7	513726.7	1455342	1340328	608683.6	597830.3	1413779	1298896
45-49	858518.3	880318	1435231	1403943	260235.7	102587.8	1713824	1822035	232333.4	543682.4	1759435	1339082
50-54	1123389	1111138	1166948	1140039	835561.5	753007.9	1260047	1286617	563720.3	524203.4	1229786	1160950
55-59	1078841	910401.6	879240.3	967589.1	945792.5	701680.1	1036474	1196916	472087	246582.2	1247604	1362073
60-64	843935.3	802470.7	508326.5	468795.8	1027732	929138.6	611634.1	624239.8	848067.1	708588	667126.6	710199.5
65-69	663806.3	594472.4	214700.2	197942.2	865316	709817.6	313590.7	366351.7	833946.5	641748.6	374223.8	458142.9
70+	339259.7	288639.9	135109.4	141587.4	510209.4	443246.6	217644.2	228914	704040.8	601483	286701	346239.9

Net movement 100% Entry rate 110%

Age group	2020 Agri Male	2020 Agri Female	2020 Non-Agri Male	2020 Non-Agri Female	2030 Agri Male	2030 Agri Female	2030 Non-Agri Male	2030 Non-Agri Female	2040 Agri Male	2040 Agri Female	2040 Non-Agri Male	2040 Non-Agri Female
15-19	215065.8	107248.4	419223.2	343200.2	111296	40496.99	445705.6	353863.8	26578.51	0	466461.3	348312
20-24	767535.7	695360.2	728967.3	572730.2	491374.3	458524.4	786176.4	606968.3	342136.1	366759.9	828239.7	611416
25-29	720355.1	939209	1246481	923619.1	332282.6	585130.1	1489374	1105504	16274.61	340556.1	1587612	1140808
30-34	532275.2	580822.7	1409255	1271758	701991.2	869594.9	1326093	1021635	302251.9	507134.3	1435195	1084350
35-39	328397	214466.7	1720288	1787186	590291.1	847998	1465830	1104728	153577.1	450963.8	1759397	1325274
40-44	765226.6	761635.5	1500343	1491271	564126.3	598804.7	1362964	1255249	733900.8	686226.1	1288562	1210500
45-49	858518.3	880318	1435231	1403943	320897.2	167079.5	1653163	1757543	575638.6	793359.3	1416130	1089405
50-54	1098428	1086753	1191909	1164425	808609.4	725487.5	1286999	1314137	617146.5	574639.1	1176360	1110514
55-59	1038422	889705.1	919659.9	988285.6	898144.7	676078.3	1084121	1222517	460922.8	269642.6	1258769	1339012
60-64	789019.2	751825.2	563242.7	519441.3	947159.3	846905.1	692207	706473.2	760183.9	615030.7	755009.7	803756.8
65-69	621663	555618.5	256843.5	236796.1	786515.8	628532.4	392390.9	447636.9	739910.1	540097.1	468260.2	559794.5
70+	312739.2	260847.8	161629.9	169379.4	429993	358576.9	297860.5	313583.8	575863.2	449223.1	414878.6	498499.8

Net movement 100% Entry rate 120%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	172539.7	73012.42	461749.3	377436.2	54042.32	0	502959.4	399453	0	0	493039.8	348312
20-24	698534.5	641436.9	797968.5	626653.5	402476.8	392278.8	875073.9	673213.8	222217.4	284025.7	948158.4	694150.2
25-29	720355.1	939209	1246481	923619.1	181200.3	474850.5	1640456	1215783	0	201790.9	1603887	1279574
30-34	532275.2	580822.7	1409255	1271758	576468.5	773406.5	1451616	1117823	139966.1	388786.5	1597481	1202698
35-39	328397	214466.7	1720288	1787186	590291.1	847998	1465830	1104728	0	318761	1912974	1457477
40-44	765226.6	761635.5	1500343	1491271	564126.3	598804.7	1362964	1255249	611930.5	591086.1	1410532	1305640
45-49	858518.3	880318	1435231	1403943	320897.2	167079.5	1653163	1757543	575638.6	793359.3	1416130	1089405
50-54	1098428	1086753	1191909	1164425	808609.4	725487.5	1286999	1314137	617146.5	574639.1	1176360	1110514
55-59	1038422	889705.1	919659.9	988285.6	898144.7	676078.3	1084121	1222517	460922.8	269642.6	1258769	1339012
60-64	789019.2	751825.2	563242.7	519441.3	947159.3	846905.1	692207	706473.2	760183.9	615030.7	755009.7	803756.8
65-69	621663	555618.5	256843.5	236796.1	786515.8	628532.4	392390.9	447636.9	739910.1	540097.1	468260.2	559794.5
70+	312739.2	260847.8	161629.9	169379.4	429993	358576.9	297860.5	313583.8	575863.2	449223.1	414878.6	498499.8

