Cultivation and Use of Ricebean

A Case Study of Dang District, Nepal

Bipin Kumar Acharya

Thesis submitted in Partial Fulfillment of requirements for the
Masters of Philosophy Degree in **Resources and Human Adaptations**

Department of Geography
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1. Introduction

1.1 Why is this research?

After the 1960s throughout the world population increased so significantly that it was termed 'green revolution' by S Gaud in 1968. Through the innovation in the technology; primarily high yielding seeds, irrigation and agricultural implements, cereal food production more than doubled between 1960s and 1985s (Conway, 2002). Improved varieties of paddy, wheat, maize increased the production of cereals usually two or three times over the traditional varieties' (Freed, 2002). This dramatic increase in food production was a breakthrough in the process of agricultural development.

Following the green revolution, different concerned institutions and academic community have started to express their views on it (Kush, 1999; Lele and Bumb, 1994; ADB, 2002). Most of them evaluated the period as a great success to address the problem of food shortage which otherwise would affect the World very badly. According to them, different developing countries increased the production level and improved national food security. People who live in the urban areas benefitted from reduced food prices while in the rural areas, people were benefitted from increased level of production. The rural landless got jobs in farms. Green Revolution (GR) not only overcame the food constraints largely but also provided engine of growth on the scale required an initiating transformation of national economy (ADB,2002). This transformation initiated by the green revolution has done much for improvement in regions' food security, poverty reduction, and raising income of the people even in continuously growing population.

Despite this dramatic increase in food production, the food shortage problem has not been solved as claimed by the pro-GR. The achievement of GR was not enough and it had not been able to solve the food problems as is presented in the report. The achievement of the green revolution is location specific and selective. Only the places where new innovation took place and their surrounding area benefited much from GR. Some remote and marginal areas could not benefit in food production due to different physical and socio economic constraints. They have neither been able to increase food production in their own farm nor to earn money outside to purchase food (in many situation it has brought negative consequences). For example food production per person actually decreased in thirty one of forty six African countries in the decade

beginning in 1985 (Richard, 2000). Therefore the fundamentals of GR as success and achievement of equality in the entire world seems erroneous. Securing food supply is more than boosting the yields (ibid).

GR has not managed to solve the food shortage problem in the world. In addition it brought several negative consequences. Loss of crop diversity, nutritional disorder and soil and pest problems are some of them. Scientist focused on a handful crops to increase yield which resulted some crops to be dominant and while others became minor. Due to severe negligence the erosion of gene pool of some crops is so severe that they regarded as lost crops.[1] The traditional crop varieties which actually suit the local niches were neglected. Some of such crops were replaced by the improved varieties. Three cereal grain crops; paddy, maize and wheat became dominant both in the production and area coverage. However legumes crops have generally declined in important with crops intensification as result production of legume decreased largely. This is due to low yield potential of legumes as compared with cereals (e.g. rice, or wheat) and their susceptibility to many biotic and biotic stresses. The resource poor people who live in the marginal areas of the world have especially been affected with such negative consequences. Losses of crop diversity in local farming system weaken their household food and nutrition security.

But in many places different underutilized local crops play a significant role to ensure the food and nutritional security through widening the food basket of the poor. Many such crops are adapted to fragile environments for example exhausted soil and dry season particularly in the remote and marginal areas. Therefore they are considered important in many traditional farming systems. In many cases they serve as life savers of resource poor people in regions where food and nutritional security significant problems (ibid). If one crop is damaged either from disease and pest or from drought or from any other constraints and do not yields good, there is still chance having good production from other crops. The household with single crops as a staple food is less secure in such setting than those with the more crops (Wahlqvist, 2003) because there is always high risk of pest and disease in diverse cropping. Therefore, despite less yields than the IMV local landraces yields are important in the traditional

[1] http://www.underutilized-species.org

subsistence framing system. These give sustainable production with low cost (Richard, 2000) as these are more insect and pest resistant drought tolerant local crops not the hybrid plants which give more yields only in ideal condition(Horne, 2001) and reduce the dependency on the large company for the seed. They also contribute in the diversity richness and hence on the stability agro ecosystems[2].

The first GR was entirely based on the biological and technological approach to increase food neglecting largely sociological approach. As result all did not equally from it. Poor and marginal people are more affected by the loss of crop diversity in general and with the decreased legume production in particular. They became neither able to adopt MV in their farm nor to protect their traditional landraces. Many traditional foods were considered poor and backwards leads destruction of dietary pattern and dietary diversity (Johns, 2001). As result there food diversity declined lowering significantly protein and minerals diets in their food. The food diversity became monotonous by few varieties and nutrition became disordered. It is certainly right that the total calorie increase after the green revolution. But that increase was at the cost of nutrition balance. As present over fifty percent of world's requirements for protein and calories are met by only three: rice, wheat and maize (http://icuc-iwmi.org/default.asp; Richards 2007). Still many people are not getting enough proteins and micronutrients.

Lipton (1989) and Shiva (1991) are strong critics of GR although Lipton has accepted increase of the production from HIV over the traditional, Shiva has rejected this fact. According to her there are many traditional varieties which could yield better than HIV. Richard and Conway are the scholars among others who are moderately critical on GR and suggest than achievements and loss both need to be counted very carefully. According to them, the revolution has not solved the problem of food and hunger absolutely. There are still huge mass of people struggling with food for survival in the world.

However there is agreement among scholars that the success of the GR neither the absolutely positive nor completely problematic. Rather it has both positive aspect and

[2] http://www.ifad.org/

limitation in terms of achievements (Richard, 2000; Conway, 1998; Evenson and Gollin, 2003). Increasing the production at the cost of crop diversity grain legume was logical at that time, otherwise the problem would be even more severe than today. Therefore they argue the need of second revolution to address the problems not solved from GR while keeping the gains achieved from the first. The next GR should be more be productive but also should cover diverse localities equitable, sustainable, and environmental friendly based on socio economic approach as the first revolution has taken starting point biological challenges inherent in the producing high yielding food crops (ibid). The next revolution should take food security of the poor and should ensure to the access of all to feed the all people in the future.

1.2 Why ricebean?

It is natural to have the question that why ricebean is selected to address the problem of food security among the resource poor farmers. Therefore I think it is necessary to answer that question first before going ahead with this research. In the following paragraphs I have presented my justification of selection of ricebean, a grain legume to address the food security issue in this study.

Ricebean keeps great potential to solve the food and nutritional problem. In the marginal areas resource poor farmers cultivates the ricebean. Therefore this crops is directly related with the population who is really suffers frequent food shortage and many nutritional disorders. Mostly it is cultivated in the non irrigated and uncultivated land which otherwise goes to waste. In this sense cultivation of ricebean in such areas is considered important contributing food and nutritional security and to utilize uncultivated marginal land and conserving biodiversity (Gautam et al., 2007). This further adds to the food basket in the household and secures them in the time of food shortage in the areas where limited livelihood option exists for them (Latif, 1999).

Being a native species and high local adaptability it can be grown well in the less fertile, exhausted, degraded marginal land without much efforts and input (Joshi, 2002). This could be further advantage for the resource-poor farmers of the marginal areas. The high suitability of the ricebean for intercropping with maize also creates potential to increase the production of food without loose of others. Similarly being grain legume, it might be the effective methods of soil erosion control and to fix

Nitrogen in the soil and improve soil quality which also play positive role to increase the production subsequent crops. In addition being valuable fodder crops it is known milk production.

However farmers have no option of getting improved varieties of seeds because there is no breeding of ricebean. Production from local landraces can not compete with modern varieties. There are different problem about the seed of local landraces. Unavailability of improved seed is significant which ultimately link to the plant breeding which have not been in the absence of research (ricebean.org). As a result farmers have no choice of improved seeds they preferred rather than cultivating landraces of their area. Those who have lost the seed in the past face the problems when they want to grow next time. Consequently it is not grown extensively in the area suitable for it (ibid). Therefore present situation of the ricebean is not good in terms of production, coverage and utilization despite its great potentiality. Farmers in many places have already left its cultivation in the more accessible land. Even in its cultivation is said to be decreasing annually.

Very little is known so far about the ricebean because there is little research has been done in its different dimensions. However very recently some work has been started in this crop. For example (Ali, et al, 2001) growth and yield response of ricebean to different seeding rates and planting pattern in Pakistan, growth and yield parameter in India (Thakur, et al, 2004). Some other studies have focused on the chemical composition (CK et al. 1998; Mohan and Jandh , 2000; Saharan et al. 2001; Kaur and Kawatra, 2002; Saharan et al. 2004) nutritional status and domestic processing. But the socioeconomic aspect this crop to understand the role of ricebean in the farming and food system of the subsistence farmers has been neglected. It is important to consider socio economic factors which may largely determines the adoption and non adoption of ricebean in the particular farming system.

The situation of Nepal is also no different than other countries. Here too very little work has been done so far. Whatever the study were carried out has also been concentrated on the bio technical aspect of the crop, neglecting the socio economic aspect of the crop production for example NARC had started collecting germplasma from different district which later continued by the LIBIRD. Currently FOSRIN has

started multidisciplinary research on different aspect of ricebean ranging form molecular and chemical aspect to the market and socio economic aspect. This study has also been done under the framework of FOSRIN

Through enough research there is great scope of genetic improvement of ricebean. The focus of the study on ricebean as a food item will help the scientist to find out the consumer preferred ricebean variety which more tasty and easy to cook and suitable to their social and economic condition. Moreover it could also explore the practice of the resource poor farmers on the preparation and processing of the ricebean to enhance the bio availability of the micronutrient nutrition reducing anti-nutrients content in the crop. In this context this study was carried out to understand the role of ricebean in the farming system and food system of subsistence farmer. The research underutilized crops also holds promise to attain sustainability, profitability and diversification in agriculture (Joshi, 2002).

In this backdrop this study is hoped to improve the livelihood and food security situation of the household in marginal environments through the cultivation and use of ricebean. This study might be helpful to the scientist to explore and invent the new varieties of seeds preferred by the local farmer suitable in particular ecological niche, specific cropping system, diverse season environment and markets

Nepal is predominantly agricultural country where 57.6 percent of population involved in the job is engaged on the agriculture on in their own farm. If included those who have not their own land but depend on agricultural activities in different forms of labour, the percent may move up. The recent agricultural census (2003-04) shows 78 percent of household are agricultural households and derive their living from the agriculture. In this way agriculture is an important economic activity in Nepal. However subsistence agricultural contributes much less (38% GDP) to the national economy.

Crops, livestock and trees are the integral parts of subsistence Nepalese farming system (Khadka, 1987). Although farmers grow varieties of crops, vegetable and fruits in their farms, cereals crops (rice, wheat and maize) dominates the whole farming system. Rice alone covers the 55 percent of cultivated land of Nepal. Maize

and wheat come in second and third order in terms of both production and area coverage (CBS, 2003). These three crops are significant through out the country. However most of all farmers grow some amounts of legume in their farm. The legume is produced for the home consumption in mountain and hills however it is cultivated for both purposes; for selling and home consumption in *Terai* and inner *Terai* (Khadka, 1987). Livestock and trees; fruits and grass, have also a key roles in the Nepalese farming system.

The role of grain legume crops is significant in Nepalese diet and cropping system. They are sources of protein, minerals and other micronutrients particularly in the rural agrarian household who rarely consume animal products and consumption of fruit is highly depends on seasonal availability. In the cereal based food system, different pulses further brings taste and texture in the diet.

But legume do not cultivated as significant crop as cereals. Farmers plant only on the areas where major cereals are not cultivated because they are perceived as risky crops, especially by resource-poor farmers. Consequently, production of the pulses has not been increased as demand of the pluses over the year (CBS, 2001). As result the per capita consumption of pulses decreased sharply (www.ricebean.org). The traditional legume growing area has been largely replaced by the major crops particularly by the rice in the summer season and by wheat in the winter season and legumes are being driven to the marginal areas as the result production has not increased corresponding the population increase.

However if we go through the legume varieties, we can see some legumes such as lentil, black gram and chick pea has seen increased (http://www.moac.gov.np) through improved seeds. Farmers have better opportunity to obtain seed and other technical service for these crops because of more significance in these crops in research and in the breeding of these pulses. But the traditional varieties which .are mostly cultivated in the marginal areas such as ricebean have been replaced by other crops. This has resulted in low production of the pulses in the marginal areas.

As a result people in the marginal areas are getting enough pulses in their diet. Although this problem prevails all the parts of the country irrespective of the space

and group of people. In the remote and marginal areas where local food availability is synonymous with local food production indicates the decreasing legume consumption. As result nutritional disorders, particularly the specific segments of the population such as pregnant mother, infants and children below than five years are the most victimized population (Malla, 1999). The problem is more serious in the marginal areas and to resources poor farmers who can not afford and access the pulses due to their low purchasing power.

In this backdrop this study intends to suggest the policy makers to improve the livelihood and food security situation of the household in marginal environment through the cultivation and use of ricebean. This study which will be helpful to the scientist to explore and develop the new varieties of seeds preferred by the local farmer suitable to their particular ecological niche, specific cropping system and diverse seasonal environment and market.

1.3 Purpose Statement and Research Question

This research basically intends to know the cultivation and use of the ricebean in the subsistence farming community of Dang district. The overall purpose of the study is to explore the role of ricebean in the farming system and food system among households in Dang District. Following are the sub research questions.

- What are the different aspects of cultivation?
- How they use and utilize ricebean?
- What is the market situation?

1.4 Organization of the Study

This study has been organized in eight chapters. The first chapter starts with introduction where I have presented research issue, its context and background; problem behind the research issue and the rational of the study. In the second chapter different relevant literature with this study has been reviewed substantially. Basically literature review has been done in two categories; first includes food security, underutilized resourcesin the second theoretical aspect of the study has been presented where I have discussed about farming and food system approach. Third chapter is about the methodological approach adopted in the study. Then I have presented overall physical and socio economic aspect of the study area in fourth chapter. Fifth, sixth and seventh chapters are the main analysis chapters. Chapter eight concludes the

studies with some academic and policy implication and recommendation based on the study.

2. Literature Review

Ricebean is one of the underutilized grain legume cultivated by the most resources poor farmer of the marginal areas in the tropical and subtropical Asia and East Asia. It is also cultivated in Nepal by the poor subsistence farmers. As mentioned above aim of this study is to contribute on the household food security of such people who live in the remote and marginal areas through its wide adoption. Therefore various literatures relevant to this study have been reviewed here. The chapter starts with the conceptual aspect (underutilized crop, grain legume crop and food security) of the study in the first section which follows by the approaches adopted.

Conceptual Understanding

Ricebean is a multi purpose grain legume crop mainly cultivated for food, fodder and green manure specifically by the resources poor farmers in the marginal areas of South Asia and South East Asia. It is mainly cultivated in the tropical and sub tropical climatic region of south and south East Asia such as Nepal, India, Bangladesh, Thailand, Vietnam and China (Gautam et al., 2007). However its cultivation and production is limited and restricted small and marginal areas. Therefore ricebean is regarded as underutilized crops

Underutilized crop

International Center for Underutilized Crops defines underutilized crops as plant species that are used traditionally for their food, fiber, fodder, oil or medicinal properties. They have an under-exploited potential to contribute to food security, nutrition, health, income generation and environmental services are the underutilized crops. (http://www.icuc-iwmi.org/default.asp). International Food policy research institute has clearly mentioned three criteria of the underutilized crop as locally as compared to globally abundant; restricted in the particular areas either single or multiple, practical local knowledge, but limited scientific knowledge, within and outside user circle; Limited use in the current relative to its potential (EPT Discussion Paper,154, June 2006)

Food Security Food security refers to the ability of a household to secure adequate food to meet the dietary needs of all the members of the household (Mittal, 2006). Farming household to be sufficient and to lead healthy and productive life each household either must grow enough food to feed all the member of the family or should have the sufficient earning in to purchase food not covered by the their own production (Conway, 2000). Food security is concerned not only with food availability but also with access to and utilization of, food.

2.2 Farming System Approach

Farming system approach has been dealt as essential theoretical base to address the above mentioned research problem. In the system approach, whole the component of the study is taken into the consideration on the way of investigating. System thinking is logical and necessary way interpreting and understanding complex reality. Wilson (1988) says that the system approach is the best method to address the ill defined situation .He further describes the importance of the system approach as:

"System approach can assist in all aspect of learning from the initial clarification of where we may wish to focus our attention and gain perspective of complex situation through, the various stages of understanding and comprehending, till we reach the point where we may feel confident to decide about something". (P.7)

The system thinking approach could, therefore, be able to explore problems and constraints of ricebean cultivation of the resources poor farmers which is almost impossible through isolated sector approach. Therefore this study of the ricebean is being investigated through the farming system approach. Local knowledge System will also be incorporated as the sub approach for the farming system approach. Further the food system approach has also been discussed as the next indispensable elements in the agro food analysis to address the value of ricebean in the household. The food system is rather dealt as the integrated with farming system approach rather than isolated one.

