CHAPTER – I

INTRODUCTION

Agriculture has been the fundamental source of survival for man for thousands of years. Even today it has been a source of living to more than half of the world’s population. The problem of ass hunger can be overcome only by countries, which can carry the burden of the growing population with better and more production. During the pre-independence period, Indian agriculture was usually called as a gamble with monsoons because of the existence of a great deal of insecurity about crop forecast as the monsoons played a very crucial role in determining the agricultural productivity and its failures would lead in well-known famine and misery. However Indian agriculture has been doing a very extraordinary improvement and is therefore now more flexible to the ill effects of the monsoon, although the country’s population has been increasing more than double.

1.1 Sustainable Agriculture and Organic Farming

With the non-stop increase in population including both human and animal along with the decreasing availability of land and water, and other related negative effects on environment has led to lots of unintentional developments, which has resulted in the ruin of the natural resources. The reduction and ruin of the natural resources have not only led to the down fall of productivity, but have also caused a number of other ecological problems. The desire to produce more has only added more troubles causing un-sustainability of the agricultural production system throughout the world. Scarcity of land and water resources, with the increasing population, has resulted to the switching of the land which were used for agricultural purposes to other uses, and the never-ending problems of hunger and starvation in different parts of the world has seriously attracted the world’s attention for problems related to sustainability in the agricultural production systems.

In the Indian context, with greater part of the land being ruined, the country has a very little expectation of sustaining even the present crop yield rates in the years to come. The further growth in productivity should be fully based on a improved usage of water and agri-chemicals, and better use of organic manures, indigenous pest
control and renewable sources of energy. Therefore, the biggest confront will be to produce more food the people with only few available land which has higher demand of water and other inputs to feed the hunger. The reasons which were responsible for the advancement of green revolution have now become the topic of criticism for us. However, there is a way to solve the problem through usage of inputs like organic manure and bio-fertilizers. And thus organic farming plays the key role for agricultural development.

Sustainable agriculture in the simplest way is defined as the practice of agriculture, which is economically, environmentally and socially feasible. The terms sustainable agriculture and organic farming are very often used as different words with the same meaning. However, they are both entirely different concepts though some of the attributes may be similar. For example, both are recyclable and resource preserving. According to organic farming there should be a total ban on the use of synthetic chemicals and does not forever guarantees economic feasibility and sustainability. The Department of Commerce, Ministry of Commerce and Industry, Government of India has started a National Programme for Organic Production (NPOP), in order satisfy the greater demand of productions through organic farming.¹.

The concept of organic agriculture has been defined differently by different researchers. To majority, it indicates simply the use of organic manures and indigenous plant protection methods without the usage of synthetic fertilizers and pesticides. It is explained by others as farming which includes the use of fertilizers and organic manures together along with chemicals and natural inputs for plant protection. IFOAM (International Federation of Organic Agriculture Movements)² explains the main goal of organic farming as ‘Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.’ According to the United States Department of

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Agriculture (USDA) National Organic Standards Board (NOSB) definition, April 1995, ‘Organic agriculture is an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony’³. ‘Organic farming is a form of agriculture that relies on techniques such as crop rotation, green manure, compost and biological pest control. Organic farming uses fertilizers and pesticides but excludes or strictly limits the use of manufactured (synthetic) fertilizers, pesticides (which include herbicides, insecticides and fungicides), plant growth regulators such as hormones, livestock antibiotics, food additives, genetically modified organisms, human sewage sludge, and nano materials’⁴. ‘Organic agriculture is a well defined method of production that minimizes the use of costly synthetic fertilizers, pesticides and herbicides⁵.

Market for organic products has been growing since 1990, which has reached $55 billion in 2009 according to Organic Monitor (www.organicmonitor.com). And this demand has lead to a parallel increase in the organically cultivated farms which has developed during the years 2001-2011 at a rate of 8.9 percent annually⁶. According to 2014 Annual Report of IFOAM, about 170 countries has reported organic farming activities compared to 86 countries in the year 2000. India has the largest number of organic producers in the world⁷.