Net movement 90% Entry rate 90%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	301553.4	176541.7	332735.5	273906.9	226584.1	126212.7	330417.5	268148.1	177360.3	100776	315679.4	247536.1
20-24	932077.6	822878.3	564425.4	445212	698228.5	611225.2	579322.2	454267.5	607176.4	548058.1	563199.4	430117.8
25-29	835645.9	1019484	1131190	843344.1	748884.1	885018.9	1072772	805615	535793.2	692026.2	1068094	789338.2
30-34	578858.9	622861.4	1362672	1229720	1054255	1136329	973828.9	754901.3	734399.7	820061.3	1003047	771423.4
35-39	359532.8	246813.3	1689152	1754840	749946.7	962270.7	1306175	990455	668644.8	827949	1244329	948288.7
40-44	765226.6	761635.5	1500343	1491271	609179.8	640297.7	1317910	1213757	1076195	950052.7	946267.7	946673.5
45-49	858518.3	880318	1435231	1403943	350818.1	198889.6	1623242	1725733	729880.9	906047	1261888	976717.2
50-54	1085849	1074463	1204488	1176714	795026.4	711618	1300582	1328007	644026.8	600014.8	1149479	1085138
55-59	1017871	879274.7	940210.3	998716	873919.3	663175.8	1108347	1235420	456086.6	281548.7	1263605	1327106
60-64	760505	725528.4	591756.9	545738	904441	803306.3	734925.3	750072	713589.8	565428.2	801603.9	853359.3
65-69	599176.1	534886.8	279330.4	257527.8	742625.6	584203.4	436281.1	491965.9	687533.8	484661.2	520636.5	615230.4
70+	298588.3	246018.5	175780.8	184208.8	382416.8	308331.1	345436.8	363829.5	495745.4	354539.7	494996.4	593183.2

Net movement 80% Entry rate 90%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	341272.2	208880.6	293016.8	241568	272788.2	162295	284213.5	232065.8	230198	139781.1	262841.8	208531
20-24	996491.4	873508.7	500011.6	394581.7	772469.2	668071.9	505081.4	397420.8	692967.9	610392.2	477407.9	367783.7
25-29	835645.9	1019484	1131190	843344.1	876941.1	980134.1	944715.1	710499.8	685150.4	798240.3	918736.6	683124.1
30-34	578858.9	622861.4	1362672	1229720	1165391	1222178	862692.8	669052.5	862941.3	916596.7	874505.4	674888
35-39	359532.8	246813.3	1689152	1754840	749946.7	962270.7	1306175	990455	817180.6	939909	1095793	836328.7
40-44	765226.6	761635.5	1500343	1491271	609179.8	640297.7	1317910	1213757	1184186	1034966	838276.9	861760.3
45-49	858518.3	880318	1435231	1403943	350818.1	198889.6	1623242	1725733	729880.9	906047	1261888	976717.2
50-54	1085849	1074463	1204488	1176714	795026.4	711618	1300582	1328007	644026.8	600014.8	1149479	1085138
55-59	1017871	879274.7	940210.3	998716	873919.3	663175.8	1108347	1235420	456086.6	281548.7	1263605	1327106
60-64	760505	725528.4	591756.9	545738	904441	803306.3	734925.3	750072	713589.8	565428.2	801603.9	853359.3
65-69	599176.1	534886.8	279330.4	257527.8	742625.6	584203.4	436281.1	491965.9	687533.8	484661.2	520636.5	615230.4
70+	298588.3	246018.5	175780.8	184208.8	382416.8	308331.1	345436.8	363829.5	495745.4	354539.7	494996.4	593183.2