2.2.1 Farming System Approach

Among various approach, Farming System Approach is the most popular interdisciplinary approach in the research oriented towards agriculture on one way or another. It means even the research which directly not concerns with agriculture but aims to explore different activities of the agrarian society may also use the farming

system approach in their study as tools for the data collection and of the different units of the system and to explain their association. Unlike the previous sectoral approaches, farming system approaches focus on the holistic aspect in the study of agriculture. Each and every element which makes the farming as system whole is analyzed in the wide social economic and political context. This interdisciplinary approach calls in both production science and social science for an integration of different lines of analysis into the system approach that's more accurately reflects the complex reality of agriculture (Edens and Haynes, 1982 cited in Brush and Turner, 1987). As the previous disciplinary and particular subject focused sectoral studies could not bring best result, the approach was developed as an alternative way to understand the agriculture in the holistic perspective integrating wider socio economic, political environmental and technological context in elements of the systems (Turner and Brush, 1978 p1). Philipp and Schhehl (1982) assert that farming system research is essential to understand the complex system of agriculture of the developing countries practiced by the resource poor farmer. According to them the agriculture characteristics of developed countries is simple such as mono cropping, market oriented production and controlled environment and capacity minimizing risks are the cases of the resources rich farmers may not need the farming system approach to understand them.

The whole farming system consist several sub systems (ibid). However there is no agreement on the number and name of subsystem which make the farming system as whole. Ruthenburg (1976) describes subsystem as form of hierarchy consisting of mechanical biological and human while Duckham and Masefields (1970, cited in ibid 1978) considers at least five subsystems based on the factors that determines the farm locations. Turner and Brush (1978), however, has described about the three subsystems in general and numerous components of each subsystem. According to them human, environmental and genetic subsystems integrate to form the farming a single farming system in the whole. The following paragraph further deal with farming system approach based on the book of Turner and Brush (1978)

The research interest of the researcher and scientist does not always goes on the system as whole rather they usually try to the selected facets of the system. Their background discipline mostly determines the interest of the researcher. For example

social scientist gives their interest on the components of the human sub systems for instances on rules that governs the resources use (land tenure), on labour intensity and availability, on human demography, on communication and diffusion of innovation on the relation between economic and social units on consumption variables, on decision making and on the links between these feature and environmental subsystem. Soil scientist and agronomic scientist study the environmental subsystem. For them the issue related with water, soil surface geometry, pest, pathogens and symbiotic organism might be a key for the investigation. The genotype and phenotype of cultivators and animals and population dynamics that affect crop and animal evolution are studied by the natural scientist such as botanist, agronomist, animal scientist and geneticist.

The farming system approach was not new concept in the agricultural research. It was believed that the term was used since the 1945 on the interdisciplinary research based on broad social sciences. These authors further say that it is not the outcome of the single, seminal work. Rather it was emerged from the fragmented literature of the different discipline. Similarly, according to them, in those early days the term was not standard and accepted by all rather the term was in a use because of lack of any better term. These same authors have identified three elements as cause on the emergence of the farming system approach. Development of interdisciplinary and comparative focus in the several branches of social sciences with interest in agriculture was the first. Increased concern for the understanding in agriculture and its change in the context of social and economic change also made the positive ground which is the second reason for its emergence. Use of holistic or the system approach and ecological analysis as means of analyzing agriculture are the last one.

Regarding the scale, the approach can be used in any level of the study from farm and village to the district and reason or even in larger units. That means the farming system approach can be used in the any level of the study form the village as unit to district and to the region and even world as unit of the analysis. In this regard Turner and Brush says a farming system is any level of unit(s) engaged in agricultural production as is wedded in social political economic and environmental context. However it is best suited in the micro or meso level of agricultural research – the farm, the village or a small area as units of analysis.

Farming system research often proceeds in the steps in; starting from Targets and research area selection. Problem identification and development research base comes after that which followed on farm research and analysis. Extension of the research is the last step of the farming system research (Philipp and Schhehl, 1982).

2.2.2 Food System Approach

Increasing the yield and production neither address the hunger and poverty issues effectively nor strength the food security of the household and nation. It is because these issues goes far beyond the production and covers the issue such as access to and affordability on the agricultural production (Zurek, 2006). Production, processing and consumption should therefore need to be viewed in the holistic terms rather than isolated and fragmented way. This has inspired the contemporary agriculture researcher and scientist to integrate food system approach in the Farming system approach. In this work I have also used the food system approach with farming system approach in this study.

Human activities for the production, processing, preparation and consumption of the food result the food system. GCAFS has conceived food system as set of activities ranging from producing food through to consuming food including processing and packaging, and distributing and retailing of food (ibid). Food availability, access and utilization are the outcome of these activities which ultimately shapes the food security. **Food availability** indicates production, distribution and exchange; affordability, allocation and preference to **food access** and **food utilization** point out nutritional and societal values and safety. If any one of these elements is stressed, food security is diminished (Gregory et al., 2005). Therefore the issue of food security is not merely on the production of food it is much broader than production and productivity. Food system approach deals the problem from farm up to table.

The integrated food and farming system approach involves the systematic analysis of the elements as unit of farm and the analysis of particular agricultural production as food. The approach focuses both on the farm, and at the table. Highlighting the importance of linking the agricultural production discipline to food science, Combs and his colleagues (1997) say that linking agriculture system to human nutrition and

food security is logical way to solve the food based solution of the growing micronutrient deficiency problem. Further in the conservation of farm genetic resources and to address the household food situation, the food system approach is being used in the agriculture research. Pant (2002) and Pandey (2005) have dome their studies linking agriculture and food tradition from the subsistence farm community of Nepal.

The common rational of these studies is that the farm genetic resources can be better conserved through the extensive use of crops in the household as a food and other daily use than only through valuing its ecological significance. Means crops that are the main sources of food items for human consumption are maintained and conserved by the active management of rural farmers than only having the ecological values. Although both studies has linked the farm resources to the food tradition, the former one has focused more on the food security situation of the household with case of the rice landraces and kodo millet while the later on the farm genetic resources conservation taking the whole crop in the study. Panta have assed livelihood resources of the farmer such as crop landraces, knowledge associated with crop landraces and food tradition, and exchange of such knowledge in relation to the livelihood outcome. He explains that food secure households grow higher number of landraces crop in the small patches while the unsecured households grow few modern varieties in the larger area. Similarly Pandey describes that crop in extensive use do not need the efforts of immediate conservation, however, the limited use and grown by few household more attention for the conservation is seems necessary. According to him more diversity in food in the household contributes the genetic resources and varieties conservation and to strengthen food security situation.

Welch et al., (1999) has discussed the agriculture research in the historical perspectives. According to him, the whole agriculture research can be divided into three broad groups. According to him the research conducted in the early period represents the production paradigms. In this paradigm the research were oriented to just to produce more food to the growing world population. The technology including new cultivators, chemical fertilizers and pesticides and machine to supplement labour force were used extensively to grow more food. As result the large amount of crops particularly cereal were grown to save the huge masses of people particularly in the

developing world from the starvation and famine. The green revolution of 1960s and 1970s comes in this paradigm (ibid).

In the agriculture research of the late 1980s and the early 1990s, more concerns was started to give towards the environmental effects caused by the haphazard use of chemical fertilizer, pesticide and insecticide in the name of increasing yield. The research in this time had focused their concerns to increase the production conserving the agriculture resources base. The theme of the research in this period was present generation should not degrade the resources base at all to produce the crops of the future generation. Therefore this paradigm is called the sustainability paradigm. It did not, however, linking farming system sustainability to food system sustainability as whole (ibid).

The third paradigm which the Welch et al. (1999) termed as food system paradigms is the sustainable production of nutritious food. Unlike the previous paradigms it not only focus on the high production and sustainable production, it equally gives its due consideration on the nutritious food. Combs et al. (1997) also clearly mention the need of paradigm shift in the agriculture, nutrition, and health science to work together through interdisciplinary approach.

Welch further claims that since the dawn of the green revolution cropping system the high yielding cereal crops has displaced the other traditional crops which are higher in iron, zinc and other micronutrients essential of our body for its natural growth. As result the particular section of population such as women, infants and children from low income families of developing countries have significantly affected. He agreed on the strategy of increasing the cereal production even of the cost of such micronutrient enriched food in the first two paradigm phase. Chambers and Ghidyal (1985) also agree on the statement that the strategy of increasing more food to the growing population in the time of 1960s and 1970 was right which otherwise could hardly be solved. However he question on whether the entire farmer were benefited through it. He says that in a fact only the better off farmer and better endowed areas which could be most readily be adopted the new high yielding technology generated on the research stations were benefited. In this connection, Welch et al. says that without green revolution the problem would be more serious than the problem of

micro nutritious deficiency problem in the particular segment of the population. Therefore focusing on the cultivation of such crops which are enriched with protein, vitamin and minerals to combat with growing hidden hunger is better to address the problem in correct way.

Therefore study both in farm and in the house would be the most correct way to address the livelihood, food security situation, micronutrient deficiency problem and any other agriculture related problem in the marginal peasant communities of the third world countries like Nepal.

2.2. 3 Local knowledge System and Ricebean Farming

In the late 19th century scholars from the various field has come to realize that knowledge based on the western scientific thought alone is not complete. Particularly to work on the developing countries of the south, they realized the need of incorporating the experience and traditional knowledge of the local people in the research and development. Subject such as geography, agriculture science, and social anthropology which concerns with people and resources such as land water and forest has felt the thrust of such knowledge. Therefore they have started to work in this gap, as result range of literature now are available dealing with the local knowledge and perception of the people on the resources utilization and management.

There are several terms in the literature to refer knowledge of local people of the particular place. Indigenous knowledge, rural peoples knowledge, rural technical knowledge, and indigenous technical knowledge, traditional knowledge, ecological local folk knowledge and so on. Andersen (2005) who advocate the need of contextual knowledge which he describes as an interface between local and scientific knowledge prefer to use the local knowledge instead of indigenous knowledge. According to him indigenous term blurs the ideas to romanticize the concept. Talawar and Rhoades (1997) also want to use the term local knowledge which is comparatively more accepted terms and has less negative social connotation and easy to distinguish from the scientific knowledge. Scott and Walter (1993) have also used the term local knowledge. According to them, the combination of experience and traditional wisdom build the local knowledge. The perception of the people about the environment are created and transmitted through several of ways and reflected in the language and the cosmology and is mostly area specific.

In this study I will make an attempt to explore the local knowledge of the farmers as an asset of their agriculture resource management. Farmers' knowledge on soil or land, disease, weed and pest will be captured in the case of ricebean. How they select the land for the different crops and crop varieties of ricebean? How they classify the soil, how they identify the disease, weed and pest and how they manage this sort of agricultural constraint will be tried best to focus on the way of investigating the local knowledge system.

In the field of agriculture several studies has been carried out to know about such knowledge experience persisted in the local communities. These studies have shown the very significant role of such knowledge in the development of agriculture. Particularly to innovate the technology economically viable socially acceptable and environment friendly, and politically realistic, the study of local knowledge is essential (Trutmann, et al., 1996). They focus the need of integration of the local knowledge system with scientific knowledge it is essential to make the farmers in the center and their knowledge in the consideration. With new and traditional knowledge farmers would then be able to develop suitable disease management.

Trutmann et al. (1996) has studied the local knowledge and farmer perception on bean disease in the central African highland. Their study has not been found any skill of the farmers to identify the actual disease type based on the observation. However they have found that farmers were able to recognize symptoms of a number of important diseases as associated with forms of rain, soil fertility, or varietal traits. Farmers were found practicing very practical preventive measure in the disease and pest management which is environmentally more sustainable and cost effective. They mostly found being able to link the disease with rain, humidity and the vigor of plants. Farmers were rarely found given their attention on the curative aspect of the disease.

Trutmann further suggests that promotion of the local knowledge may discourage the dependency of the exogenous input. It is because the attempt of avoiding the disease gives less chance of the use of pesticide and other chemical substance in the field which thereby reduces the health hazard. But before including the local knowledge in

the policy and development planning one should be careful on its location specific characteristics and therefore the same vocabulary may have different meaning.

Talawar and Rhoades (1997) have made similar studies in soil. They argue that to make the soil types understandable to the local farmers, local classification criteria should also integrated on the scientific categorization of soil. Based on review study, they argue that farmers commonly use multiple criteria classifying their soils. Morphological features, contextual features, and vegetative features mostly appear as such criteria for the farmers. But mostly local soil classification is highly contextual and takes the soil crop relationship in the consideration. However texture and colour criteria mostly found used by the farmers. In middle hills of Nepal soil color, texture and a and erosion hazard are considered as the indicator of the agriculture productivity (Gurung 1989 and Mulur Boker 1991 cited in Talawar Rhoades, 1997) Therefore farmer takes range of criteria to rate the soil as a fertile. The includes sustainable productivity, high permeability, and water holding capacity, few tillage operations, ease of operation and low requirement of composted manure.

They have categorized such study into the four broad groups as

- Straight forward description that links the soil terminology to observed soil characteristics (texture drainage and compaction).
- Comparison farmers' criteria with the scientific criteria of the soil classification
- Test the scientific basis or the merit of the local soil classification.
- Local soil knowledge and classification in agriculture policy and development planning.

In soil, I am interested on the local system of soil classification and its implication with crops. For example how they classify the soil, what parameters they consider on the soil classification and how they link the soil properties with the crops, particularly with the ricebean are the some of my research interest in this case. This may give me an opportunity to understand well about the potentiality and constraints in soil in ricebean cultivation form local perspective.

Similarly the crop rotation (temporal diversification) and intercropping (spatial diversification) strategies could improve the yield and controlling the weed invasion (Liebman and Dyck, 1993). The weed population and biomass production could markedly be reduced using these strategies. They says that if weed management is done with these strategies, the use of agrichemical could be reduced thereby enhancing the agro ecology of the region. Practice of such strategies is to do with farmers. In this connection, the knowledge and practice about these strategies will be asked to the farmers so that I can make an explanation about the strategies of the practice to control weeds.

2.2.4 Participatory Approach in Agriculture Research

Participatory approach in the agriculture science has become popular. Particularly research with purpose of innovating new technology in the different input of agriculture such as seed, fertilizer, machinery and any other innovation, participatory approach is now popularly being used. In the participatory approach how the farmers give the value to the crops they have grown is also equally important for the agriculture rather than only making the efforts to increase the yields. As this research is intended towards to invent the new varieties of seeds of ricebean suitable for farmers living in different socio economic and cultural setting, this study too takes participatory approach in consideration.

But the situation before the 1980s was completely different. The transfer of technology (TOT) model in which new technology is generated by the highly skilled mechanical and agricultural engineer agronomist and other scientists in the laboratories, workshop and experiment station (controlled environment) and then is hoped spread in the outside to the common farmers by the extension workers model had dominated all the research and extension work in the field of the agriculture. But the TOT model had been made some sort modification in the later decades. In the early 1950s and 1960s it was said that the ignorance of the farmers was the main constraint in the adoption of the technology of thought which still continued in the 1970s. Scientist instead of exploring why farmers did not accept the new technology yielding more blamed that it was because they did not know about the new technology and therefore they educate the farmers. But in the1980s, the reason was slightly modified and farm level constraint was regarded as the constraints in the adoption of the new technology. That sort of notion changed reversely after the 1980s and started

to regard the technology does not fit in the local condition (Chamber and Ghidyal, 1985).

Chamber and Ghidyal (1985) further explains that characteristics of the resource rich farmers (i.e. large land holding, good soil and topography, mono cropping, market oriented production, controlled environment and risk minimizing capacity) are similar in may respect with environment of developing the technology and therefore has got immense success to adopt the new technology. But the case is not same in the resources poor farmers rather the situation is almost reverses. Unfertile land vulnerable to floods and erosion or subject to low and unreliable rainfalls are the characteristics of the resources poor farmers. Further size of the land and size of the population in the family is large in relation size of the cropped area and total food production. Therefore farmer rejected the technology not due to ignorance but because the technology do not fit their needs and their physical, social and economic conditions. This shows that technology is adapted to the place where the condition is similar but often not where the conditions are different.