1.2 Agriculture in Less Developed and Developed Countries

Majority of the world’s poor people live in rural areas (i.e., about 75%), and farming is the main source of livelihood for most of them. The most common problem faced in these areas that comes in the way of agricultural advancement are problems related to the access of better technologies, huge institutional weaknesses, and problems linked with the organization and management of research, extension and education systems thus many countries and agricultural systems are still caught up in the state of underdevelopment and faces all the major obstacles to the use of knowledge and modernization for growth.

1.2.1 Agriculture in Developing Countries

For developing countries agriculture still plays a very important role and Gross Domestic Product (GDP) growth from agriculture has observed to have benefited the poor people’s incomes two to four times more than GDP growth in rest of the sectors of economy. In Less Developed Countries (LDC’s) agriculture is explained as a subsistence agriculture, the main purpose of which is to supply food for farmer's family’s domestic consumption. This type of agriculture is mostly practiced due to the absence of money and technology in these LDC’s. And the other reason is due to the environmental condition that many LDC’s exist in.

Shifting cultivation is one of the earliest types of cultivation that subsistence farmers used in world's most humid, low latitude climate regions and excessive rainfall. This type of cultivation is practised mostly in the Amazon area of South America, Central and West Africa, and Southeast Asia including Indochina, Indonesia, and New Guinea. It has two characteristic areas, first is the slash-and-burn agriculture where the farmers would clear land for cultivating by cutting down all flora and burning the remains. Then the farmers will cultivate on the cleared land

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for few years and then which will be moved on to another land to cut down all flora in order to start cultivating. The reason for the movement is to let the vegetation grow back on the land so that the soil can be restored. The burning remains are used as the only fertilizer. Rice, maize and manioc are some of the major crops of shifting cultivation.

Pastoral nomadism is the next important practice of subsistence farmers in less developed countries, and this type of farming is based on the herding of domesticated animals. Milk is provided by animals and their skins and hair are used for purposes like clothing and tents. Thus, it is simply a way of surviving on land that has too little rain for agricultural activities. In India, this kind of farming is mostly common in the dry lands of Western India (i.e., Thar Desert) and on the Deccan Plateau, and in the mountainous regions of Northern India (i.e., the Himalayas) \(^{11}\).

Finally, intensive subsistence agriculture is the third type of subsistence farming, here intensive means that the farmers must work more deeply to survive on a small plot of land. Since the ratio of farmers to cultivable land is very high in heavily populated areas, therefore farmers must cultivate on every bit of land. In the wet region of Asia, wet rice is the most popular crop grown and here rice is planted on dry land in a nursery then later the seedlings are moved to a flooded field in order to encourage growth. Crop rotation is another type farming which is practiced mostly in parts of Asia where wet rice cannot grow, here varieties of crops are planted each time in the same plot of land, which helps the farmers in keeping the soil from exhausting. Thus, in less developed countries subsistence agriculture is the only way for the families to survive. In less developed countries agriculture is only for survival and for the security of their own families.

1.2.2 Agriculture in Developed Countries

Agriculture system in more developed countries is relatively different from the less developed countries and can be describe as the commercial agriculture. Commercial agriculture is type of agriculture which aims mainly to produce products for sale from the farm and such farm is supported considerably by the income earned

from cultivation and the agricultural business. This type of agricultural sector plays a crucial role in the state's economy. Dependence on technological and scientific advancements is an important distinguishing characteristic of commercial agriculture. Thus, a very small number of farmers in a developed country can provide food to many since they depend on technology rather than human labour or animals. Another important feature of commercial agriculture is that most of the farmers belong to either large or average farm size and that the main motive of the farmers behind the agricultural activity is to earn huge profit from the farm rather than to feed their own families. Signing big contracts with well known food companies to sell their crops and livestock in huge number for high prices is their main motive. And finally commercial farming’s incorporation with other businesses is the final important character. Thus it is an agribusiness, because the farm is not an isolated activity but is incorporated into a large food production industry.