Net movement 70% Entry rate 90%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	308217.6	180802.3	326071.4	269646.3	242973.4	134934.9	314028.3	259425.8	205791.6	114863.4	287248.2	233448.6
20-24	988005.2	864149.5	508497.8	403940.9	769378.2	660234.3	508172.4	405258.3	694007	602101.2	476368.8	376074.7
25-29	1049447	1169088	917389	693740.6	969068.5	1038238	852587.8	652396.1	780634.4	853170.2	823252.7	628194.3
30-34	669677.6	704819.1	1271853	1147762	1242855	1275161	785229.4	616069.4	949959.2	972468.9	787487.4	619015.7
35-39	420951.4	310620.3	1627734	1691033	1035337	1167596	1020784	785130.1	959999	1036225	952974.8	740012.2
40-44	765226.6	761635.5	1500343	1491271	697015.3	721191.6	1230075	1132863	1259457	1087371	763006	809354.8
45-49	858518.3	880318	1435231	1403943	409840.1	261638.2	1564220	1662984	1005595	1108524	986173.5	774240.2
50-54	1060492	1049691	1229845	1201486	767646.5	683660.8	1327962	1355964	698050.6	651014.8	1095455	1034138
55-59	976089.3	858249.7	981992.4	1019741	824665.3	637167.7	1157601	1261428	447920.3	306095.4	1271771	1302560
60-64	701364.5	670987.1	650897.4	600279.4	813974.2	710975	825392.1	842403.3	614915.1	460382.6	900278.5	958404.8
65-69	551371.7	490813.7	327134.7	301600.9	645254.9	487879.4	533651.7	588289.8	571336.4	364202.8	636833.9	735688.8
70+	268505.4	214493.2	205863.7	215734.1	270345.6	189910.4	457507.9	482250.2	296397.6	120181.5	694344.2	827541.4

Net movement 90% Entry rate 80%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	341272.2	208880.6	293016.8	241568	272788.2	162295	284213.5	232065.8	230198	139781.1	262841.8	208531
20-24	996491.4	873508.7	500011.6	394581.7	772469.2	668071.9	505081.4	397420.8	692967.9	610392.2	477407.9	367783.7
25-29	835645.9	1019484	1131190	843344.1	876941.1	980134.1	944715.1	710499.8	685150.4	798240.3	918736.6	683124.1
30-34	578858.9	622861.4	1362672	1229720	1165391	1222178	862692.8	669052.5	862941.3	916596.7	874505.4	674888
35-39	359532.8	246813.3	1689152	1754840	749946.7	962270.7	1306175	990455	817180.6	939909	1095793	836328.7
40-44	765226.6	761635.5	1500343	1491271	609179.8	640297.7	1317910	1213757	1184186	1034966	838276.9	861760.3
45-49	858518.3	880318	1435231	1403943	350818.1	198889.6	1623242	1725733	729880.9	906047	1261888	976717.2
50-54	1085849	1074463	1204488	1176714	795026.4	711618	1300582	1328007	644026.8	600014.8	1149479	1085138
55-59	1017871	879274.7	940210.3	998716	873919.3	663175.8	1108347	1235420	456086.6	281548.7	1263605	1327106
60-64	760505	725528.4	591756.9	545738	904441	803306.3	734925.3	750072	713589.8	565428.2	801603.9	853359.3
65-69	599176.1	534886.8	279330.4	257527.8	742625.6	584203.4	436281.1	491965.9	687533.8	484661.2	520636.5	615230.4
70+	298588.3	246018.5	175780.8	184208.8	382416.8	308331.1	345436.8	363829.5	495745.4	354539.7	494996.4	593183.2

Net movement 80% Entry rate 80%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	344261.9	210794.6	290027.1	239654	279765.9	166014.6	277235.8	228346.2	241887.8	145566.5	251152	202745.5
20-24	1021259	891794.3	475244	376296.1	803794.5	689648.6	473756.1	375844.1	730245.6	633616	440130.2	344559.9
25-29	945343.1	1096110	1021493	766717.9	977259.5	1049808	844396.7	640825.8	794613.5	870263.6	809273.6	611100.9
30-34	624659.7	664193.5	1316871	1188387	1251676	1285626	776408.1	605604.3	960746.8	985690.8	776699.9	605793.8
35-39	390384.3	278864.5	1658301	1722789	898156.2	1068710	1157965	884015.9	951430.6	1035699	961543.3	740538.3
40-44	765226.6	761635.5	1500343	1491271	653476.1	681093.3	1273614	1172961	1268028	1097722	754434.3	799003.7
45-49	858518.3	880318	1435231	1403943	380465.7	230409.1	1593594	1694213	873065.2	1011010	1118703	871754.4
50-54	1073203	1062110	1217134	1189068	781372.1	697675.8	1314236	1341949	670999.7	625477.9	1122506	1059675
55-59	997093.9	868789.5	960987.8	1009201	849426.1	650205.6	1132840	1248390	451751.5	293700.8	1267940	1314954
60-64	731286.8	698582.4	620975.1	572684	860057.1	758007.6	779309.2	795370.7	665179	513891.8	850014.6	904895.6
65-69	575745.7	513285.2	302760.8	279129.4	695580.1	537338.8	483326.6	538830.5	631391.9	426054.4	576778.4	673837.2
70+	283843.7	230567	190525.4	199660.3	329338.1	252254.8	398515.4	419905.8	403104.6	245432.6	587637.2	702290.3