Scoones and Thompson (1993) in highlighting the participatory approach say that without consulting and realizing the conventional scientific knowledge of rural people, the straight forward attempts of formal scientist do not work well to improve the agriculture and to improve the life of the farmers. Therefore, according to them, agricultural science must change its approach of investigation in order to learn farmer knowledge and not simply assuming they have nothing to do to improve the agriculture.

Witcombe et al. (2005) comes with the several illustration to argue that farmers participation is not only desirable but even essential during the selection process in the early generation which is in the most of client oriented approach is considered as option rather than prerequisite. According to them such participation of farmers brings close to the breeding scientists with different traits of the society so that the scientist can give the seeds preferred by the farmers. This, of courses, leads toward plant breeding efficiency and cost effectiveness.

Joshi et al. (1997) also argue that the farmer's participation in the varitial selection is cost effective approach and allow evaluation of new crops verities under the range of biological, economic and social condition and increase chance of success in the adoption of new crop varieties. The farmer to farmer knowledge transfer of variety makes the approach cost effective where women can play significant role in the process. The study was carried out in Nepal in the case of chaite rice. However author show that that participatory approach can be applied in range of crops and other species other than the chaite rice.

Tiwari et al. (2004) also come to the same conclusion on the need of participatory approach in the agricultural research and extension. Previous centralized approaches which only focused only on germplasm and agronomic aspect ignoring actual and varied farmer's circumstance have been very less successful. The study has analyzed the farmers agronomic practice in hill Nepal intending improvement on maize crop. According to them, coupling of knowledge-rich extension advice on locally relevant crop management options, with participatory selection of germplasm, is required to support farmer innovation. This in itself demands new thinking and skills amongst research and extension staff, and new institutional mechanisms and tools to facilitate their interaction with farmers. They further say that this could also be applicable in highly heterogeneous environment other than the study area, particularly foothills of mountain ranges.

In this study the farming system approach will employed as the down stream system research rather than upstream mode. Unlike the upstream in which the elements of the system are evolved and investigated in the experiment station, investigation of the elements of the system starts with farmers and ends with farm and farming system.

3. Methodological Approach

The term methodology refers to the larger research design that one follows when engaging in research (Bailey, 2007). Methodology basically concerns with certain rule concerning how we construct our representation. Therefore research methodology is more than just method used for data collection (ibid.). Moreover, methodological approach also covers theoretical perspective overarching the different techniques we use to construct our social reality. In sum, methodology also has to do with theoretical understanding of what is real, what constitutes knowledge, way of interpretation and so on. Methods on the other hand are defined as comprehensive set of approaches to gather evidence and analyze a specific problem and are directly operational (Mikkelsen, 1995). Bailey (2007) has defined the methods as the techniques used during the data collection. Techniques are the practical ways of collecting data and analyzing the information obtained in the research process (Panta, 2002). Household interview, focus group discussion, observation and key informant interviews and market interview are such techniques followed in this research. The questionnaire and checklists are the instruments.

This chapter describes research design and tools and instruments used in data collection during the field work, the ways of data processing and methods of interpretation and presentation.

3.1 Entering in the field

Ricebean, an underutilized crop, is not much popular crop against other common legumes in Nepal. Its cultivation and uses are therefore limited in certain areas. Even in the recent years its cultivation is decreasing. It is said that very few farmers in the hill and inner *Terai* have been continuing its cultivation in limited areas. In this context it was not easy task to find out relatively large ricebean growing place in the district to understand the role of the bean in farming system where the farmers are growing it in the recent days.

Before leaving the university, I discussed several times with my supervisor about the field site. In the beginning, I was thinking to go to *Gulmi*, but later, I decided to select Dang as my field site to avoid the repetition of the study, as LIBIRD, one partner institute of Food security through ricebean research in India and Nepal (FOSRIN) has been carrying out a number of studies in *Gulmi*. For last three years. Further, one

report prepared by LIBIRD shows Dang as ricebean potential district out of 10 in the country where more than 90 ha area is still under the ricebean cultivation (ibid). I went to *Pokhara* to consult with LIBIRD staff just after arriving in Nepal. There I got the name list of ricebean growing farmers prepared during germplasm collection. Following that list I conducted several informal interviews, field conversation and group discussion in different locations of the district. Such interviews and group discussions helped me to know more potential villages on the one hand and to draw general picture of the particular area in general and the district on the other. I followed the information collected from the interviews and group discussion and went from one to the next village. In this way I visited 11 different villages and finally entered **Lamidamar** and **Rampur** in the district which lies in ***Halawar*** and ***Goltakuri*** Village Development Committee respectively to conduct interviews and group discussions. In these two villages I found that almost seventy percent households were growing the rice-bean in different scales. I decided to conduct a detailed study in these two villages.

2.2 Data collected: Primary and Secondary

First hand primary information was mostly used to prepare this thesis. However secondary information has also been used substantially in most of the places. As said by Flowerdew and Martin (2005) secondary data were used in three ways: to sketch out issue, or question of my primary research, to provide context to the primary data (mainly on geographical, historical and socioeconomic data) and to demonstrate the ability to collect, manipulate, present and interpret secondary data in the research work. Regarding the secondary information, most of them were collected from the CBS Kathmandu and DDC Dang. National Population Census, National Sample Census of Agriculture, Nepal Living Standard Survey collected from the CBS while periodic plan of Dang form DDC Dang. Besides different literature, archive and publication were also used where felt necessary. The field instruments have been further dealt in the following section

Methodological paradigm adopted in a research usually decides the field instrument. Positivists mostly use structured interview in the field research while semi structured and unstructured interviews are often administered in the interpretative paradigm (Bailey 2007). However taking the task of field research as set of linear step would be wrong. Rather it is very interactive and may change on the course of interview (ibid).

The one who has started the task of interview from very structured interview may complete the work with unstructured format. This often depends on the ways of responses from the informants. This study goes phenomenological (interpretative paradigm) approach and that may have been reflected in the field instrument.

2.3 Role of Researcher in the field

In all research philosophy except positivism, the role of researcher has accepted; the difference is only how and in which magnitude. However the positivists assert that the research work should be objective, value free and neutral. They strongly deny the role and any value of the researcher in the research work and consider the status irrelevant. However those who frame their work with interpretative and critical framework asserts, that status characteristics is very much matter.

As I am doing this research using more interpretative paradigm, I accept my role in all the process of the research, before, after and during the field work. I entered in the field as an insider because Dang is my home district. One of members of Rapti Agriculture Graduate Society (RAS) who is also my friend accompanied me to explore the ricebean grown village. For this we had visited 11 villages and conducted group discussion and informal interviews. As he has been working in the district as agricultural technician, he had good network with farmer. Therefore in most of places we did not face any problem to build the rapport and to invite people in the group discussion. But in some villages farmers expressed their expectation as we were from the district agriculture office or from NGO to distribute agriculture input. So they came to participate in the discussion. In such situation I did my best to clarify the reason of visiting the village. I told them the purpose of the research and my affiliation to the University of Bergen. In *Tharu* villages we had visited nearby school and met *Tharu* local teacher. They helped us greatly in rapport building. My language skills also helped greatly to communicate with elderly *Tharu* people who were source of historical information. In this way I performed different social roles based on the place, situation and time and attempted my best to make the close social distance to make better the understanding the people and their life world better.

2.4 Sampling Strategies

The logic of using sample of the subjects means to make the inference about the larger population from the smaller one-sample (Berg, 2007). The sample population is the respondents taking part in the study, sampled to try and answer the research

question (Kitchin and Tate, 1999). Researcher must consider whether findings obtained from the sample are generalizable to the total population from which the sample is taken (Russell, 1996). In the methodological approach, sampling strategies is therefore necessary to be mentioned to obtain validity and reliability of the research work. Three separate methods of sampling strategies were followed in this work.

For the household interviews, probability based simple random sampling method was used. The total number of the household (sampling frame) were asked to the key informant in the village and found 64 household in the Rampur and 60 in the Lamidamar and list of household head was prepared. It was not possible to get the household list from VDC office because some record was lost during the Maoist insurgency. Then 60 households were selected based on the probability principle using lottery methods for the household interview for the household level analysis. The total sample size of the household was one half of the total household. The information collected from household was analyzed combined

Key informants, group discussions and informal talks were conducted based on snowball sampling method. Snowball sampling is non probability sampling technique in which one member of the population is identified at first and researcher spoke to him. Then the member is asked to identify to other member of the population. Therefore it is also called chain sampling which is not based in the other way. Based on this principle easily accessible people of the village under the study were requested to participate in the discussion and for the interview. In this sampling strategy, care was given for the socially differentiated class not in the representativeness in the sample. Further priorities were given to those who have more knowledge about the farm and crop as key informants. Information from the focus group discussion and from the key informant has not been used on the quantitative analysis. Most of the analysis was based on the qualitative information.

To understand about the marketing situation of the ricebean, some interviews were also conducted in the market center. The snow ball purposive sampling method was used to select the grocery shop for the interview. Grocery shopkeepers are the main market actor of the ricebean. The big grain traders do not collect the ricebean. Therefore they are not included in the interview. At first the list of the grocery shop

was collected from the shopkeeper's union office. Then it was decided to take three grocery shops in each entry point, north east, west and south. Besides, three shops were also taken from the core for the interview. The purpose of taking location aspect in the sampling was with assumption that famer generally prefer to sell the agriculture product to their entry point.

2.5 Household Interview

When I found out two ricebean grown villages in the district, 30 household from Lamidamar and same number of household were selected from Rampur for the interview using the simple random sampling methods, I started household interview using semi structured questionnaire. I had designed interview guidelines in more structured and specific way following the topic and content of the subject, but in the interview, I did not follow the structure and order of the questionnaire, as principle of the semi structured method (Bailey, 2007). This flexibility in administer the guidelines was an advantage for me to explore new thing about the topic. Depending on the how the interview progress some questions previously planned late for the interview were asked earlier and some questions were skipped as they were answered earlier in the probing or in the follow up question.

During the interview I followed probing to encourage the interviewee to expand answer or to say more on the original question (ibid) not only proceeding through the sequential question. Care was also given to feel the participant comfort either due to the location or with the nature of question. For their ease, the interviews were conducted in the home or on their farm or other location where I met them and where the informant feels comfort. The purpose of the research was described in detail in the beginning to make the courtesy with the informant.

Basically to identify the ricebean growing farmer, and to understand role of the ricebean in the household based on taste, preference, health and other indirect role of the ricebean in the household, this field instrument was considered useful. Ricebean cultivating household and household characteristics were assed through this field instrument. Further the use of the bean (food, fodder and forage and green manure) and mode, timing of the consumption were assessed in the household interview. Further different aspects of use of ricebean in the household were also collected from

the household interview. Similarly traits preference (such as taste, yield, sowing period, growth habit of the plant, market value and so on) had also explored. The main purpose of this instrument was to facilitate the comparison among the household based on the household characteristics with statistical measure.

2.6 Group Discussion

Interaction between members in the group is the characteristics of the group discussion which is distinct from the interview method where interaction takes place between interviewer and interviewee (Hay, 2003). Group discussion method is considered best to collect be socially constructed reality, having multiple meaning that people attribute to the places, relationship, process and events and to explorer different point of view and to formulate and reconsider their ideas and understanding about the topic (Berg, 2007; Phil and Myers, 2005and Hay 2003). Specifically, this technique is considered useful to explain large number of ideas, issues, topic and even solution to a problem (Berg, 2007) that might not have been revealed through method like questionnaire and individual interviews. Further it provides possibility of correcting on the talks, and responding to others (Bernn and Johnson, 1996). However some researcher feels that the real and natural conversation is not possible in the group (Berg, 2007) by pace alteration, change in direction of the comments, interrupt or stop of conservation and so forth. These limitations of the group discussion were taken in the consideration while conducting group discussion in the filed.

I had started my field work with the series of group discussion and informal talks. Initially it was planned to conduct Focus Group Discussion, but when I entered in the field, it was not possible to invite the people with specific characteristics who either cultivate ricebean or have at, least, knowledge on it. Further I thought that general group discussion could provide the sufficient information I needed. Therefore, group discussions were held in different location instead of Focus Group Discussion.

Although this technique may be used either as the sole research technique or to supplement other techniques, I had used it to supplement other techniques. For example basic quantitative information, I had collected more from the household interview administering the semi structured questionnaire while supporting qualitative information has been left for the group discussion. The historical information of the ricebean such as its cultivation in the past, production was collected form the group

discussion. Further current situation of the ricebean cultivation in different parts of the district was also explored from the focus group discussion.

2.7 Observation and Categorization of the information

Some people want to see observation as either controlled or uncontrolled while others wish to distinguish as primary and secondary (Berg, 2007). However mostly observation are seen as either participant or non participant method of observation. But most authors argue that it is not possible to carry out through non participant observation (Hay, 2003). According to him it is hard to be passive in the social situation being observed even though those who believe that they are presenting but not participating in the research contest often alter the research setting. Therefore the binary of participant and non participant is the false construction. But the term participant does not need to be the participation as anthropologist adopt in the study. The difference is only a matter of the degree of the participation involved (Hay, 2003). However those who conduct research on the positivist paradigm often use non participant method of observation (Bailey, 2007). Further the nature of the research question also decides about the participation in the observation (ibid).

Hay (2003) has summarized the three purpose of the observation as counting, complementing and contextualize which mutually exclusive and with mixed purpose. I have used observation method of complementing and contextualize the issue. My observation was participatory, active and uncontrolled observation in which I had taken observation and interviewing simultaneously. It was off agricultural season when I had in the field. So it was not possible to observe the ricebean standing crop in the field and farmer working in the ricebean field and other agricultural activities preformed in the farm. However I had observed the ricebean field and talked with famer in their ricebean growing field. My field assistant has taken some observation later when crop was in the field. To make familiarity with context, I had passed several hours with famers in their filed. But I did my best to balance for insider and outsider with the research context so that my observation might not only limit either on the participation or on the observation.

Unless observation is categorized, it would be meaningless and can not be used as information. By localizing the observation into the category we create order on it

giving the meaning of the observation. Researcher takes observation first which goes in the mind for the processing where observation is conceptualized for the data in our cognitive mind. That cognitive mind looks like the container with matrix of infinite number of rows and columns where we place observation to produce data based on the concept (Aase, 1997). In this way, information is the function of concept, observation and category where a category is universal and observation is also mostly similar (ibid). But the concept varies greatly due to cultural differences. Therefore the categorization of the events is variable among the place and time. Aase (1997) therefore recommends avoiding ones one way of category while describing the new place people and world. To know their culture and experience is necessary to understand their way of categorization properly. Further the categorization varies between region, profession, gender and generation with the same culture.

During the field work and for the analysis, information tried best to obtain properly from local category. Categories about crop, land, cropping system, soil disease pest, taste, preference were collected on their own perception and category. For example the local classification of disease, pest, weed, soil and cropping system may have different category than the scientific. This helped me to understand their problem from their perspective.

2.8 Interview with Key Informants and Informal Talks

People having more knowledge about the farming system, farming technique, crop varieties, seed availability, fertilizer, and food habit were requested as a key informant for the interview. These includes innovative farmer, elderly people and agricultural and extension technician working in the village. These kinds of interview were started to carry out before the household interview and were continued in the end of the field work hoping that some sort of idea can be made earlier for the sampling of the household interview and the later interview and group discussion provided me more in depth information about the issue. Ten key informant and several talks were conducted during the field work. Selection procedure about the key informant was discussed above in the sampling strategies.

2. 9 Interview with Shopkeepers

Besides above techniques, market interviews werealso carried out to know about marketing situation of the bean in the district. *Tulsipur* which is proximate market center from the both study villages from where farmer of both place usually purchase

the goods and services and sell their agricultural product was selected based on the information from farmer in the villages. Information such as popular pulses in the market, source of pluses, and the position of the ricebean among other were collected with this technique Besides channel of ricebean flow (if existing) in formal market, volume and time of transaction, selling prices, perception of the ricebean in the market, and problem and constraints in the marketing were also collected for the market analysis.

2.10 Data Validity and Reliability

Data validity and reliability is essential in research. Validity concerns soundness, legitimacy, and relevance of the research theory and its investigation (Kitchin and Tate, 1999). However I am, here, more concerned about the validity of the field data. I have used triangulation method as a useful strategy to check the consistencies in the data and to verify them. It is especially important when to collect data from respondent who occupy different social locations or are likely to have divergent views (Bailey, 2007). But the purpose of triangulation should be toward collecting the different opinion of people about the issue rather than for the rejection of inconsistent data.