There are sharp divisions between developed and developing countries and there has been urgency for the latter to develop their indigenous supply of food to meet the needs of their rapidly expanding population.12

1.3 Indian Agriculture

Indian agriculture during ancient period was mainly based on organic farming and the whole agriculture system was based on organic inputs, where the fertilizers, pesticides were from plant and animal remains. Small and marginal farmers feeding their families and local village communities by producing foods was the main feature of traditional farming system in India. The farmers deciding on the types of crops to be produced based on climatic and soil conditions played a major role in decentralizing the farming system in India. Farming practices such as the shifting cultivation, conservation, use of animal manures and farm wastes, and legumes into crop rotations helped in achieving pest control and improving soil health.

1.3.1 Indian Agriculture Development: Before and After the Green Revolution

During 1950’s and 1960’s, with the increasing population of India and the natural calamities, India had to suffer a severe food scarcity. So to deal with the

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problem, the government had to increase the production of food in the country, for which several efforts were made. The New Agricultural Strategy (NAS) was initiated in 1966, which formulated policies to utilise and promote high-yielding varieties of food grains in all districts selected under the Intensive Agricultural District Programme (IADP) and Intensive Agricultural Area Programme (IAAP) schemes. The NAS also came to be known as the High-Yielding Varieties Programme (HYVP)\(^{13}\).

After World War II, green revolution had lead to the advancement of commercial agriculture in the developed countries. It mainly aimed at improving the land productivity through scientific technology. Under HYVP, varietal improvement helped packing into the seed an ability to yield more for a given situation. This potential is best expressed and realised through an appropriate attendant crop management practices more relevant and calls for simultaneously devoting research efforts for its improvement. The crop management practices are closely linked with the land situation and water availability conditions. In India, the first dwarf variety of wheat was introduced by the scientists with the help of Dr. Norman Borlaug at the Indian Agricultural Research Institute (IARI), New Delhi, in 1962-63. Since then a number of rice research centres have been established in India.

The advancement of Indian agriculture during the last 40 years can be explained under three areas, First is the advancement in developing the research and educational infrastructure, which was required for developing and testing technologies which would be appropriate for different agro-ecological regions, next was a sensibly capable input production system for the production and distribution of seeds, fertilizers and other inputs. Finally he third step to develop the policies necessary for inspiring higher productivity by small farmers and higher consumption by the poor rural and urban people. Thus, the agricultural system was completely developed with the introduction of high-yielding varieties which resulted to a huge number of pest

issues of economic significance. And increased higher fertilizers usage, irrigation and adoption of high-yielding varieties caused the rebirth of pest problems\textsuperscript{14}.

But unfortunately, green revolution had a negative impact on farmers with small farm size, as they found themselves trapped in the cycle of high interest rates on seeds, fertilizers and pesticides which they had to buy on credit\textsuperscript{15}. In order to solve the problem of uneven geographical distribution the researchers tried to cooperate with the environment by using traditional methods of crop rotation and the cultivation of various varieties of crops. However, they introduced advanced crops that would be adapted to any inappropriate conditions as long as they are properly irrigated and provided expensive inputs of fertilizers and pesticides which resulted in inequalities between the rich farmers and the poor farmers\textsuperscript{16}. Thus, due to the evil effects of green revolution, many farmers committed suicide, making the number of suicide cases during 1966 as 37,848 farmers the rate of 7.6 percent, which later on has increased to 10.8 percent by 2000\textsuperscript{17}.