Net movement 70% Entry rate 80%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	346328.6	212546.4	287960.4	237902.2	283259.9	169066.8	273741.8	225294	247220	150068	245819.7	198244
20-24	1021164	910086.5	475338.9	358003.9	806497.9	710387.2	471052.7	355105.4	735629	654824.9	434746.8	323351
25-29	1049447	1169088	917389	693740.6	1068718	1115041	752937.9	575592.8	886249	935819.6	717638.1	545544.8
30-34	669677.6	704819.1	1271853	1147762	1270210	1345221	757874.3	546008.8	983764.3	1049075	753682.3	542409.2
35-39	420951.4	310620.3	1627734	1691033	1035337	1167596	1020784	785130.1	1071382	1123343	841591.8	652894.3
40-44	765226.6	761635.5	1500343	1491271	697015.3	721191.6	1230075	1132863	1286038	1156668	736425	740057.8
45-49	858518.3	880318	1435231	1403943	409840.1	261638.2	1564220	1662984	1005595	1108524	986173.5	774240.2
50-54	1060492	1049691	1229845	1201486	767646.5	683660.8	1327962	1355964	698050.6	651014.8	1095455	1034138
55-59	976089.3	858249.7	981992.4	1019741	824665.3	637167.7	1157601	1261428	447920.3	306095.4	1271771	1302560
60-64	701364.5	670987.1	650897.4	600279.4	813974.2	710975	825392.1	842403.3	614915.1	460382.6	900278.5	958404.8
65-69	551371.7	490813.7	327134.7	301600.9	645254.9	487879.4	533651.7	588289.8	571336.4	364202.8	636833.9	735688.8
70+	268505.4	214493.2	205863.7	215734.1	270345.6	189910.4	457507.9	482250.2	296397.6	120181.5	694344.2	827541.4

Net movement 90% Entry rate 70%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	380277.3	240727.5	254011.7	209721.1	316429.6	196698.8	240572.1	197662	277955.1	175566	215084.7	172746
20-24	1060470	923842.5	436032.8	344247.8	844101.9	723248	433448.8	342244.6	772320.9	668756.8	398054.9	309419.2
25-29	835645.9	1019484	1131190	843344.1	1002698	1073802	818958.6	616831.8	826223.9	899513.6	777663.2	581850.8
30-34	578858.9	622861.4	1362672	1229720	1275777	1307524	752307.2	583706.5	986967.1	1010295	750479.6	581189.5
35-39	359532.8	246813.3	1689152	1754840	749946.7	962270.7	1306175	990455	963048	1050166	949925.9	726072.2
40-44	765226.6	761635.5	1500343	1491271	609179.8	640297.7	1317910	1213757	1291447	1119382	731015.5	777344.5
45-49	858518.3	880318	1435231	1403943	350818.1	198889.6	1623242	1725733	729880.9	906047	1261888	976717.2
50-54	1085849	1074463	1204488	1176714	795026.4	711618	1300582	1328007	644026.8	600014.8	1149479	1085138
55-59	1017871	879274.7	940210.3	998716	873919.3	663175.8	1108347	1235420	456086.6	281548.7	1263605	1327106
60-64	760505	725528.4	591756.9	545738	904441	803306.3	734925.3	750072	713589.8	565428.2	801603.9	853359.3
65-69	599176.1	534886.8	279330.4	257527.8	742625.6	584203.4	436281.1	491965.9	687533.8	484661.2	520636.5	615230.4
70+	298588.3	246018.5	175780.8	184208.8	382416.8	308331.1	345436.8	363829.5	495745.4	354539.7	494996.4	593183.2