In this study I had collected same information with all field instruments as far as possible. For example I had asked the people about the production, productivity, use; and problem and constraint of the ricebean cultivation in the village in the informal talks and key informant interviews which information was also collected from the household interviews and group discussion. I had started my field work with more explorative method such as key informant interview, group discussion and observation. That had given me an ample opportunity to work on the more quantitative household and market interview. For example, I have selected the detailed study village and the market center based on the information obtained form informal interviews and group discussions. The information gathered from one technique was rechecked with another. In this way the consistencies on the information was checked and the reason why the different opinion people had expressed, also evaluated. The inconsistencies and multiple responses in the information were used as opportunity to answer why people answered differently and to enter in the depth of the issue not rejecting them as inconsistent data. Observing

different people different times in different location was followed as another form of triangulation

2.11 Analysis and write up thesis

Data processing work was started from the very beginning of the field work. Particularly, qualitative information obtained from the group discussion and informal talks and observation, processing task was started from the field and but the quantitative data processing work was started only after back to the university. Interview, photograph, myths, saying and stories which contain several kinds of meaning and interpretation of the informants were acquired and noted down just after the talks and discussion and later in the evening entered in the computer as textual information. However other printed and written text documents were entered at the time of literature review.

Qualitative information was presented as descriptive text to explain the information. In some places photograph has also been used to give further support to arguments. Deconstructing the text and analyzing the multiple meaning, ideologies and interpretation of the world is the way of textual analysis (ibid).

However the quantitative information obtained from the household was entered systematically in the computer system. Proper coding was done to feed the data in Microsoft Excel. Then table and graphs were generated to present the result.

4. Overview of the Study Area

As mentioned in the previous chapter, this study was carried out in one of the Midwestern *Terai* district of Nepal. The District as a whole and two villages have been taken as unit for the analysis. This chapter is therefore designed to give basic understanding about the Dang on its physical and social environment to provide the context and background information of the district so that it could be easy to understand ricebean cultivation and use in Dang. I have started with outline of the location followed by physical characteristics and social environment such as population, cast, ethnicity, language and infrastructure.

In the second section I have presented more information about the farming system, major crops their production in the village and in the District. About the food regarding timing, composition and frequency is also presented in the end of this chapter.

4.1 Location

Two valleys Dang and *Dekhuri* of the mid western *Terai* make the Dang a district as a administrative unit of Nepal, out of five district of Rapti zone where this study was conducted. Geographically the Mahabharat range in the north and Chure in the east south and west surrounds the Dang valley while the *Deukhuri* is surrounded by Chure in all side. *Puythan, Arghankanchi Kpilvastu* (in the east) *Rolpa, Salyan* (in the north) and, and *Banke* (in the west) borders the district. The south boundary of the district touches the international boundary to India.

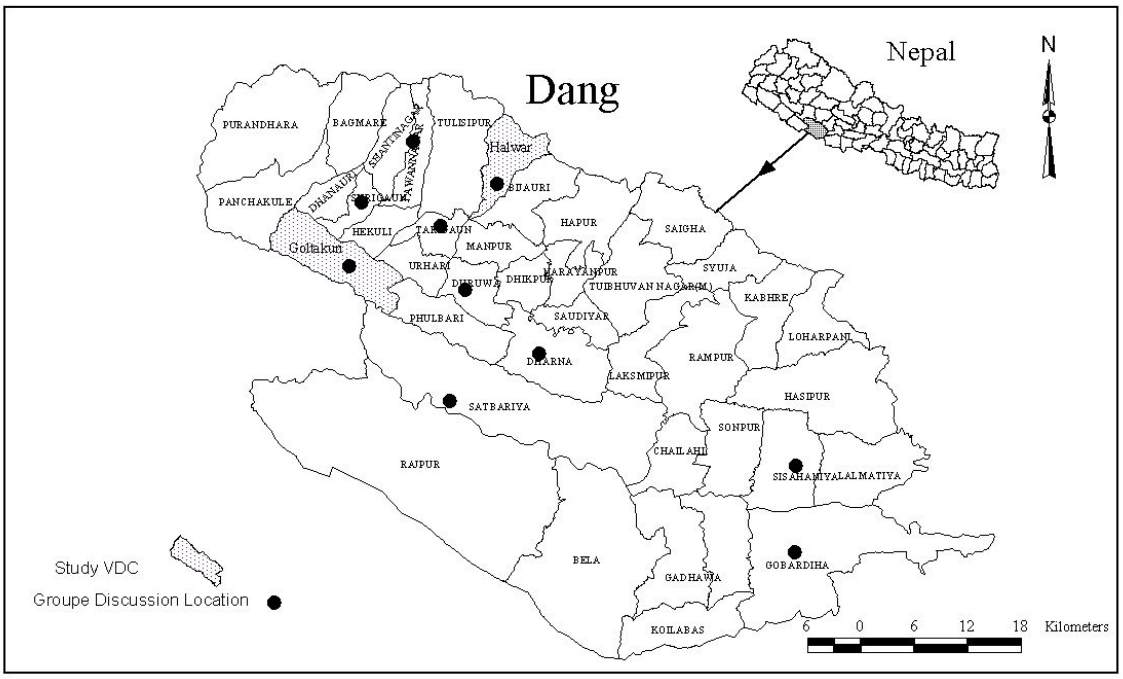


Figure: 4.1 Location Map of Study Area

Laminar and Rampur villages are the two villages where I have collected more in depth information in general and household information in particular. They lie in *Halawar* and *Goltakuri* VDC respectively among the thirty nine VDC of the district. Rampur is situated on the foot hill of the of the Chure range in southern part of the Dang valley. Lamidamar lies in the north of the district in the foot hill of the Mahabharat and next to *Salyan* district. To reach the village one needs to walk about one and half hours from the *Shitalpur* bus stop in the main north south Rapti highway. *Babai* River flows just north of the village.

4.2 Physical Characteristics

Dang is largest valley in the country with an area 295500 ha and lies in the southern part of Mahabharat range. The district is composed of two big and one small valley. Dang and *Deukhuri* are bigger while *Phulbari* is the smaller valley in the district. Most area of the district comprises plains except some areas in the Mahabharata range in the north and some in the Chure hill in the south. Altitude varies from 213 to 2048 meter above the sea level.

Physically, the district has undulating terrain sloping toward south. Yamanaka and Yagi (1984) argue Dang comprises size different terrace: the highest terrace, higher terrace, middle terrace, lower first terrace, lower second terrace and lower third

terrace. According to them ancient river terraces are more prominent in the northern part of the valley than in the south while fluvial in the south. Most part of the plain is made by the fertile alluvial deposit by the different small and large river of the district in different geological time. The valley is deposited in the central part with fluvio lacustrine sediments. But Chure is made by gravel and sand not suitable for the agriculture. However it is said best for the luxurious growth of forest. In the north, foot hill of the Mahabharata one can find mineral rich red colour residual soil. However in the most part of the valley alluvial river deposit dominates.

The district enjoys tropical to sub tropical climate depending on the altitude. Deukhuri and the valley floor of Dang are lies on the tropical region, in high altitude one may find subtropical climate. Mean average temperature decrease from south to north as increase of altitude.

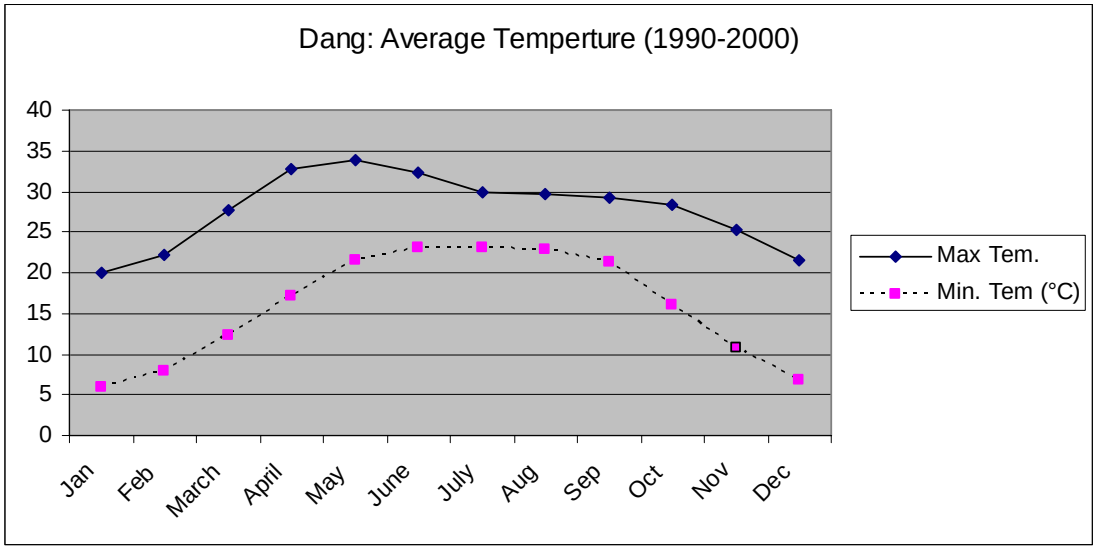


Figure4. 1

The above diagram shows the average maximum and average minimum temperature of Dang for 1990 to 2000. The average maximum temperature in January, the coolest month of the year was 20.1 while the minimum average is 5.9 in the same period. Similarly the average maximum in the July, hottest month is 29.8 and minimum is 23.1

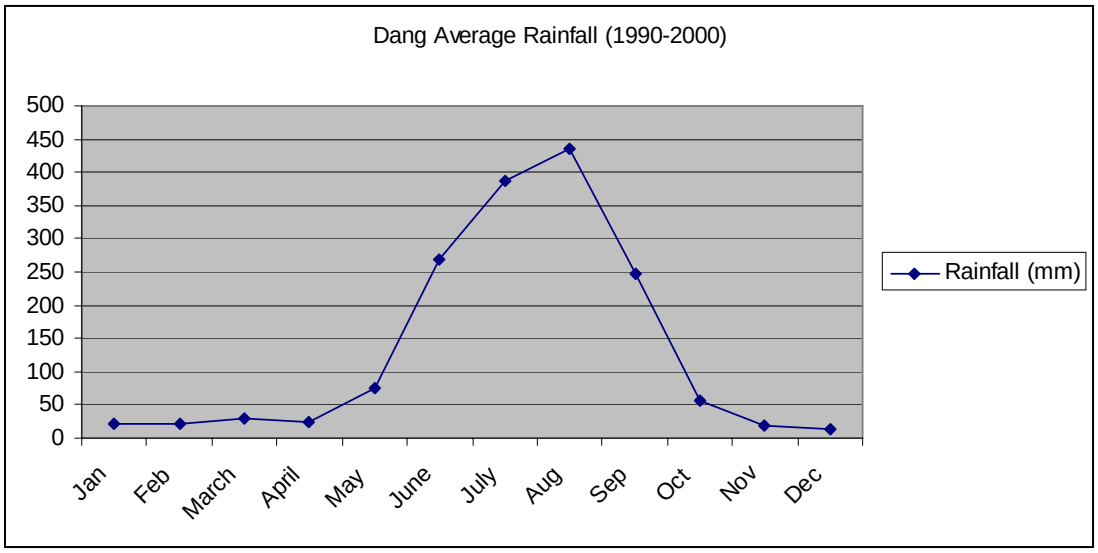


Figure4.3

The ten years the average weather report shows that the district receives sum 1600 mm rainfall annually of which above 80 percent occurs in four month long monsoon period (June, July August, September). The rest 8 month are almost dry in the year. However some rainfall in the winter is received from effect of the western wind. But the total rainfall in the 8 months duration is only 20 percent of total annual rainfall.

Rapti and Babai are the two main river systems of the district and follow on east to west direction in the southern part of Deukhri and Dang. Both rivers are second order rivers originating from the Mahabhart mountain range. Therefore volume of the water increases with the onset of the monsoon and decreases in the dry season. In Deukhuri, all large and small rivers flowing north to south and south mix in Rapti and flow to west. Similarly in Dang all small and large streams mix with Babai flow parallel with Rapti in same direction and exit from south west of the district.

4.3 Social Characteristics

Population

Dang district is one of the moderately populated districts. The total population of the district is 462380 which is sum 2 percent of national population. Female population outnumbers the male by 4464 in the district. The annual growth rate of the district (2.67) is slightly higher than national (2.25) average. The 2001 census further shows 82495 household in the district. The average household size of the district was 5.6 which also slightly higher than the national average (5.45). Population of density of the district is 156.6 which also slightly higher than national average (154.5).

Table: 4.1 Age sex Composition

Location	Rampur		Lamidamar		Total
Age Interval	Male	Female	Male	Female	
0-5	18	20	17	14	69
6-15	39	41	31	33	144
16-59	59	63	44	53	219
59+	7	5	9	8	29
Total	123	129	101	108	461
Family size	8.4		6.9		7.6

Source: Field Interview, 2007

The total population of the selected household was 551 where female population out numbers male by 25. The move of male for the abroad job (mostly in the India) is one of the reasons of lower male number in the villages. Both total population and average household size is higher in Rampur than Lamidamar.

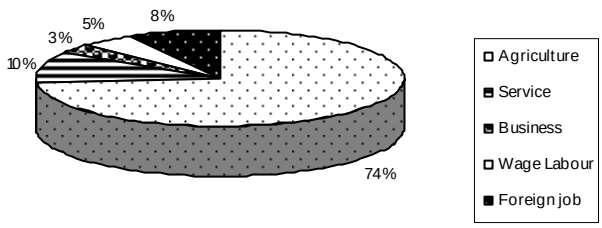
Caste Ethnicity, Language and Religion Characteristics

Different castes and ethnic groups of people inhabit Dang. *Tharu* (31.9) is the main ethnic group of the district; some other fifteen caste ethnic people also reside in the district. *Chettri* (22.7) and *Brahmin Hill* (10.8) are second and third dominant caste group in the district after the *Tharu* (CBS, 2001*). Damai, Mueselman, Badi*, and *Gupta*, are minority caste ethnic people who share less than one percent in the total population of the district. Other groups of people have migrated in different historic time. The time of migration varies greatly; for example, *hill Brahmin* were considered to have migrated first, before the malaria eradication and were considered living together with *Tharu* community. However, they seasonally migrated to the surrounding high hill in the summer due to fear of malaria. After the eradication of malaria other group of people such as *Chhetri* came in to the district while the *Magar* has recently migrated to the district from different hill district.

Caste and ethnic composition of the population of the Goltakuri VDC is a bit different than the overall situation of the district. In this VDC, *Tharu* stand in second after the *Chhetri, while Brahmin-hill* is in the seventh position after *Magar, Kami, Damai* and *Sarki*. These occupational caste people *(Damai and Kami and Sarki*) cover 28 percentage of the total population in the VDC.

In the *Halawar* Hill *Bramin* (27%) stand first followed by *Magar* (19.94%) *Chhetri* (18.01%) and *Tharu* (16.14%) in second third and fourth respectively. The pattern of the population composition is similar with the district in many respects.

Nepali speaking people are the quite large in both VDCs and shares (72%) and (88.62%) in Goltakuri and Halawar VDCS respectively. After the Nepali, *Tharu* comes in the second in both places covering the 27 and 10.69 percent population respectively. Besides these *Magar* (0.38%) and *Gurung* (0.21%) and speaking people also resides in the villages who were migrated from the hill district Rolpa, and Rukum.



All the sampled households at Rampur were from *Tharu* community. However, two non *Tharu* household in the village were reported Chhetri out of total sixty five household. All people speak *Tharu* language as their mother tongue in the Rampur. Non Tharu also understand and speak Tharu language due to close interaction with them as second language. In Lamidamar all the sampled households were from non Tharu community. They were from Chhetri, Brahmin, Magar, and Gurung and occupational caste. In Lamidamar all people speak Nepali language except those Mangar and Gurung households who have recently migrated there mostly from Rolpa and Rukum district.

Occupation

Agriculture is the main occupation in the study area. About 74 percent of the populations were entirely depended on the agriculture. Remaining 26 were involved in the non agriculture sector. However they were also found involved in the

Figure 4.2 Occupantion By household

agriculture. They have some crop cultivation, keep animal. This means that no household were found totally outside the agriculture.