1.3.2 Indian Agriculture: The Present Scenario\textsuperscript{18}

Agriculture has been an important sector of the Indian economy, and about 48 percent of India’s population is dependent on agriculture, however it accounted for 17.6 percent of the total nations’ GDP in 2014-15. The Central Survey Organisation had estimated a positive growth rate of 0.2 percent for agriculture in India during 2014-15. It has also been recorded that the total food grain production in the country stood at 251.1 Metric Tonnes (MT) in 2014-15, showing a decline of 13.9 MT from 2013-14. The area under cultivation of food grains has remain stagnant, at 120.4 million ha, for over four and a half decades, however, the area under cultivation of


rice has increased from 37.0 million ha to 43.9 million ha, from 1968-69 to 2013-14. India has proved as an important agri-exporter in crops like oil-meals, cotton, pepper rice, and sugar, as well as meat. India’s agricultural exports were valued at US$47 billion in 2013, and its share in total world exports stood at 2.7 percent. Among the top exporters of agricultural products, India was also one of the countries showing the greatest increase in agricultural exports of about 11 percent.

1.3.3 Agriculture in North-Eastern India

In India the North East part constitutes of the eight states they are Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, surrounded by the hills and the Brahmaputra River between its north and south. To its north lies Arunachal Pradesh and towards the North West bordering of China and Bhutan lays Sikkim. At the southwest and east is the Bangladesh and Myanmar. The heavy Brahmaputra provides its rich alluvial silt beside the banks of the plains of Assam. The tropical rain forest which is rich in flora and fauna, covers from Arunachal Pradesh to Assam. It is a land with rice as the stable food, tea is a trade, handicrafts a key of livelihood and martial arts is an ideal activity of the people.

The North East states are one of the most bio-diversified regions in the world. About 65 per cent on an average which is covered by forest cover is owned by government, and the rest is owned by the village communities, individuals and chiefs. There are three geographical divisions, they are the Shillong Plateau, the North Eastern hill Basin and the Brahmaputra Valley. The identification of economy of North-eastern parts India is mainly due to its rare physical, economic and socio-cultural characteristics. An area of 2.62 lakh sq. km. is covered by the NER of India and accounts for about 7.9 percent of total geographical area of the country.

1.4 Statement of Problem

With the non-stop increase in population including both human and animal along with the decreasing availability of land and water, and other related negative effects on environment has led to lots of unintentional developments, which has resulted in the ruin of the natural resources. The reduction and ruin of the natural resources have not only led to the down fall of productivity, but have also caused a

19 www.ibef.org, Accessed on 02/02/14.
number of other ecological problems. The desire to produce more has only added more troubles causing un-sustainability of the agricultural production system throughout the world. Scarcity of land and water resources, with the increasing population, has resulted to the switching of the land which were used for agricultural purposes to other uses, and the never-ending problems of hunger and starvation in different parts of the world has seriously attracted the world’s attention for problems related to sustainability in the agricultural production systems.

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Very few studies on organic farming from economic perspectives are available so far. This study attempts to fill this gap. It attempts to compare the economics of organic and inorganic rice farming in Nagaland. Besides, it examines whether organic farming benefits the rural farmers as compared to the inorganic farmers by farm size. This study deals with some of the main problems like labour absorption, input and output structure, cost and returns, determinants of yield, yield gap and yield constraints, farm size and productivity, inequalities of income distribution from rice cultivation and farmers’ choice of rice cultivation determinants.

According to 2011 census, Dimapur district in Nagaland had 205 villages, and the total number of farming households was 35,662, out of which the total farming population was 1,83,552\(^{20}\). Out of these 205 villages in Dimapur district, Suhoi and Kuhuboto villages were chosen for the study as these two villages have both the types of farmers, i.e., a group of farmers still practising the traditional organic farming, and another group practising the modern inorganic farming using hybrid seeds and improved techniques mostly for commercial purpose. Of the sixteen varieties of rice cropped in Nagaland, Ranjit (inorganic) and Naga Local/Special rice (organic) are the two mostly cropped rice varieties by the farmers in the study area. Therefore, the two varieties have been chosen for the comparative study.

With the increase in the use of high yielding varieties and modern technology, input use and cost have also been increasing with the rising yields. A comparative study of the levels of input application and the returns accruing to both rice varieties, as well as to the small and medium farmer groups is warranted to understand the pattern of input use, cost and yield across the rice varieties and farm size.