Net movement 80% Entry rate 70%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	382809.6	242349.5	251479.4	208099.1	321819.1	199520.8	235182.6	194840	286515.4	179652.2	206524.4	168659.8
20-24	1082069	939795.6	414434.3	328294.8	870575	741569.5	406975.6	323923.2	802139.3	687462.8	368236.5	290713.1
25-29	945343.1	1096110	1021493	766717.9	1089489	1134185	732167.4	556449.2	917370.1	959933	686516.9	521431.5
30-34	624659.7	664193.5	1316871	1188387	1351021	1362878	677063	528351.9	1070230	1069378	667216.5	522106.6
35-39	390384.3	278864.5	1658301	1722789	898156.2	1068710	1157965	884015.9	1079230	1133205	833743.9	643032.7
40-44	765226.6	761635.5	1500343	1491271	653476.1	681093.3	1273614	1172961	1364562	1174133	657900.9	722593.3
45-49	858518.3	880318	1435231	1403943	380465.7	230409.1	1593594	1694213	873065.2	1011010	1118703	871754.4
50-54	1073203	1062110	1217134	1189068	781372.1	697675.8	1314236	1341949	670999.7	625477.9	1122506	1059675
55-59	997093.9	868789.5	960987.8	1009201	849426.1	650205.6	1132840	1248390	451751.5	293700.8	1267940	1314954
60-64	731286.8	698582.4	620975.1	572684	860057.1	758007.6	779309.2	795370.7	665179	513891.8	850014.6	904895.6
65-69	575745.7	513285.2	302760.8	279129.4	695580.1	537338.8	483326.6	538830.5	631391.9	426054.4	576778.4	673837.2
70+	283843.7	230567	190525.4	199660.3	329338.1	252254.8	398515.4	419905.8	403104.6	245432.6	587637.2	702290.3

Net movement 70% Entry rate 70%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	385124.8	243830	249164.2	206618.6	326370.9	201785.9	230630.8	192574.9	293541.6	182701.4	199498.2	165610.6
20-24	1103676	955754.3	392827.2	312336	895811.2	759198.4	381739.5	306294.3	829114.2	704579.4	341261.6	273596.5
25-29	1049447	1169088	917389	693740.6	1170160	1190730	651496.3	499903.6	999268.3	1015048	604618.8	466316
30-34	669677.6	704819.1	1271853	1147762	1421475	1414871	606609.4	476358.6	1145886	1123633	591561.1	467852.1
35-39	420951.4	310620.3	1627734	1691033	1035337	1167596	1020784	785130.1	1184768	1209198	728206.1	567040.2
40-44	765226.6	761635.5	1500343	1491271	697015.3	721191.6	1230075	1132863	1433021	1225560	589441.2	671166.6
45-49	858518.3	880318	1435231	1403943	409840.1	261638.2	1564220	1662984	1005595	1108524	986173.5	774240.2
50-54	1060492	1049691	1229845	1201486	767646.5	683660.8	1327962	1355964	698050.6	651014.8	1095455	1034138
55-59	976089.3	858249.7	981992.4	1019741	824665.3	637167.7	1157601	1261428	447920.3	306095.4	1271771	1302560
60-64	701364.5	670987.1	650897.4	600279.4	813974.2	710975	825392.1	842403.3	614915.1	460382.6	900278.5	958404.8
65-69	551371.7	490813.7	327134.7	301600.9	645254.9	487879.4	533651.7	588289.8	571336.4	364202.8	636833.9	735688.8
70+	268505.4	214493.2	205863.7	215734.1	270345.6	189910.4	457507.9	482250.2	296397.6	120181.5	694344.2	827541.4