Foreign job are the most significant non agriculture jobs in the study area which covers 8 percent of the household. Similarly about 5 percent household told service as their main occupation and 3 percent business. Teaching is the main service occupation followed by the military service.

Land holding, ownership and tenure

Land holding and land ownership in Nepal is very unevenly distributed. Only 77.5 percent agriculture household own their agriculture land for the cultivation. Reaming households rely on others' land under different types of contract; either on the share cropping or other types of contract. 519 out of 68500 household are landless agricultural households which accounts sum 0.75 percent of the total agriculture household which is lesser than in the development region (86.8%) and than the national average (NLSS, 2004). Those who are real farmers and work on the farm have not enough land and in many cases they are landless. Despite some efforts from the government to implement the Land Reform Act 2064, and other regulations related to land, very little is done to solve the problem.

Table: 4.2 Household By landholding Size

Landholding (ha)	National	District	Study Area
Below 0.5	15789119	26735 (39.32%)	37 (61%)
0.5 and under1	915674	20086 (29.54%)	13 (21.6%)
1 and under 2	588649	15965 (23.48%)	5 (8.33%)
2 and under 3	157026	3117 (4.58%)	4 (6.333%)
Above 3	97172	2077 (3%)	1 (1.66%)
Total	3337439	67981 (100%)	60 (100%)

Source: Household Interview and National Sample Census of Agriculture 2001-2002

The above table shows that the majority of households have very small holdings. This further indicates that in both study villages no landlords with big size of holdings were found. Most of all are small farmers. However other part of the district large size of holding is bigger. About 80 percent of the household has less than one ha land. Very few only 5 household told their holding greater than 3 ha. The average area per holding in the district is less than one (0.97 ha) ha which is slightly above than national average (0.8). However, in the Rampur and Lamidamar average holding is

slightly less than 0.7 ha. This shows most of the farm household in the study villages. And those having littlie holdings are also medium level farmer.

Landownership is also next important aspect in the agriculture. It is the main in determining status and wealth of inhabitants creates social hierarchy in the agrarian society. Different aspect of the land has found influencing the ricebean cultivation.

Table 4.3 Household by land holding and ownership

Size of the land (ha)	Holding	Rented in	Rented out	Own land
Below 0.5	37 (61%)	7	2	30 (50%)
0.5 and under1	13 (21.6%)	3	1	15 (25%)
1 and under 2	5 (8.33%)	2	4	7 (11.6%)
2 and under 3	4 (6.333%)	1	2	5 (8.33)
Above 3	1 (1.66%)	2		3 (5%)
Total	60 (100%)	15 (25%)	8 (13.33%)	60 (100%)

Source: Household Interview, 2007

Above table gives land ownership holding and tenure pattern of the selected villages. It clearly shows that 75 percent of the sample houses have less than one ha and 50 percent less than 0.5ha. 11 percent has between one and two 8 percent between 2 and 3. Only 5 percent has greater than ha land.

The table also shows the how land is rented in and rented out among the household. From the table it is seen that not only on the large holder but also in the small holders has rented out the land. However the reason may be different for renting in and renting out their land. Among the small holders, mostly the household who's male, were abroad mostly rented out the land despite the small land. But most of the larger holders can not manage all the land so they rent the surplus land to others. The household whose family is large and their own land is not enough to produce the food all the year round rented in from others.

Land is mostly rented based on a share cropping contract under which the tenant work the land owned by the landlord. The inputs are shared fifty-fifty. The production then divided in equal basis. At the national level share cropping is the most common method of renting comprising46.5 percent of the holdings. Share cropping involved 56.4 percent of the total land area being rented at that time. In 2001 and 2002 the proportion of sharing went to 62.2 and 69 percent (CBS, 2006).

Food Security

Despite being an agricultural country, Nepal is not self sufficient in food production. Mostly mountain and some districts of hill are often reported moderately to acute food deficit. Most of Terai districts are considered to have food surplus till now.

However if we look at food sufficiency at the micro level, household level or on the community level, we can find number of insufficient households in all district irrespective of ecology, administrative division and rural urban division (AT NIAS) study found seven different groups of vulnerable people in different parts of the country accounting 38 percent of the total population of the country. Mostly marginal farmer with small land holding, rural service cast, and agriculture labour household are the food deficit household. These three groups alone cover almost 21 percent of the national population among 38 percent population (FAO, 2004).

The over all food security situation of the district is positive. Statistics (DDC cited DAO) shows that 40077 metric ton food was in surplus in 056/057. However the food surplus in the district is decreasing over the years. The surplus situation has decreased by 17 percent in between 052/53 and 056 and 057. But the district is still food sufficient situation. But as argued above the actual number of the vulnerable people was not found

Table 4.3 Household food sufficiency in staple food production

Months-Places	Rampur	Lamidamar	Total
Surplus	27 (90%)	24 (80)	51 (85%)
9-12	3 (10%)	3 (10%)	6 (10%)
6-9	0 (0%)	3 (10%)	3 (5%)
<6	0 (0%)	0 (0%)	0 (0%)
Total	30 (100)	30 (100)	60 (100)

Source: Household interview, 2007

The table shows that altogether 9 household in the study villages were found unable household to supply food all the year round from their own production. Three household in each villages told that they can not provide the food on the last three month from their own production. Further three household told about the shortage after the 6 month of the production in Lamidamar. Food shortage mostly occurs after planting main crop paddy. The reason of food shortage is off course small landholding

which is further compounded by different reason such as low agriculture input. The recent trend on vegetable farming around the market center is another reason of reducing the staple food production. This is case of Lamidamar. The food deficit household in the Lamidamar is much higher than the Rampur village due to cultivation vegetable instead of wheat or mustard and legume in their field.

Food deficit household manage their purchase the food grain from the village in the cash earn from off farm and none far activities such as labouring, service job, and remittance from abroad.

Infrastructure and Services

Dang enjoys a relatively better position in road and transport facility among the five districts of the Rapti Zone. However compared with the other districts of the Terai, road situation of the district can not be considered better. The Mahendra highway running from east to west of the district has the length of about 77 km an is the main portion of black topped road in the district. Another black topped road joins Dang and Deukhri valley from Tuslsipur to Lamahi in the 47 km distance. Other roads are graveled and earthen. The length of graveled road is about 160 km and while earthen road covers highest share of the total length of road in the district covering 357 km. The graveled road and earthen road covers some section of the Rapti high way and different district roads which join the different villages with district and zonal headquarter. Although it is possible to run vehicles in graveled roads through out the year, the earthen roads are seasonal and can not be operated in the rainy season. Besides road transportation one airport provides air transport in the districts.

Electricity is another important development infrastructure. However large sections of people in the district are not still getting electricity. Only 30 VDC out of 41 VDCs and municipalities of the district has electricity and the rest of the VDC has not been connected with the electricity. Although both selected VDCs are connected to the grid, none of them have the electricity facility. Therefore most of the people in Dang depend on kerosene and firewood for energy consumption.

Despite the efforts of the government and establishment of District Water Supply Corporation in 1998, The people are not all getting safe drinking water. Data shows

that only 76.79 percent population in the urban and 59.79 percent of population has drinking water facility. Of which only 37.53 percent of population have tap water facility in the district. Tube wells and springs are the major sources of drinking water in the rural areas. In the South mostly people use underground water for drinking but in the north due to low water table people mainly use underground water for drinking. For example In Rampur well and tube well has been found mostly used for the drinking purpose and contrarily in the Lamidamar spring water supplied by pipe has found used.

Currently 278 Primary, 44 lower secondary, 64 secondary and seven higher secondary schools are running from both government and private side. Besides, 2 campuses and 4 vocational training schools are running in the district. Nepal Sanskrit University is the only one Sanskrit university of the country, is situated in Dang.

5. Cultivation of Ricebean

5.1 Introduction

When ricebean was first grown in the district has not been explored yet, but it is believed that ricebean have been grown and consumed for a long time. It is said that ricebean was widely grown in the past in different cropping systems and seasons in the district. It was cultivated both as summer crop (*kharif*) and winter crop (*rabi).* Residual soil of the paddy field was largely utilized by the ricebean in the past after the harvest of traditional long-season rice varieties. Intercropping with maize in *bari*, and sole cropping in the marginal land was also popular besides its cultivation in the upland of the paddy field which was difficult to utilize for other crops in summer.

However introduction of short duration varieties and change in cropping pattern of rice has substantially displaced the bean from *khet* (*rabi).* Short duration variety of paddy has opened the possibility for other crops in winter. Short duration variety of paddy made it possible on the cultivation of two major crops in the year. Farmer grow wheat, lentil, mustard after the paddy or multiple cropping of paddy depending on irrigation facilities. These crops are comparatively more significant in the farming system than the ricebean. In *Gobadiya* area of *Deukhuri,* farmer expressed this type of view in an attempt to answer why farmer do not adopt ricebean as much as in the past. Even in the rice bund they have stopped growing ricebean because local landraces of the ricebean takes much longer time to ripe and harvest than the short season rice varieties. Therefore to make land available for the next crop, farmer grow short season black gram in the bund or left to cultivate. In this way cultivation of the ricebean has decreased in last few years.

Similarly in the past, farmer grew ricebean intercropping with maize in the maize wheat cropping system. After the harvest of maize they left the land fallow for some time to m appropriate time for wheat plantation and harvest the bean from *bari*. Maize wheat cropping systems have been changed on maize oilseed, or maize winter vegetable cropping system. Therefore they can not grow ricebean in *bari* to allow next crop to be grown in same land resulting significantly reducing both coverage and production of the bean in the district.

Due to its low priority in cropping system it is not cultivated in the plain land because other several other crops can be grown there. However the reason of declining of the ricebean in the district should not be viewed only in the individual crop production context. It is imperative to see the bean production the total grain legume production. Studies have shown that in legume growing area has remained either stagnant or decreased loosing their traditional niche[3]. The reason of declining both production and area coverage of the ricebean and other legume is the low priority in the national policy (Agriculture Perspective Plan)[4].

5.2 Production coverage and productivity of ricebean

No intensive research has been carried out exclusively to understand the production, area coverage and productivity of the ricebean in Nepal yet. Therefore it is difficult to get exact information about the production coverage and productivity. Gautam et al., (2007) based on the information from District Agriculture Office has estimated the area covered by the ricebean for some of the districts of Nepal. According to the study, Dang district has about 105 ha ricebean growing area which is 31 percent of total ricebean grown area of the development region and about 3.2 percent of the country. It is the only the *terai* district having highest coverage of the ricebean in Nepal. In mid western development region it comes in second order after the *Jajarkot* district (152 ha).

However there is doubt on the reliability of the above mentioned information due to scarcity of literature for their verification. Similarly as it is cultivated in the bund and sloppy and difficult terrain the exact method of measurement is necessary to be mentioned. So the area coverage needs to be estimated with appropriate method and accurate techniques. For this reason, lots of works require to be done.

In comparison to other grain legumes production of the ricebean is much lower in Dang. Based on information collected from key informants in various parts of the district, it is roughly estimated that production of ricebean in the district is around 30 metric ton last year (2006) which is 0.1. % of the total legume produced in the district in the same year. Farmer says they harvest yield between 50-100 kg per ha cultivating the bean on the edge and without much effort on the cultivation.

[3] http://www.icrisat.org/
[4] http://www.moac.gov.np

From the discussion in several places it is found that ricebean cultivation was less common in the central flat plain of *Dang* but more common on the surrounding peripheral parts of the district along the foot hill of the *Mahabaharat* and *Chure range*. Therefore the cultivation of the bean in surrounding areas is more continuous but in central parts of the district it is discontinuous where it is cultivated only in slopes made by river cut, non irrigated parts of the paddy field and some non irrigated *bari* mixing with pigeon bean. One reason among others for growing ricebean is the availability of sloping land, not suitable to plough and grow other crops, large rice bund and terrace riser in the surrounding area. Ricebean is grown well on the dry land but can tolerate more water. Therefore it has not been growing in the lower height rice bund in central plain.

The low production of the bean does not necessarily indicate lower yield. In most parts of the district farmer told that yield of the bean is more or less similar to black gram. It was not possible to observe the information obtained from farmer because there was no standing crop in the field during my field stay. Later it was verified by observation with field assistant in the cropping season. The yield however may be different between the varieties.

5.3 Diversity Perceived By the Farmer

Farmers generally take different criteria such as grain size, texture, colour, duration to maturity to classify the ricebean diversity. At the first it is classified in two varieties based on the grain size. One is that having with small grain while the other is bold grain ricebean. The former they call *siltung* in Dang and *Jhilenge* in Deukhuri and cultivate on the rice bund or on the terrace risers, edge of small canals, sloping marginal land, and none irrigated in paddy field. The latter is staked and grown on long poles and even climbing in trees. Farmer in some places call it *Rankse* due to its luxurious growth habit which literally means the over growth of the plant. Mostly *Jhiltung* is cultivated in the kitchen garden and using the green pod as a vegetable. The large grain variety has found with two colours white and yellow. Farmer say that the white bold grain is tasty and yield more compared to other varieties of the bean. It is cultivated in very lesser degree and considered rare than *siltung*. But large grain ricebean is not common compared to small grain *siltung.* 5 farmers from 3 different

locations found cultivating *jhiltung* in the kitchen garden out 10 different places. In Rampur some migrants from the hill told that they had grown that variety in hill *(Rolpa)* and had brought the seed with them but could no grow well in the new place.

Farmer further classify *siltung* (small grain ricebean) based on the colour of seed. On this basis they classify *siltung* into yellow, black, white and speckled.

Phaleo siltung (yellow ricebean) is the most common variety in the district. It yields 15 to 20 pods in one vine where 8 to 10 seed contains in each pod. Medium growth habit is another characteristic of the bean. This variety is produced more than others and exchanges with other grain mainly with other legume such chick pea, and broad bean in the village mostly.

Ricebean varieties: Yellow, Black, spackled and White bold Ricebean.

Farmers consider that black bean is tastier than other varieties but has less market value. Other traits of the bean are luxurious growth, late maturation and high yield and less prone to insect and pest. In the fertile soil it grows well covering large area. The well branched plant looks like the wild. Therefore farmers called it *Jangali* and

sometime *Banmara.* The yield is higher than *pahaelo siltung*. Number of pods per plants ranges from20 to 30 pods and mostly it is 26 to 28. The seed per pod is almost same with above means around 10.

Brown speckled is next variety of *siltung* collected during the field work. It is more rarer than the black ricebean. Yield is almost similar to the yellow one. Farmers say that this variety is not as common as other and mostly cultivated and harvested mixed with in the yellow ricebean. Therefore they did not know much about other traits of this bean.

Farmers mainly grow and harvest all these varieties together not separately. So to know about the traits and varietal characteristics of the plant based on the farmer's information was more difficult than expected during the field work.

5.4 Types of cultivation

Ricebean is cultivated in several different ways based on the location, nature of the land, and farming system. Currently ricebean is growing in three distinct production domains in Dang; on the rice field particularly in bund, terrace riser, bank of water canal (*Dhik*) and in non-irrigated parts; on the sloping land not suitable to plough and plant other crops; and intercropping with maize.

Mostly ricebean is found grown mixed with other legumes such as black gram, soyabean, and green gram in paddy based production domain. In some areas of the district it is also found growing under the pigeon bean cultivation. Farmer think combined cultivation of ricebean with other legume helps to controls disease and pest problem and also reduces risk of loss. They said that if one is destroyed by insect and disease they will have still chance to harvest another crop from same field. Another reason for growing mixing the bean may be very small production. Farmers say that both plantation and harvesting crop in small areas is not practical. Storing separately is even more tedious job. Farmer not only mix the bean with other legumes in cultivation, they also harvest together. They think that if they sell the bean mixed with black gram, they will get higher prices and make it more easily sell. They would not get a good price selling the bean separately.

Among these, first type; paddy field is most common in which ricebean is mostly planted combined with black gram. In some areas ricebean is also planted mixed with soybean and black gram and some places with green gram. In the cultivation practice, better and fertile place is generally selected for the black gram and less fertile and less good by ricebean. It means that land which is not used by the major crops is utilized by the ricebean. In the terrace riser ricebean is planted on the lower part of the risers and black gram on the top as the farmers of Illam (Andersen, 2006). Hand hoe is used to plant the seed on the ground. Based on the information from the farmer of different places it is estimated that more than 75 percent production of ricebean comes from this type of production domains in these days.