The rice yield is affected by the cultivation techniques, which tends to be different for different rice varieties and farm size. Hence, an understanding of the factors that contribute to increased or decreased output of both the rice varieties and farm sizes becomes mandatory.

It has been found that the rice yield achieved under field conditions generally fails to approach its experimental station yield potential (Mukherji\textsuperscript{21} and Kalirajan\textsuperscript{22}). It has also been found that gap exists between the maximum yield attained at farm level and the average yield achieved by farmers (Flinn and Ali\textsuperscript{23}). This leads to the necessity of studying the magnitude of yield gap that exists between the maximum and average yield for each rice variety in the study area. The identification of the biophysical and socio-economic factors that restricts farmers from achieving the potential yield at farm level is also deemed necessary.

There is a significant divergence in views relating to the relationship between farm size and farm efficiency. Several economists have opined that inverse relationship remains valid only for traditional agriculture. With the rapid technological changes and expansion of commercial farming, the inverse relationship has disappeared. Hence, a verification of the nature of relationship between farm size and farm efficiency in the study area is important.

The benefits of the advancement of technology and commercial farming have not been shared equally by farmers within and between varieties and farm size. Therefore, in order to understand the impact of cultivation of both the rice varieties on

\textsuperscript{21} D. K. Mukherji, \textit{Gap Analysis: An Effective Production Increase Concept in Rice}, Summary of Lecture delivered at the State Level Training Meeting on Rice held at Purila, Department of Agriculture, West Bengal, India, July, 1977.

\textsuperscript{22} K. Kalirajan, “The Contribution of Location Specific Research to Agricultural Productivity”, \textit{Indian Journal of Agricultural Economics}, Vol. 35, No. 4, July-September 1980, pp. 8-16.

the income distribution of the farmers, it is essential to study their income distribution.

With the absence of studies on organic rice cultivation from economic perspective, this study also attempt to examine the factors which determine the decision of farmers regarding their choice of rice cultivation method, besides exploring whether environmental concern influences organic method of rice cultivations. It also examines the attitude, concern and actions of farmers across rice variety and farm size towards environment.

1.5 Objectives of the Study

This study examines the following objectives:

1. to study the cost and returns structure of organic and inorganic rice cultivation by varieties across farm size in the study area;
2. to investigate the determinants of yield of the two rice varieties by farm size;
3. to identify the yield gap and its constraints with regard to the two rice varieties across farm size;
4. to analyse the farm size-productivity relationship of the two rice varieties; and
5. to examine inequalities in net income distribution of the farmers cultivating the two rice varieties.

1.6 Data and Methodology of the Study

This study is based on both the secondary and primary data. Secondary data is drawn from Statistical Abstract of Nagaland (various issues), Indiastat.com, Reports of Agriculture District office, and Taluk Village Development Board office, Dimapur Nagaland. The primary data is collected using pre-tested schedule from a total sample of 350 farmers cultivating rice during November-December 2013. A census method has been adopted to collect data from all 100 organic farmers cultivating Nagaland Special rice in Suhoi and Kuhuboto villages of Dimapur district, Nagaland. In addition, a random sample of 250 inorganic farmers cultivating Ranjit rice variety has been selected from the two villages, as majority of the inorganic farmers cultivate Ranjit rice variety. To examine the farm-size effects, the data collected has been divided into two groups of small farmers (with land ownership of less than 4.95 acres) and the medium farmers (with land ownership 4.95 to 12.36 acres). The small and
medium farmers alone have been considered by the study, as in the selected villages, there are hardly any farmers.