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Net movement 110% Entry rate 110%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	209858.3	103912.4	424430.7	346536.2	94754.73	31102.71	462246.9	363258.1	0	0	493039.8	348312
20-24	733158.2	670012.1	763344.8	598078.2	438225.3	423075.7	839325.4	642416.9	261008.7	318231.5	909367.1	659944.4
25-29	599470.7	855285.1	1367365	1007543	167547.5	472957.3	1654109	1217677	0	203859.7	1603887	1277505
30-34	484908.5	538077.5	1456622	1314503	566214.8	770443.8	1461869	1120786	124414.1	385783.6	1613033	1205701
35-39	296976.9	181824.7	1751708	1819828	418764.9	725607.1	1637357	1227119	0	289829.9	1912974	1486408
40-44	765226.6	761635.5	1500343	1491271	518315.6	556614.4	1408774	1297440	601967	588155.6	1420496	1308571
45-49	858518.3	880318	1435231	1403943	290703.1	134978.9	1683357	1789644	409928.2	672666.1	1581840	1210098
50-54	1110942	1098978	1179396	1152200	822121.1	739284.1	1273487	1300341	590373	549364.3	1203133	1135789
55-59	1058745	900080.7	899336.5	977910	922102.4	688913	1060164	1209683	466257.4	257986	1253434	1350669
60-64	816829.3	777472.6	535432.6	493793.9	988245.5	888838	651120.8	664540.3	804997.7	662737.9	710195.9	756049.6
65-69	643206.4	575480.4	235300.1	216934.2	827372.6	670384.5	351534.1	405784.8	788666.7	592435.4	419503.7	507456.2
70+	326296.3	275055	148072.8	155172.3	472463.4	403413.5	255390.1	268747.1	644867.2	531057.9	345874.6	416665

Net movement 120% Entry rate 120%

Age group	2020				2030				2040			
	Agri		Non-Agri		Agri		Non-Agri		Agri		Non-Agri	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19	160492.3	65295.92	473796.7	385152.7	12788.34	0	544213.3	446647	0	0	493039.8	348312
20-24	623286.5	585977.5	873216.5	682112.8	278954.6	310623.5	998596.1	754869.1	20155.15	164517	1150221	813658.9
25-29	472992.6	767712.3	1493843	1095116	-195641	219633.7	2017297	1471000	0	0	1603887	1481364
30-34	436759	494625.8	1504772	1357955	270141.7	550099.2	1757942	1341131	0	105054.7	1737447	1486430
35-39	265272.4	148887.3	1783413	1852766	234937.3	594809.2	1821184	1357916	0	0	1912974	1776238
40-44	765226.6	761635.5	1500343	1491271	471747.7	513726.7	1455342	1340328	314273.4	370212.6	1708189	1526514
45-49	858518.3	880318	1435231	1403943	260235.7	102587.8	1713824	1822035	232333.4	543682.4	1759435	1339082
50-54	1123389	1111138	1166948	1140039	835561.5	753007.9	1260047	1286617	563720.3	524203.4	1229786	1160950
55-59	1078841	910401.6	879240.3	967589.1	945792.5	701680.1	1036474	1196916	472087	246582.2	1247604	1362073
60-64	843935.3	802470.7	508326.5	468795.8	1027732	929138.6	611634.1	624239.8	848067.1	708588	667126.6	710199.5
65-69	663806.3	594472.4	214700.2	197942.2	865316	709817.6	313590.7	366351.7	833946.5	641748.6	374223.8	458142.9
70+	339259.7	288639.9	135109.4	141587.4	510209.4	443246.6	217644.2	228914	704040.8	601483	286701	346239.9

Net movement rate in past years and projected years

Age group year 0	Age group year 5	1980-1990	1990-2000	2000-2010	Low scenario	High scenario
M15-19	M20-24	0.9	0.7	0.9	0.63	1.08
M20-24	M25-29	0.2	0.2	0.2	0.14	0.24
M25-29	M30-34	0.1	0.1	0.1	0.07	0.12
M30-34	M35-39	0.1	0	0	0	0
M35-39	M40-44	0	0	0	0	0
M40-44	M45-49	0.05	0	-0.05	-0.035	-0.06
M45-49	M50-54	-0.05	-0.05	-0.1	-0.07	-0.12
M50-54	M55-59	-0.2	-0.2	-0.2	-0.14	-0.24
M55-59	M60-65	-0.3	-0.3	-0.3	-0.21	-0.36
M60+	M65+	-0.3	-0.3	-0.3	-0.21	-0.36

Entry rate in past years and projected years

Enter rate	1980	1990	2000	2010	Low	High
Male	0.08366	0.069634	0.040538	0.032988	0.023091552	0.039585
Female	0.108423	0.103986	0.045196	0.028697	0.020088249	0.034437