Ricebean and Black gram planted together

None irrigated parts in the paddy field where irrigation is not possible is often utilized by other less significant minor crops in the farming systems which do not need as much water as paddy, such as millet, peanut, ricebean and many other crops. Mostly in the *dabar* and *bagar and Ganar khet* (not on the *sim khet*) such land exists in the district where they broadcast the seed and mix the seed with soil either digging or ploughing the land which generally depends on the size of upland. Beside rice bund and terrace riser and upland, farmers also utilize the bank of small canal with ricebean in the main paddy field. This is optimal use of agriculture land in the subsistence farming system.

After the different unused parts of the paddy field, ricebean is largely grown on the unused sloping land. Due to steep slope ploughing and planting other crops is not possible in such land which is then utilized by minor crops like ricebean. In the district, peripheral parts on the *Chure* and *Mahabarat* range with the steep slope (greater than 25 degree) degree and river made slope in the elsewhere in the district is

often utilized by the ricebean because other major crops of the farming system can not be cultivated there.

Farmers also grow ricebean intercropping with maize in the district. This type of cultivation was widely practiced in the past but in the present it is declining continuously. Very few farmers were found in the district continuing ricebean cultivation intercropped with maize. In intercropping ricebean is commonly planted using hand hoe during the first weeding of maize but broadcasting ricebean in the maize field and then incorporate into the soil before first digging of maize crop is also common in practice in the district. However plantation of the bean in the *bari* is less common in the district and is considered decreasing.

5.5 Planting Season

Ricebean is normally considered as summer growing legume. Therefore it is mostly cultivated in the summer. However as mentioned earlier, it was also cultivated largely in the residual soil after the paddy in the winter.

Ricebean plantation season differs based on the types of cultivation, cropping pattern and production domain. In the paddy field such as in the bund, terrace riser bank of the canal it is planted one week after the transplant of the paddy in the main field. Normally paddy is planted in *Dang* from the mid June to the mid July depending on the onset of monsoon and available irrigation facility. The time of planting in the upland is the same as the rice bund, terrace risers and bank of the small canals. However ricebean is planted about one month before in the *bari* intercropping with maize. Farmer also plants the bean in the same time as *bari* in the unused sloppy land.

5.6 Harvesting and Storage

Ricebean normally takes 90 to120 days to ripe in Dang depending on the varieties of the ricebean landraces and altitude in the district. Therefore harvesting time varies greatly based on the time of plantation. It is normally harvested in late October to early November (*Kartik\ Manshir*) from different parts of paddy based production domain such as the rice bund, terrace rise and non irrigated parts of the paddy field after harvesting the main crop paddy. However ricebean intercropped with maize is harvested one month earlier in the late September to early October from *bari* after the harvest of maize cobs. Ricebean planted as sole crop in sloping land is also harvested

at the same time as *bari*. Due to indeterminate traits in the existing land races pod maturity extends over long periods. Pods have a tendency to shatter when left on the plants for a long time. Farmer therefore harvest the crops before maturing all the pod in the vine to save the loss of seed due to pod shattering. The mature plant is normally pulled out or cut near the base. Harvesting is done normally by hand reaping the whole plant as shown in picture (3.a.).

Harvested crop is then dried in sun as shown in the picture below (3.b.). Normally the harvested plant dried on the roof top to avoid the moisture from the ground. It is said that it takes one or two week to dry the vine completely depending on the weather condition. The well-dried pods are then threshed by various methods depending upon the quantity harvested. Small amount grain is threshed out by beating the dried pods with a bamboo stick which is most common in the district due to little production. For larger amounts of the beans threshing is done by trampling of draft animals. The seed is then winnowed and cleaned. Seeds are dried for 1-2 days before they are stored.

a. Farmer harvesting the bean **b. Ricebean collected at the roof top to dry out sun**

Proper storage is next task after the harvest of crop. It is necessary to give proper care because grain legumes are prone to insect and in the storage than their counter cereals. To avoid the insect and pest risk farmer sell all the stuff separating for the home consumption and seed shortly after the harvest. This strategy also works for the ricebean. The ricebean growers sell first separating some for the seed and home consumption. Three kinds of storage could be seen in Dang for all stuff left after the sell. For the seed farmer use some insecticide. The ricebean seed is mixed with insecticide and is kept some pot usually made by the clay soil made pot tighten the

air. But for the home consumption farmer adopt other traditional methods rather than insecticide. For example mustard extract (*pina*) , *tite pati*[5] etc are used to avoid the risk of chemical in the consumption. For the immediate use they do not use any method.

5.7 Basis of land chosen for the ricebean

As a neglected crop, ricebean is cultivated on the land unused by other major crops of the farming system. But farmers give some logics to support the selected land for the bean cultivation. Basically they explain on location and soil fertility basis. They argue that soil near the home is comparatively more fertile than the further away because compost manure is generally used more close to home and other biomasses is also deposited more close to home. Ricebean is not cultivated on the land near from the home rather cultivated little far on the *bagar* and *pakhao khet* because ricebean do not yield well in the high humus contained fertile soil. Farmers argue that if the bean is planted in the fertile soil, extra vegetative growth negatively contribute to the yield.

This logic is overruled in the case of large ricebean which is usually cultivated in the kitchen garden. This is due to different purpose of the bold bean. Bold grain ricebean is used for the source of green pod which need to be picked up at different times as a vegetable. But the small grain ricebean is only used as dry seed after the complete harvest need not to be picked at different times. Further as the bold grain bean is cultivated with stack supporting the extra vegetative growth in the home yard which could make the problem if grown in the *khet,* but small grain ricebean does not make problem as the bold grain bean.

Besides location farmers also support the selection of land for the ricebean with other criteria. For example they consider the soil type as another criterion for the ricebean cultivation. Farmers explain that low humus contained *silkey* (sandy) soil or red residual soil is best for the ricebean. Farmers claim that in high humus contained black soil is not suitable for the ricebean cultivation.

5.8 Input: Use of fertilizer, insecticide and pesticide

[5] Paste made by mixing different leaf of plant

Farmers do not care much in terms of cultivation efforts. They give least preference to applying agricultural inputs in ricebean cultivation. Only two operations, planting and harvesting is done. Weeding is not commonly done may be due perception of the farmers that ricebean can compete with weeds and no needs it. This is also may be priority of the farmers' in the paddy weeding. No chemical fertilizer, insecticide and pesticide are used in ricebean cultivation due to neglected minor crop in the farming system. Not applying such input may also be due high price and scarcity. Basically in Nepal such inputs are reserved for cereals or high value crops (Pandey and Rao, 2000)

Farmers conceptualize that due to high local adaptability of the crop, ricebean can manage nutrients even in the marginal and exhausted soil. Although very few famers are familiar with the scientific understanding of biological nitrogen fixation, most of them recognize the role of bean in utilization of marginal land and its role as cover crops. However the primary purpose of the bean is for the grain not for the cover crops. They think use of fertilizer in the crop is worthless and in many situations it reduces the yields. Further, application of fertilizers and irrigation can result in excessive vegetative growth, with resultant lodging, disease infestation, and low yield. In some places farmers conceptualize that ricebean absorbs the fertilizer used for the main crop paddy or the maize, so need not to apply such inputs separately for the bean. Similarly in the most of cases they also do not use any chemical substances to control insect and pest problems in the crop. Farmers believe that they don't know the exact medicine to control the insect problem. Further they do not consider using expensive insecticide to this crop. However, some of them told they used insecticides bought for the major crops and used left over.

5.9 Perception on disease and pest

Among others insect and pest problem is considered main limiting factor in legume production. Therefore in the lower latitude region legume crops is considered as risk crop. Singh and Emden (1979) claim that two to ten fold grain yield could be easily obtained from legume with effective insect and pest control. Although ricebean is considered more insect and disease resistant legume than others (for example black gram), some insects and disease attack the ricebean at different development stages (from its early to before harvest as other legume crops). According to farmer they

loose considerable amount of the production each year due to different disease and pest. In the second field trip farmers were expecting about 50 to 60 percent loss in the ricebean production this year due to heavy insect attack which was about 20 to 25 percent less than the black gram in Lamidamar. Same situation was also exist in the Rampur.

According to farmers, *Lahikira* (pod borer), *Bagale* (small hairy caterpillar in a group), *Jhusile* (large larva), *Rato kira, Khapate* (blister beetle) and *Cheparo* (lizard) are some of the major insect pests which harm the bean differently at different growth stage. Famer told that these insect damage either directly by eating leaf, flower, pod and other parts of the plant themselves and or creating a good environment for the other host pest.

a. Blister Beetle

b Hairy Caterpillar

c. Pod borer

Insect problem becomes serious during the early growth stage and flowering time of ricebean. In early stage insects create problem by eating new green leaves affecting the growth and development of the plant while at the flowering stage they damage the flower affecting the pod formation and amount of seed produced.

Among insects *bagale* is the most dangerous for the ricebean. *Bagale* (small larva in group) if attack, damage the crop in the entire field eating all leafs of the plant. Other larvas also damage the plant in the early stage and the pod in the later stage but not as much as the *bagale* does. Blister beetle (*rato kira*) is an insect which harms the plant by eating flower which severely affects pod formation process of the plant and lowers number of the seed to be planted. The pod borer is the most common insect severely affect the seed preparation process of the pod harming the pod and reducing the yield.

Farmer says that pod borer is most dangerous insect. Farmer opinions that, if mustard or any legume crop is attacked by *lahikira,* it would be tough to control it.

Table 5.1Most common Pest of Ricebean

English Name	**Vernacular name**	**Possible Damage of pest as perceived by farmers**
Lizard	*Cheparo*	Cuts the leave and bunds of the plant
Larva	*Jhusile*	Eat and destroy leafs and bore hole in the pod.
Small Larva (hairy caterpillar)	*Bagale*	Eat and damage the leaves.
Blister Beetle	*Rato Kira Khapate*	Damage flower and obstruct pod formation.
Pod Borer (Lepidoptera)	*Lahi kira*	Damage pod making by eating the young seed, move from one pod to another and damage several pod very soon

Source: Field Interview 2007

Apart from insects, farmer also noticed some diseases common in the ricebean. According to them leaf stem rotten and yellowish leaves (*pat pahelo hune)* problems are most common in the district. Farmers perceived them Rust and web blight, fungal disease based on the symptoms. According to them farmers, these diseases not only damage crop and reduce yield but also lower the seed quality. They explain that at first different red spot appears in the leaf (picture) then slowly and gradually it turns from reddish brown to yellow. Ultimately all the foliage appears dry and mostly the infected plant die. Farmers say that this type of disease is not regular phenomena but appears in few years' interval. They experience that the diseases become severe in the high rainfall year.

Different stage of fungal disease as perceived by farmer

However it is necessary to keep in the mind that these symptoms may also appear when micronutrients disorder remain in the soil (Srivastav et. al. 2005). For example some spots in the leave and yellowish leave appear in the boron deficiency in the soil. Therefore the above mention symptoms and farmers opinion should analyzed carefully. The skepticism about the disease and nutrition deficiency is also essential

because Nepal is deficient in micronutrients and especially in Boron. Therefore it is necessary further research about this problem in the grain legume.

Normally farmers do not do anything to prevent and manage the insect and disease problems in ricebean. As mentioned above after sowing the bean farmer goes to field to harvest bean. However some pest such as beetles and lizard are killed mechanically by hands. In exception some farmers used insecticide left after use of major crops, however insecticide is not normally bought mainly for the ricebean.

5.10 The case of the selected Villages (Rampur and Lamidamar)

Rampur and Lamidamar are growing comparatively more ricebean in the district out of ten location visited during the field trip. Number of ricebean cultivated household and production and coverage is relatively high in these villages than other places visited in the district. However it is said that cultivators, production and area covered by ricebean is decreasing over the years as other parts of the district.

Forty seven households (22 in Rampur and 25 Lamidamar) cultivated ricebean last year which is 78 percent of the total household (60) interviewed. Among them most of the household (40) are cultivating ricebean continuously generation over the generation. While some (7) of the household told they have left the cultivation of the ricebean some years before but has started again recently due to excessive insect and fungal problem in the black gram. 13 household were ricebean non grower; among them, five household told they have left its cultivation about 5 years before while others (3) household) told they don’t know about cultivation even by their parents in the past.

Total ricebean cultivated area based on the interview with farmer were 14 ha (6 ha in Rampur and 8 ha in Lamidamar) which is about 60 to 70 percent of total crop land area. The area covered by the ricebean need to be understood properly in the sense that the area told by informants is not fully covered by the ricebean. Of which ricebean covers the land not used by the major crops. The major portion of the better land generally occupies by the major crops mostly the paddy. In this sense the actual area covered by the bean is much lower than above mentioned figure.

In these two village 976kg (333 kg from Rampur and 643 kg from Lamidamar) ricebean was told produced last year. The production of the ricebean by household varies from few kilos to above eighty kilo. Average household production of bean is around 13.5 (15.3 and 18.92) and varies from some kilo to above 100 kilo depending upon on the various factors.

Household characteristics and ricebean cultivation

From the group discussion and interview carried out at several places in the beginning of the field study, it was found that entire households do not grow ricebean even within the same village despite large social and ecological similarities. Therefore I believed that, household characteristics may have playing selective role in the adoption or non adoption of ricebean in their farm besides other variables. In this backdrop the following section analyzes the ricebean cultivating household and their characteristics based on the information collected in Rampur and Lamidamar during the household interview.

Land ownership and land holding has been taken as the first variables in the household analysis followed by staple food sufficiency situation of the household, joint family structure with presence of elderly, free labour availability, cast ethnicity, and education.

Staple food sufficiency situation of the household is a next variable affecting in the ricebean cultivation. All the insufficient (6) households in the staple food production were found cultivating the ricebean in Lamidamar. This is overruled in the case of Rampur. No household was found cultivating ricebean in Rampur out of 3 household insufficient in staple food production.

Among ricebean cultivators most of them were from joint family structure with presence of elderly member. Single families with young age normally do not cultivate it. Out of 30 households all the large family with presence of the elderly members had cultivated ricebean while only 5 households from the single family had cultivated it. This factor is found no effects in the Lamidamar.

Table: 5.2 Family Types and Ricebean Cultivation

Family types	Cultivators		Non Cultivators		Total
Villages	Rampur	Lamidamar	Rampur	Lamidamar	
Single	5	16	8	2	13
Extended	17	9	0	3	17
Total	22	25	8	5	30

Source: Household Interview, 2007

In both places labour shortage has found strong factor in ricebean cultivation. Three household in Lamidamar and same number in Rampur were not cultivating the ricebean in their farm due to labour shortage. In the queries why do not cultivate ricebean despite land suitable for the ricebean cultivation. They told that who care ricebean in the labour shortage situation for the major crops. However the reason of the labour constraint of is different in two villages. In Rampur active labour of none cultivators of the ricebean has been found involved in off farm non farm activities around the village (such as carpenter) while non cultivators of the Lamidamar were mostly in abroad job. The household in the Rampur whose members are in the abroad for the works were joint family and do face the labour in the work.

Table 5. 3 Labour Availability and Ricebean Cultivation

Labour situation	Cultivators		Non Cultivators		Total
Villages	Rampur	Lamidamar	Rampur	Lamidamar	
Enough	22	25	5	2	13
Limited	0	0	3	3	17
Total	22	25	8	5	30

Source: Household Interview, 2007

Analysis based on the caste and education variable is not possible in the Rampur because entire household interviewed were from the single *Tharu* community but in the Lamidamar it has not found much selective factor.

From the above discussion it can be said that although different characteristics of the household play selective role in the ricebean cultivation. The most prominent factors in this study are the location of the land and availability of labour in the family. Those household which has the unused land such sloping land, *pakho* land or the land not suitable for the other crops generally cultivate the ricebean at least to utilize such land. But for it they need free labour from the family. Therefore the labour shortage households usually do not cultivate the bean even if they have such unused land potential for the ricebean cultivation to utilize the better and fertile land and avoid less suitable land even if they have. These two factors has played selective role in both

villages. Joint family structure and the presence of elderly member are another two variables affecting adoption and non adoption the ricebean in the farm. Elderly people generally keep the seed of the traditional crop for the next generation. If lost from the farm elderly have much information getting the seed again from those who have the seeds. Therefore they do not face much problem on the seed access and on the other large family and food sufficiency in staple food production has been found selective role only in one place. The fist is found selective in Rampur and later for the Lamidamar. Caste ethnicity and education were found weak variable in the ricebean cultivation in both places.

5.11 Problems and constraints in ricebean cultivation

From above analysis we came to know that there are different factors which discourage the farmer in ricebean cultivation. Although most of the obstacle in the cultivation is similar with others parts of the district, some of the factors are the local and are different from others. Based on the nature the constraints are categorized in three categories.