The objectives of the study has been analysed using simple averages, ratios, percentages, correlation matrix, log linear production function, simple regressions, Chow test\(^24\), Garrett Ranking Technique, Lorenz curve Gini index, Robin Hood Index (another measure of inequality) and F-test. The following log linear production function has been fitted to study the determinants of rice yield:

\[
\log \text{YIELD}_i = \beta_0 + \beta_1 \log \text{LABOR} + \beta_2 \log \text{FRTZR} + \beta_3 \log \text{PESTD} + \beta_4 \log \text{KFLOW} + \beta_5 \log \text{IRRIG} + \beta_6 \log \text{NTRTN} + \beta_7 \log \text{FRMSZ} + \mu
\]

where,

\[
\text{YIELD}_i = \text{yield/output per acre in kg. of the two rice variety by farm size } i \quad \text{(where, } i = \text{organic and inorganic small, medium and total rice farmers)};
\]

\[
\text{LABOR} = \text{total labour mandays employed per acre};
\]

\[
\text{FRTZR} = \text{chemical fertilizer/organic manure per acre in kg.};
\]

\[
\text{PESTD} = \text{pesticides per acre in kg.};
\]

\[
\text{KFLOW} = \text{capital flows per acre in Rs.};
\]

\[
\text{IRRIG} = \text{irrigation cost per acre in Rs.};
\]

\[
\text{NTRTN} = \text{net return per acre in Rs.};
\]

\[
\text{FRMSZ} = \text{farm size dummy (where, 1= small and 0= medium)}; \text{ and}
\]

\[
\mu = \text{error term}.
\]

The regression is estimated using ordinary least squares (OLS) principle. The expected effects of all inputs are positive on yield. Whereas, increase in farm size is expected to have negative effect due to the emergence of diseconomies of scale.

Further, Chow test (1960) was estimated to examine if structural difference exists between organic as well as inorganic rice farmers, and small and medium farmers. The formula used is:-

\[ F^* = \frac{\epsilon e^2 - (\epsilon e_1^2 + \epsilon e_2^2)/K}{(\epsilon e_1^2 + \epsilon e_2^2)/n_1 + n_2 - 2K} \]

where, \(K = \) number of parameters, including the intercept term; \(\epsilon e^2 = \) unexplained sum of squares for total farmers; \(\epsilon e_1^2 = \) unexplained sum of squares for organic small farmer group; \(\epsilon e_2^2 = \) unexplained sum of squares for inorganic medium farmer group; and \(n_1 + n_2 = \) total number of observations.

The relationship between the farm-size and productivity has been examined in terms of land, labor, average variable cost and average total cost. For the analysis, the given model has been estimated in log form:

\[ \ln \text{DEPVA}_i = \alpha + \beta \ln \text{ACRES} + \epsilon \]

where, \(\text{ACRES} = \) the total cultivated land; \(\text{DEPVA}_i = \) represents the dependent variables, where, \(i = 1, ..., 4: 1 = \) yield per acre in Kg.; \(2 = \) labour mandays per acre; \(3 = \) average variable cost per acre in Rs.; \(4 = \) average total cost per acre in Rs.; and \(\epsilon = \) represents the error term.

The yield gap for both the rice varieties has been calculated in two different ways: first, by estimating the difference between the experimental station yield to the potential farm level yield called the yield gap-I; and the second, by finding the difference between potential farm yield and actual yield called the yield gap-II (Nirmala, 1992)\(^{38}\).

Garrett ranking technique (1969)\(^{25}\) has been used to identify the main constraints to potential yield in the two villages. The respondents ranked the constraints faced by them according to their priority. Then the order of merit assigned to each constraint ranked by the respondent was converted into ranks by using the following formula:

\[ \text{Per Cent Position} = \frac{100 \left( R_{ji} - 0.5 \right)}{N_j} \]

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where, $R_{ij}$ = rank given by the $j^{th}$ individual for the $i^{th}$ factor; and $N_j$ = number of factors ranked by the $j^{th}$ individual.

The percent position of the ranks obtained are converted into scores using Garrett’s ranking table. These scores of all farmers are then added up and divided by the number of farmers who have responded. This gives the mean scores for each reason, which are arranged in descending order and ranks given.