Net moving sensitivity

Index	Total agri worker	%total agri	%aging agri	%agri age50-59	%agri age30-49	%agri age15-29
120	9581615.42	27.474534	45.27288688	18.85478436	27.98161456	7.890714
119	9735238.77	27.9150369	44.25050796	18.6157398	28.81926234	8.31449
118	9887058.53	28.3503682	43.26487023	18.3875778	29.62655856	8.720993
117	10037083	28.7805518	42.31371324	18.16966615	30.40534905	9.111272
116	10185320.6	29.2056113	41.39495031	17.96142187	31.15733741	9.48629
115	10331779.2	29.6255701	40.506652	17.7623065	31.88409862	9.846943
114	10476467.2	30.0404514	39.64703138	17.57182197	32.587091	10.19406
113	10619392.3	30.4502781	38.814431	17.3895069	33.26766693	10.5284
112	10760562.5	30.8550727	38.00731114	17.21493331	33.9270824	10.85067
111	10899985.6	31.2548576	37.22423947	17.04770366	34.56650553	11.16155
110	11037669.3	31.6496548	36.46388163	16.88744824	35.18702425	11.46165
109	11173621.2	32.0394861	35.72499287	16.73382276	35.78965311	11.75153
108	11307848.7	32.424373	35.00641049	16.58650626	36.3753395	12.03174
107	11440359.3	32.8043368	34.30704706	16.44519918	36.94496919	12.30278
106	11571160.3	33.1793986	33.62588425	16.30962159	37.49937137	12.56512
105	11700259	33.5495789	32.96196731	16.17951168	38.03932316	12.8192

104	11827662.4	33.9148984	32.3144	16.05462433	38.56555374	13.06542
103	11953377.7	34.275377	31.68234008	15.93472978	39.07874809	13.30418
102	12077411.7	34.6310349	31.06499512	15.81961252	39.57955036	13.53584
101	12199771.4	34.9818917	30.46161875	15.70907018	40.06856699	13.76074
100	12320463.4	35.3279667	29.87150721	15.60291261	40.54636946	13.97921
99	12439494.5	35.6692791	29.29399622	15.50096093	41.01349692	14.19155
98	12556871.3	36.0058478	28.72845809	15.40304679	41.4704585	14.39804
97	12672600.2	36.3376914	28.17429912	15.3090116	41.91773549	14.59895
96	12786687.6	36.6648282	27.63095719	15.21870584	42.35578326	14.79455
95	12899139.9	36.9872763	27.09789952	15.13198847	42.7850331	14.98508
94	13009963.2	37.3050535	26.57462067	15.04872634	43.20589387	15.17076
93	13119163.7	37.6181774	26.06064067	14.96879366	43.61875353	15.35181
92	13226747.4	37.9266653	25.55550329	14.89207155	44.02398055	15.52844
91	13332720.3	38.2305341	25.05877444	14.81844756	44.42192518	15.70085
90	13437088.1	38.5298008	24.57004075	14.74781527	44.81292068	15.86922
89	13539856.7	38.8244818	24.08890816	14.68007395	45.19728441	16.03373
88	13641031.7	39.1145932	23.6150007	14.61512813	45.57531886	16.19455
87	13740618.8	39.4001513	23.14795934	14.55288737	45.94731257	16.35184
86	13838623.3	39.6811716	22.68744087	14.49326587	46.31354107	16.50575
85	13935050.7	39.9576696	22.23311695	14.43618227	46.67426762	16.65643
84	14029906.2	40.2296605	21.78467312	14.38155935	47.02974403	16.80402
83	14123195.2	40.4971593	21.34180801	14.32932378	47.38021133	16.94866
82	14214922.7	40.7601807	20.90423249	14.27940596	47.72590044	17.09046
81	14305093.7	41.0187391	20.4716689	14.23173974	48.06703277	17.22956
80	14393713.2	41.2728486	20.04385042	14.18626226	48.40382081	17.36607
79	14480786.1	41.5225233	19.62052034	14.14291378	48.73646865	17.5001
78	14566317.1	41.7677766	19.20143149	14.10163751	49.06517246	17.63176
77	14650310.8	42.0086221	18.78634566	14.06237942	49.39012101	17.76115
76	14732771.9	42.2450729	18.37503306	14.02508816	49.71149603	17.88838
75	14813704.8	42.4771418	17.96727184	13.98971485	50.02947269	18.01354
74	14893114	42.7048415	17.56284756	13.95621303	50.34421993	18.13672
73	14971003.8	42.9281843	17.16155282	13.92453846	50.65590085	18.25801
72	15047378.3	43.1471823	16.76318678	13.89464908	50.96467305	18.37749
71	15122241.8	43.3618474	16.36755482	13.86650488	51.27068893	18.49525
70	15195598.2	43.5721912	15.97446812	13.84006778	51.57409599	18.61137