Socio economic and agronomic constraints

- low yield potential of existing landrace and no availability of improved seeds
- labour shortage in the household
- small and fragmented land holdings and low priority of the bean in the farming system
- land tenure and ownership
- change in cropping pattern

Negative traits on the local landraces and biological constraints

- long sowing period
- indeterminate growth
- asynchronous flowering habit
- disease and insect pest

Socioeconomic and agronomic constraints

It is very obvious that very little is known about the ricebean in the absence of enough research its different dimensions. In the absence of research, there are no improved varieties of ricebean with high yield potential available in the market. In the absence

improved high yielding varieties farmer are cultivating local landraces with low yield capacity. In the subsistence farming systems yields is always top priority over the other aspects of the production to make the household better position in household food situation. Therefore farmers normally attracts toward the improved varieties of other legume such as black gram, soybean which give better return against ricebean in the district. In the most of places of the district farmers have left the bean cultivation. Even in marginal areas it is also in decreasing trend. In the most parts of the district rice bund now can be found utilized by the black gram which was covered with the bean in the past. Even in the surrounding areas where ricebean is cultivated at a greater extent farmer were found utilized better and accessible land with black gram and left the worse for the ricebean.

Intra household crop competition is the most significant factor in the adoption and non adoption matter of the ricebean. Generally, if markets are accessible emphasis is on the cash crops, if they are inaccessible subsistence crops are emphasized (Tamang, 1993,). However, despite growing specific crop for the market purpose, subsistence farmers sell every surplus production to buy other household needs. Therefore mostly farmer want to grow black gram, pigeon bean, green gram or other high market value legume in the land where they usually cultivate ricebean so they can sell the surplus production after household consumption.

Seed access is another problem in ricebean cultivation. It is not commercially available in the market. In this situation farmer should manage seed themselves for the next year which is more difficult due to some unfavorable traits such as shattering of seeds and differential flowering habit in exiting local landraces. If farmer wait to let mature all pod, seed fall breaking the pod and if harvest earlier pod in the higher parts of the plant do not mature well. I found several farmers struggling with seed in the study area that had left ricebean cultivation some years back but want to grow. Finding the local seed themselves in the village is only the option which is comparatively difficult task This type of problem is mostly reported by the farmer who suffered a lot with problem of insect (*Jhusile kira*) after the adoption of the black gram in their farm and want to grow ricebean again replacing the black gram.

Small and fragmented landholding has also been explored as constrain in ricebean cultivation. Subsistence farmer needs to fulfill the food demand of the family from their own production. They can not afford food from the market in the absence of other cash income in the household. Therefore usually small land holders prefer cereals crop to grow in their farm. Cultivation of legume comes in second priority if they have the more land available after cultivating the cereals. Even within the legume ricebean come in lower priority. Therefore generally farmer with small landholding do not cultivate the ricebean because ricebean do not come in the up in their priority crops. In the contrary, the large land holder usually plant ricebean and major crops on the more accessible land.

In some of the villages share cropping (*bataiya*) was also reported as a constraint for the ricebean cultivation in the district. In share cropping tenant and landlord usually makes verbal agreement of sharing fifty -fifty percent both produce and inputs needed in the cultivation the tenant solely contributes. However Cederroth (1995) mentioned another type share cropping practice in which tenet lease the land from the landlord in life long basis. Landlord can not easily terminate the contract because right of the tenant is protected by the law. But in the annual contract the sharecropper has no right on any matter of the land. The agreement is made only verbally. Landlord on the other hand posses all kind of right from the choice of crops to be planted to terminating the contract. The share cropper has no rights even on the crop choice. Therefore despite the interest, sharecropper can not grow the bean. This is the constraint to those who have not their own land and have to rely on others land for the livelihood on share cropping basis.

Negative traits on the local landraces

Besides these there are some negative traits on the exiting landraces. Long sowing period, shattering habit, differential flowering time and indeterminate growth are unfavorable traits to local farming system.

Normally farmers grow two crops in a year in the most part of *Dang*. Both irrigated land and non irrigated land are utilized in both seasons as far as possible. Summer crop is considered important crop however winter crop also play important role in household food security. Long sowing period creates problems to the next crop to be

grown after the ricebean. So they do not want grow ricebean rather want short duration crops instead of ricebean. For instances farmer in many places told that they grow black gram instead of ricebean to prepare for the next winter crop.

Non uniform flowering time (asynchronous) does not lead the pod to ripe in same time. Lower section of the plants flower blooms earlier and makes pods, but in the upper parts flowers develop successively. As result, already matured pods of the lower section of the plant break off and often beans fall on the ground before ripping of the pods of the upper parts of the plant. This on one hand reduces the yield on the other mix the different size grain of the bean, lowering the grading of the bean. Further the grain received from the immature pod does not soak and also takes longer time to get tender.

Indeterminate growth and twining traits on the local landraces has also bee considered problem in the paddy based farming system. If the bean were grown for the green fodder or the manure, it could be best the traits but as it is grown mainly for the food grain, so it is considered as constraints by farmer. The large plant with well branched vine climbs on the paddy (main crop) and affecting the paddy production negatively. Besides, this habit of the plant also reduces product itself. For example luxurious growth habits of the bean cover much space on one hand on the other could not bear pods. Rather in invites different insect and pest and

As discussed above problem of disease and insect is also one of the constraints on ricebean cultivation. Legume crops, particularly in the lower latitude region are considered more susceptible and prone to different disease insect and pest than cereals. Therefore farmers give less priority to the legume cultivation. Although selection of proper insecticide and pesticide can control the disease and pest, it is not enough to manage disease and pest in long run, the development of pest resistant varieties is necessary to make wide adoption of grain legume (Singh and Emden, 1979).

5.12 Trait Preferences and Ranking by Farmers

Despite importance and potential to improve the food and nutritional security particularly among the resources poor farmers of the marginal areas, ricebean has not

been found widely adopted in *Dang*. In the most parts of the district its cultivation has almost vanished; even if grown by some household, it has very limited or no role in total cop production and consumption. However in the surrounding area along the foot hills of *Chure* and *Mahabharat* range, farmer cultivate it in relatively large areas and consume it considerably. Despite this its cultivation and production is decreasing over the year.

In this back drop I was interested to learn about the traits preferred by farmer on the ricebean so that the preferred traits could be include in the improved seed and they could adopt it any longer. In the end of every group discussion conducted in different places in the first phase of the field study participant farmers were therefore asked five traits they prefer in the bean for its wide adoption. They were also requested to put that traits in rank based on their important feature.

Previous studies made in Nepal (Joshi et. al.) and elsewhere (Kitch, 1998; Morse et al. 2003) shows that farmer prefer different characteristics of the particular crop based on their ecological and socio cultural setting. Some may give emphasis on the yield while other may give other characteristics of the crop such as size, colour growth habit, or many more. The choice of the traits always goes in the purpose of the crop to be grown and its role in farming system. Apart from method of cultivation, production domain also largely determines on the traits preference. Therefore it is not always necessary to have high yield potential alone for the wide adoption of crops. There may be other traits of the crop to make it adopted or rejected. The preferred trait study conducted in northern Cameroon on the cowpea farmers preferred colour over the yields because of its importance as cash crops more than food crops (Kitch, 1998). In similar study in Nigeria, farmers have given seed availability as most important criteria for the adoption of cowpea as leguminous cover crop (Morse et al. 2003). The preference and rejection is therefore not universal rather varies over the space and time.

Therefore in the varietal selection farmers participation is always essential. The farmers preference (selection criteria) is not necessary the same as the criteria made by the scientist in the research station. Therefore the farmers' involvement in the final

line selection is both efficient and cost effective and helps the scientist to breed the varieties to be adopted by farmers of particular location (Witcombe, 2005).

Table 5.4 Preferred Traits in Ricebean by Farmer of Dang

Places Traits	Number and size of pod	Large seed	Time to maturity	Taste	Determinant growth and erect type	Water logging tolerance	Uniform flowering time	Planting season	Disease and pest tolerance	Rainfall tolerance
Rjapur	1	3			2			5		4
Kanjawar	1		3			4		2	3	5
Bagrapur	2		1		4		5		3	
Goulauri		5		2	1		3		4	
Ghorneti			1	2			3		4	
Manpur		4	2	5	1				3	
Amiliya	2	4	3		5			1		
Kumalgadi	2		4		3		1			5
Dharna	1		3			5	2		4	
Rampur	3	5			4				1	2
Total	13	21	17	9	19	9	14	8	22	16
Net Score	1.85	4.2	2.4	3	2.7	4.5	2.8	2.6	3.1	4
Rank	I	IX	II	VI	IV	X	V	III	VII	VIII

Note: Rankings are based on the score where lower score is the best and highest is worst.
Source: Group Discussion, May 2007

The above table summarizes ten different traits preferred and their ranking from the discussion conducted at different places of *Dang*. Number and size of pod, short duration maturity and planting season are the three top ranked traits expected by the farmers in the bean. Farmer preferred more pods along with and large and in seven different places of which it is ranked first in three places, in three places second and in one place third. More pods, along with large and long pod of are some the opinion expressed by the farmer to increase yield. They said that if any high yield varieties were available to them, it is likely to be better adopted by the farmers. Farmer expressed their concerns on short duration ricebean varieties after the size and number of pods to allow winter crop to be grown on residual moisture after the paddy and ricebean harvest from the *khet*. Similarly to those who are interested on the green vegetable after the maize harvest in *bari* also want it so that that they would adopt such varieties of bean to intercrop with maize if available. However they were not currently growing bean with maize. In one place short duration to maturity was ranked in first while it was ranked in second, third and in other four places.

In three places farmers also expressed another plantation season than the usual. Due to small landholding they want plant the bean in off agriculture season in April and harvest before planting main crop, maize or paddy not loosing the production staple crops. It was ranked first, second and fifth order preference in one each places.

Determinant growth and erect type, uniform flowering time and good taste are other three preferred traits ranked on fourth, fifth and sixth order. In 7 different places farmer preferred determinant growth and erect type of traits in the ricebean so that they could cultivate bean not making any harm in the on the main crop paddy. Farmer in three places ranked this trait in the second third and fifth but two in each it was ranked first and fourth preference. It was ranked in second and fourth preference in one in each place. Farmers in five different places suggested uniform flowering time to make harvest possible at single time, reduce seed loss and for the lower quality differential grain size. Farmer explains that the grain harvested from differential flowering local landraces does not look good and makes difficult for selling. The seed harvested from the immature seed also takes long cooking time and not cook well. However they ranked the traits differently in 5 different locations. It was ranked third in two but in first, second third and fifth one in each. Farmers also prefer good taste in

the bean in three places of which in two place second and in one in fifth. They claim that if it is tastier like black gram, farmer may prefer it against other grain legume.

Beside above mentioned six traits, disease and pest tolerance, rainfall tolerance, large seeds and water logging tolerance are the lower preferred traits in the ranking. Farmers preferred disease and pest tolerance traits on the ricebean in seven different places but with low priority. It is because farmers found it more disease and pest resistant of the ricebean than its competitor crops such as black gram and green gram. However In one places it ranked on the first order however ranked in third and fourth order in three and three places. In two places farmer preferred the rainfall tolerance traits on the bean. Farmer has strong concept that ricebean can not tolerate heavy rainfall. Heavy rainfall is considered cause fungal and other disease in the crop. Therefore farmer believe that if ricebean have such traits, good production could be secured even in the high rainfall year. Rainfall tolerance traits were preferred in three different places of which in two places it was ranked fifth, in two places but second and fourth one in each. Similarly water logging traits was also preferred important in two places.

This way reflects that the exiting varieties of ricebean are already more restricted than others such black gram and green gram.

5.13 Summary and Discussion

Ricebean is an underutilized legume crop mainly cultivated in the inaccessible area of the district by the resources poor farmer. Despite the unpopularity due to different traits unsuitable of the farming system, farmers are cultivating it as an alternative crop to supplement the food amount in the household. Therefore it has not significant role in the farming system. It is mainly cultivated in the unused parts of the paddy field such bund and non irrigated parts without any care and input.

However it is believed that ricebean was massively grown in all the area of the district in the past in different cropping system and season. Intercropping ricebean with maize was popular cropping system in the past. But it was also cultivated in other cropping system such unused parts of paddy field as today. Further in the past ricebean was also grown in winter season in residual soil after the paddy.

There are different name given to ricebean according to varieties and location. *Siltung, Jhiltung and Jhilinege* are common name given for the ricebean in Dang. Ricebean is normally considered less prone to disease and pest than other legumes. However sometimes it is also attacked badly by different insect and pest. Farmers do not use pesticide to control the disease and the pest and except harvesting the left. Both insecticide and traditional method is used to protect from the insect and pest during the storage.

6. Common Use and Utilization of Ricebean

Ricebean is usually considered as multi purpose legume crop and is mainly cultivated for the food, fodder, and green manure. Sometimes it is grown with one particular purpose but most often for the all. However primary purpose of the crops may vary from place to place depending on the nature of the farming system. In most part of the Dang it is mainly cultivated as food grain crop in the less accessible marginal areas. Other use such as fodder and green manure is less compared with the food purpose. In the following section common use of the ricebean has been discussed in detail.

6.1 Ricebean as a food grain crop

Ricebean in the district is perceived as a minor crop. Socially it is considered inferior and mostly regarded as the food of the poor. Therefore it has limited role in the food system especially in the socially and economically higher class of people. People with availability of other legumes do not consume it due its strong taste and lower social status. Even if consumed, that is rare and occasional as to take just taste of the new harvest. But in the marginal areas, specifically in less accessible areas of the district ricebean is one of the commonly used pulses among others. People use it regularly as their staple food along with the food prepared by the rice, maize and wheat. This further could be significant crop particularly when the availability of other staples crops is reduced and household suffers from the acute food shortage *(anikal.)*. It comes in the top three most consumed legume grain in such area because production of other legumes is comparatively low than other parts of the district. But evens there people mainly prefer other legumes over the ricebean.

6.1.1 Preference of Ranking

The table below gives the preference of the people on commonly grown legumes in the selected villages. Every household were asked in the interview about their preference on the pulses commonly grown in their area based on the taste, nutrition and use of grain legumes as *Dal*. Those who were not growing ricebean currently were also participated in preference analysis. The purpose of the preference analysis was to know the popularity of the ricebean among several pulses grown in their area. Informants respond well in two aspect; taste and use as *dal*, but they told that they don't know much about the nutrition level of the ricebean as they were uneducated.

However still I asked them to make the study make the compare possible with this kind of study in other parts of Nepal.

Table 6.1 Preferences ranking among commonly grown legumes

Commonly grown legume	Taste	Nutrition	Used as *Dal*	Total	Overall ranking
Lentil	3	5	2	10	III
Black gram	2	6	1	9	II
Chickpea	1	1	6	8	I
Broad bean	6	4	3	13	VII
Ricebean	4	3	4	11	IV
Pea	5	2	5	12	V

Source: Household interview, 2007

In the preference analysis chickpea was ranked in the first. People preferred it first in taste and nutrition; however it was preferred less for the use of *dal*. It is because chickpea is mostly consumed as vegetable and snacks than *dal*. Vegetable prepared by grain legume is commonly called guda[6]and chickpea most preferred for it. In the season it is largely consumed as a vegetable. Black gram is ranked in the second position in the total ranking however it was in the higher position as use of *Dal*. But in terms of nutrition perception it was ranked in the sixth. Ricebean is ranked in fourth after the lentil. Although lentil is most consumed legumes in Dang, it was ranked only after the chickpea and black gram. It is because people think that it is less nutritious than other pulses. Further they also think it less tasty than black gram and chickpea. Very few household preferred the ricebean in the given parameter. As mentioned above this preference was carried out based on the multiple criteria, framers prefers the grain differently based different factors. Pea was ranked in fifth and broad bean in the last.

6.1.2 Food Items prepared by ricebean

Several food items are prepared locally by the ricebean based on the social and culture setting and food habit of the local people. The green pod is used for the vegetable. Local *Tharu* people called vegetable prepared by the green pod *Thusa*. Normally bold grain ricebean are usually grown in the kitchen garden is used for this purpose. The small grain variety is usually not used for the green pods. However in several places

[6] Legume vegetable soaked and cooked

Tharu people told that they also pick the pod from the small ricebean for the vegetable. Rest of the food items is prepared from the dry seed of the bean.