Lorenz curve, Gini ratio and Robin Hood Index have been used to examine the impact of the two rice varieties and farm size on their income distribution. F – test is used to examine whether they are significantly different.

The following Ordinary Least Squares (OLS) regression has been fitted to study the determinants of the farmers’ choice of rice cultivation method:

$$PRDC\text{H} = \alpha_0 + \alpha_1 \log EDUF\text{R} + \alpha_2 \log EXPFR + \alpha_3 \log LNDON + \alpha_4 \log PMKTS + \alpha_5 \log NTRTN + \alpha_6 \text{SEXFR} + \alpha_7 \text{MRTL}S + \alpha_8 \text{ATTD}F + \mu$$

where,

$PRDC\text{H}$ = farmers’ production method choice, taking value zero for inorganic farming, and one for organic;

$EDUF\text{R}$ = farmers’ education in years;

$EXPFR$ = farmers’ rice cultivation experience in years;

$LNDON$ = farmers’ land ownership in acres;

$PMKTS$ = percentage of marketable surplus out of the total output produced;

$NTRTN$ = net returns per acre in Rs.,

$SEXFR$ = farmers’ sex, taking value one for female and zero for others;

$MRTL}S$ = farmers’ marital status, taking value one for married and zero for others;

$ATTD}F$ = farmers’ attitude towards use of agri-chemicals in rice cultivation;

$FRMSZ$ = farm size in acres; and
1.7 Scope of the Study

A comparison of organic and inorganic rice cultivation by farm size in Dimapur district, Nagaland, will help to understand the economics of cultivating them across varieties/farm size, based on the cost and return structure of farming activities for both the rice varieties by farm size.

An analysis of yield determinants will highlight the important variables that determine yield by rice varieties and farm size. A look into the yield gap between the two rice varieties (Ranjit for inorganic and Naga Special for organic rice) by farm size will indicate which variety yields relatively more output, and which farmers by farm size produce larger output. Further, a survey of the problems leading to the yield gap will illustrate the reasons for the yield gap.

An analysis of farm size and productivity efficiency relationship with respect to land and labor productivity, and total and variable costs for the two rice varieties will provide information on their effects as farm size increases in the study area.

A study of the inequalities in household income distribution of the farmers cultivating the two rice varieties would demonstrate as to which rice variety cultivation contributes more to narrowing of income variations among the sample households.

Overall, such a study would highlight the overall economic benefits of cultivating the organic and inorganic rice varieties across farm size. This would be useful to policy makers for formulation of suitable policy measures to encourage the respective farmers in cultivating the respective rice varieties more efficiently and narrowing the yield gap. It would also provide significant information to researchers on the issue and encourage further research on it.

1.8 Limitations of the Study

This study is based on data limited to only one kharif season rice cultivation of the year 2013. A limited sample size of 350 rice cultivating farmers has been studied and has also been confined to only two rice varieties, viz., Naga special rice (organic) and Ranjit rice variety (inorganic). Further, the study has been conducted at a micro
level in two villages Suhoi and Kuhuboto, in Dimapur district, Nagaland. Therefore, the findings cannot be generalised for the whole country and for all the crops, but is applicable only to regions with similar geographic and climatic conditions.

1.9 Chapter Scheme

The chapter scheme of the study is as follows:

Chapter – I gives a brief introduction, along with statement of problem, objectives, data and methodology, scope and limitations of the study.

Chapter – II reviews some of the earlier studies relating to the present research.

Chapter – III briefly outlines the profile of the study area.

Chapter – IV presents input and output structure, labor absorption for different farm activities, and cost and return structure for both organic and inorganic rice varieties by farm size.

Chapter – V examines the determinants of yield, the yield gap between the two rice varieties and farm size, yield gap constraints, and the relationship between farm size and productivity.

Chapter – VI analyses the household income distribution of the farmers cultivating the two rice varieties, determinants of choice of rice cultivation method and farmers’ attitude towards environmental issues.

Chapter – VII summarizes the major findings and gives the policy implications of the study.