Entry rate sensitivity

Entry rate	Total agri worker	%total agri	%aging agri	%agri age50-59	%agri age30-49	%agri age15-29
120	9411515	26.98678	39.10431	20.42552	36.06892	4.401247
119	9562565	27.41991	38.48662	20.10288	36.35219	5.05831
118	9713012	27.8513	37.89049	19.7915	36.62724	5.690762
117	9862859	28.28098	37.31482	19.49081	36.89451	6.299862
116	10012108	28.70894	36.75857	19.20026	37.15438	6.886785
115	10160761	29.13519	36.22079	18.91936	37.40722	7.452629
114	10308820	29.55974	35.70058	18.64764	37.65337	7.998418
113	10456287	29.98259	35.19708	18.38464	37.89316	8.525115
112	10603164	30.40375	34.70953	18.12998	38.12688	9.033618
111	10749454	30.82322	34.23716	17.88324	38.35482	9.524773
110	10895159	31.24102	33.7793	17.64409	38.57724	9.999372
109	11040280	31.65714	33.33528	17.41216	38.7944	10.45816
108	11184820	32.0716	32.90449	17.18714	39.00652	10.90184
107	11328780	32.48439	32.48636	16.96874	39.21384	11.33107
106	11472164	32.89553	32.08033	16.75666	39.41654	11.74647
105	11614973	33.30503	31.6859	16.55063	39.61484	12.14863
104	11757209	33.71288	31.30257	16.3504	39.80892	12.53811
103	11898873	34.11909	30.92989	16.15574	39.99895	12.91542
102	12039970	34.52367	30.56742	15.96641	40.1851	13.28107
101	12180499	34.92663	30.21476	15.7822	40.36752	13.63552
100	12320463	35.32797	29.87151	15.60291	40.54637	13.97921
99	12459865	35.72769	29.5373	15.42835	40.72178	14.31257
98	12598706	36.12581	29.21179	15.25832	40.89389	14.636
97	12736989	36.52232	28.89465	15.09267	41.06282	14.94986
96	12874715	36.91724	28.58555	14.93121	41.2287	15.25454
95	13011886	37.31057	28.2842	14.77381	41.39164	15.55035
94	13148504	37.70231	27.99032	14.6203	41.55174	15.83764
93	13284572	38.09247	27.70363	14.47055	41.70912	16.1167
92	13420091	38.48106	27.42387	14.32443	41.86386	16.38784
91	13555063	38.86808	27.1508	14.18179	42.01607	16.65134
90	13689490	39.25354	26.88419	14.04253	42.16583	16.90746
89	13823375	39.63745	26.6238	13.90653	42.31322	17.15645
88	13956719	40.0198	26.36944	13.77366	42.45834	17.39856
87	14089523	40.40061	26.12088	13.64383	42.60125	17.63403

86	14221791	40.77988	25.87795	13.51694	42.74204	17.86307
85	14353524	41.15761	25.64045	13.39289	42.88077	18.0859
84	14484723	41.53381	25.4082	13.27158	43.0175	18.30271
83	14615391	41.90849	25.18104	13.15292	43.15232	18.51372
82	14745530	42.28166	24.9588	13.03684	43.28527	18.71909
81	14875142	42.65331	24.74133	12.92325	43.41641	18.91901
80	15004227	43.02345	24.52847	12.81206	43.54581	19.11365
79	15132789	43.39209	24.32009	12.70322	43.67352	19.30317
78	15260830	43.75924	24.11604	12.59664	43.79959	19.48774
77	15388350	44.12489	23.9162	12.49225	43.92407	19.66749
76	15515353	44.48906	23.72043	12.38999	44.04701	19.84257
75	15641839	44.85175	23.52862	12.2898	44.16845	20.01313
74	15767811	45.21297	23.34064	12.19162	44.28844	20.1793
73	15893270	45.57271	23.15639	12.09538	44.40703	20.3412
72	16018219	45.93099	22.97576	12.00103	44.52425	20.49895
71	16142659	46.28781	22.79865	11.90852	44.64015	20.65269
70	16266591	46.64318	22.62495	11.81779	44.75476	20.80251