Dal (soup) is the common use of the bean in the food. *Dal* is curry prepared by the different kinds of pulses. People use both dehulled bean and the non dehulled seed of the bean directly to make *dal*. However way of *dal* preparation differs between dehulled and none dehulled seed. The non dehulled bean is normally soaked and cooked but the dehulled is not soaked before cooking. Mostly it is mixed with other plusses such as black gram and lentil available in the home. *Dal* is prepared to supplement the rice in the morning meal. Mostly the ricebean *dal* is prepared mixing the non splited with others pulses such as black gram and lentil or other pulses available in the home. In the rice based food system *dal* is preferred by the most of the people in the morning meal with pickle and vegetable.

Biruala is another food item prepared from ricebean after *dal*. *Biraula* is a snack made of soaked ricebean either fried or steamed which is consumed as snacks in the mid day meal. Chick pea and pea is mostly used to prepare *biraula* along with ricebean. To prepare *biraula* ricebean generally is not mixed with other legumes as the *dal.* Ricebean *biraula* is popular among *Tharu* people. They offer it especially in social gathering and when guest is in the home. According to them, availability of the ricebean increase the legume grain varieties which are considered essential to serve guest in the social gathering. According to them more food varieties show their social status and respect to the guest.

Khariya is another popular food items in *Tharu* community. It is made by the flour of the legume deep fried in oil which in other parts of the country is known by *batuk* (Joshi, 2007). Normally this kind of food is known as *pakauda* in other places and used as snacks in the half days meal.

6.1.3 Timing, season and frequency of ricebean consumption

Ricebean is normally not consumed regularly. Many factors influence timing season and frequency of the ricebean consumption in Dang. Perception on hot cold food

dichotomy, perception on digestion problem, seasonality and food habit are most influencing in this regards.

Ricebean is mostly consumed in the winter after the harvest in November - December and goes on for some months ahead depending on the amount of produce. Consuming new harvested grains is in the subsistence farming system is usually more on the immediate months after the harvest of crop and decreases in the months ahead due different reason such as low production, storage problems and to pay debt. This is one of the common features of the subsistence farming system. Therefore not only ricebean but also other grains also consumed more on the immediate months of the harvest and decrease on the months ahead. This is the seasonality factors influencing the consumption of the ricebean.

People perceive that best season for the ricebean consumption is winter because it warms one and protect body from cold. This is another reason for its consumption in winter. However this logic contradicts with people of central Nepal (Joshi et al, 2006) where warm season is considered as the best season for the consumption. Andersen (2006) regards this is arbitrary division of in the hot cold food dichotomy and is not based on the real qualities of the food. Consumption period is therefore from December and last for two or three months which also relate to the time of harvest and perception of best season of the consumption.

As other types of grain legumes ricebean is not consumed regularly because people perceive that it creates problem on digestion if consumed regularly. The digestion problem is also usually mentioned in *Gulmi*. However in Illam (Andersen, 2006) ricebean is considered easily digestible grain among commonly grown grain legumes. Therefore even in its high consumption winter season it is not consumed regularly. Children, elderly and ill persons are normally avoid ricebean consumption. Ricebean growers in the villages say that they eat ricebean maximum twice or a thrice a week and eat other legumes in between them.

Regarding the timing, ricebean is consumed in all meal but more on the morning and mid day meal than in the evening. The food habit of the people has greatly influenced time of the consumption. As mentioned above there is tradition of *dal bhat* in the

morning but in the evening *dal* is not normally cooked rather food (bread or rice*)* is generally taken with some vegetables. Therefore usually it is not taken in the evening meal. However at the time of green pod; it is picked some time for vegetable for the evening meal. But that is for short duration.

6.1.4 Traditional domestic processing method practiced

The grain legume is generally utilized after certain processing on them. Although people use mostly industry processed legume in more accessible and urban areas, different kinds of domestic processing are still widely practiced in rural areas. Domestic processing is the traditional cultural practice of the local people. People process legumes with different purpose either to cook fast or to enhance taste on them, or for better product and acceptability. Usually they don't know about the alteration of nutrient content on the seed. Therefore the type of domestic processing chosen is based on cultural and taste preference not on the on knowledge on the alteration of available nutrition on the seed. However the domestic processing does have significance on the nutrition value for the consumer.

Grain legumes often contains the anti nutrients toxic elements in its raw form like phytic acid which reduces bioavailability of essential nutrients (Saharan, 2001, Mahadevamma, 2003 and Sakiya 1999.). If consumed without processing especially the mineral nutrients are less available. Direct consumption also creates problem in digestion (Mahadevamma, 2003) and causes flatulence (Singh, 2003). Therefore it is imperative to reduce the concentration of such anti nutrients to enhance extractable mineral and other nutrients from the seed. Some of such toxic elements are destroyed during cooking through different kind of heat treatment such as roasting toasting and frying and increase the availability of the nutrient (Singh, 2003, Sakiya, et al, 1999). But heat treatment through cooking is not enough. The availability nutrient content is significantly altered through different types of other domestic processing such as soaking, sprouting, and dehulling. Such processing also helps to increase palatability of food (Mahadevamma, 2003).

Raw grain of the ricebean relatively contains large proportion of such anti nutrients specially phytic acid. Sakia (1996) claims that anti nutrient problem of the ricebean

can be solved if processed it properly. According to him prolong cooking time is the best method for it. According to Saharan (2001, 2004) sprouting is the best method followed by dehulling and soaking. It also solves the problem of prolong cooking time, hard seed phenomena and poor digestibility.

Therefore I was interested about different kinds of domestic processing practiced by the people and their perception on them with the intention of improving nutritional status of the local people with consumption of locally grown grain legumes. The following section incorporates the type of processing practiced in the district and reason behind them.

From the interview and group discussion it has been found that all people do not practice any processing before cooking despite its great significance on nutrition alteration. However most of them practice at least one method before cooking the bean. Those who do not practice any processing argue that if process the bean before cooking; they would loose the real taste of the bean. According to them the raw seed gives the real taste. So they cook the bean directly in the pressure cooker to preserve the real taste. The majority of the informants told they use at least one method of domestic processing soaking, sprouting or dehuling before cooking the bean.

Soaking is the most commonly practiced method of domestic processing for the grain legume in *Dang*. Particularly it is practiced on the non dehulled and non splited seed to reduce cooking time and to remove coat of the seed. Normally if not soaked the seed of ricebean, it takes longer time cooking. People practice it in most of pulses such as chickpea and pea besides ricebean, and other grain legume.

Sprouting is bit less common than the soaking. Usually people just soak and cook the grain not keep the bean for the sprouting. However it is also widely practiced domestic method of processing in Nepal. Sprouting is also linked with religious tradition. In the festival *jaina purnima* people eat *quanti*. *Quanti* is sprouted mixture of different grain legume. However single sprouting of ricebean is not as much as common in chick pea, some beans and.., it is less practiced with the ricebean.

Dehulling is a next common and popular method of processing in other pulses such as lentil, pigeon pea, field pea, common bean and other but it is not much common in ricebean. People prefer to make the food from non dehulled seed due to palatability of seed. Dehulling and splitting enhance product quality and acceptability along with reducing cooking time. Though pulses mill largely do it, it is also performed in the home.

Table 6.2 Domestic method of processing

Types of Processing	Soaking	Sprouting	Dehulling
Soaking	35	23	31
Sprouting	23	9	5
Dehulling	31	5	17

Source: Household Interview, 2007

This table gives the overview about the domestic method of processing of the ricebean in the selected villages. Forty households process at least one method of domestic processing out of forty seven household ricebean growing households. However entire ricebean cultivating household (47) consumes it although some households consume it more often and some less. Out of forty, thirty five households practice soaking. Sprouting and dehulling practicing household in the village are 9 and 17 respectively. Households which practice sprouting and dehulling is 5, soaking and dehulling is 31 and soaking and sprouting is 23.

This shows that same household practice more than one method of processing depending up on the food being prepared by the ricebean. For example some time they soak and cook the bean while another time dehulling and cook the bean. The choice is found based food item to be prepared by the bean.

As discussed above the domestic processing practice by the people is linked to the local culture and food practice of the people. The choice of appropriate method of domestic processing therefore depends on the social-cultural setting and food practice of the people.

6.2 Problems and constraints in Consumption

Despite rich in micro nutrients, fiber and even in protein and vitamin and easy access to poor, several problems emerge on using ricebean as food grains.

During the field work informants told some constraints they are facing on the consumption of ricebean. I have divided such constraints into two categories based on their nature. The first is related with nutrition and processing aspect such as presence of anti nutrients, prolong cooking time, strong taste, hard seed phenomena and poor digestibility (Saharan et al., 2004). Another is social aspect which lower position of the bean among others common legumes. The reason of not accepting the ricebean by rich and socially higher class people as staple pulses is its lower social profile. They only consume the bean if they have not other alternative legumes enough in the household.

Ricebean is not only unpopular among rich and higher class people and those who do not grow ricebean, even its growers normally do not prefer it for their household consumption. Most of the ricebean growers in the district told during the interview that they eat ricebean only in two situation either to sell other legumes in good prices or if there is no enough production of other legumes. Not only rich and socially higher people, even small ricebean growing farmer mostly prefer other legumes for the home consumption and sell or use in.

Farmers have opinion that ricebean normally takes longer time to cook than other common pulses. Introduction of pressure cooker has solved the long cooking problem in great extent. In pressure cooker it takes 7 to 8 bowls which is 4 to 5 more bowls than other common pulses. People remember the very long cooking of the ricebean before the introduction of the pressure cooker in the villages which was almost 15 years back but now it has not much problem to cook. But the poor and marginal household who could not afford the pressure cooker still cook legumes in *kasaudi* and for them problem is the same as it was before. Therefore they soak the seed one night before cooking it to reduce the cooking time. They say that soaking really reduces about of total time it needs to cook on the non soaked condition.

There are different views regarding the digestibility of the ricebean. In Dang and Gulmi people perceive it as indigestible grain not easily digested and cause the flatulence. Therefore they do not consume it regularly and avoids children from its consumption. But in Illam and elsewhere it is perceived oppositely easily digestibility

among other grain legume. According to them Low level protein in the ricebean makes it easily digestible and prefer people prefer it to children, elder and sick people.

As others parts of Nepal and India ricebean is normally considered lower value crop and the poor men's diet in Dang. A Nepali proverb *Siltung Khanu* literally indicates the lower status of the crops. Socially higher class people usually do not consume it despite their own production in the household. The production received by the tenant in the share cropping contract either sells or exchange in the local market or mix the grain with other cereals to make animal feed. In some cases they keep the grains safe and use for the labour in peak agriculture period because ricebean is considered heavy diet which last for long hour in the work. But not eat themselves as other grains produced in the household.

6.3 Livestock Fodder

After the food livestock fodder is another purpose of the ricebean. The production of livestock fodder seems important in the subsistence farming system where livestock is considered significant unit of the farming system. Luxurious growth habit of on the local landraces of the ricebean makes it possible to produce large amount of biomass. This creates great potential on it. This types of potential is not possible in other grain legumes such lentil and black gram due to their short growing and erecting habit.

Despite its great potential, it has not been used specifically for that purpose. No one were found using the ricebean for the for green fodder even subsidiary purpose in all the ten places visited during the field work. However in some places farmer told that if plant do not timely ripe and do not yield well, they do cut the plant and use for the green fodder. But this use is exceptional. Farmers generally use dry straw of the bean as a livestock feed for the dry season. So they store the dry straw in their farm yard after the harvest of seed. But this is only subsidiary use of the bean not the primary. Three main reasons were explored from the farming system and one from the traits of the bean on the poor adoption of ricebean as green fodder.

The first is among resources poor farmer food production is always come in up priority. So generally people do not plant any crop only for livestock feed or other purpose except food. But exceptionally *Jai* and clover is planted for the green fodder

in the winter on the residual moisture of paddy in limited areas. They argue that if they do so they will loose the grain to be harvested and the food security situation of the households will weaken. In Dang the grain is considered more important than the milk and other animal product. Therefore grain production is always prioritized over the animal food.

In rainy season there are ample green grass in different unused parts in the maize and paddy field. Farmers collect that grass for green fodder without any investment. Therefore farmer do not feel any difficulties to manage green fodder for their animal in monsoon and post monsoon season when ricebean is grown. Farmers believe that it is unnecessary to grow ricebean with green fodder purpose in that season and exiting cropping system. Further in the most part of the district including Rampur and Lamidamar, forest is important unit of the farming system from where farmer collect fodder and other forest product essential for their agriculture and feel any problem in managing the green fodder for their livestock

The reason of not using the bean as green fodder is also coarse leave of the bean. In the most of the place farmers expressed that due to coarse leave (*kharso pat)* animal do not like the green foliage of the bean as a fodder. So they do not use it to feed animal. They emphasized as other parts of Nepal (Joshi et al, 2006), on the softness to make possible using the ricebean for the green fodder in the coming days.

6.4 Green Manure

The vigorous growth habit of the ricebean yields large biomass from the plant. This has also created great potential of the bean for the use of green manure to improve the soil condition. Green manuring involves the soil incorporation of any field or forage crop while green or soon after flowering, for the purpose of soil improvement. Besides enrich soil nitrogen content it also increases the good amount of humus (organic matter) on the soil which helps to improve soil structure and porosity and also contributes to the weed control and also save the money buying chemical fertilizer.

Despite importance of green manure and the potential of the ricebean for it, I did not find any farmer planted ricebean primarily for green manure during my field study.

Other plant is also seldom used for green manure at all villages visited during the field trip. It can be said that there is no tradition of green manuring, or there is poor adaptations of ricebean in green manure purpose.

Buch (2003) argue that the farmer should have different benefits to adapt green manure crop. According to him non economic environmental and socio-cultural factors alone can not play the role in the adaptations. According to him following characteristic should have on the green manure crop to make any crop adapted:
easy establishment, vigorous growth under local condition, ability to cover weeds quickly and ability to concentrate Nitrogen and phosphorus quickly, resistant to insect, resistant to disease and insect, grazing animal and other problem they may face in within the desired system, multiple use, available seed and should tolerate shade if to be used intercropping for the adoption in local farming system.

Ali (1999) also argue that the long term benefits are alone do not necessarily make it adapted by the small farmers rather immediate short term advantage on the green manure crops is necessary to be adopted by the farmers. Although ricebean has most of these characteristics, farmers were very reluctant on the adaption of ricebean for it. High cost of land preparation and inputs in the cultivation seems the main reason of non adoption of ricebean as green manure in *Dang* as the others parts of the country (ibid). Further being the subsistence farming system, land in most of time is covered by other main crops and in the short off agriculture period protecting the crop from the animal is difficult. Moreover there is no cultural tradition of using green manure in Dang. Planting any crop without direct benefit is considered waste of resources.

Farmers use compost made by decomposing the waste biomass collected from the home and farm and farmyard manure in their farm and consider that is enough for organic matter and to protect the soil. Other essential nutrient is supplemented by the chemical fertilizer. But in the surrounding areas such Rampur and Lamidamar which are proximate to forest, farmers also collect litter to make compost manure. Farmers prefer first *bari* for the organic manure than the *khet*.

6.5 social, cultural and environmental aspect ricebean

Many underutilized crops keep several non economic; environmental, social and cultural, significances besides economic advantage in the local farming and food system. Therefore such crops are continuously growing despite their low yield low market potential and unfavorable traits for the farming system. Ricebean has also some such non economic values significant for the local people. Contribution in agro biodiversity, promotion tradition and culture and nutrition, these crop play important role in the farming system.

Ricebean being leguminous crops it can play significant role to improve the nitrogen concentration on the soil in the cereal based production system. Cultivation of different kinds of legume crop in the in the rice and maize field can improve the status of nitrogen through biological nitrogen fixation. In the rice based cropping system legume cultivation also helps to absorbs nitrogen from soil Nitrate (George et. al 1992). If it is reintroduced in the intercropping with maize it will increase the maize yield and improve the soil. Control of soil erosion, fixing N2 from the atmosphere, contribution on agro biodiversity**,** improvement on the nutrition, maintenance of tradition and culture are some of such none directly economic oriented significant values. But most of the advantages are poor exploited due to low adaptation of ricebean in the district. However some advantages were getting currently. Protection of soil in the sloping terrace and control of disease and pest at least some how in black gram were the more observable advantage getting by farmer currently in the study area

In the maintenance of tradition and culture, it keeps importance in *tharu community*. *Tharu* people need ricebean in religious ceremony in the *Dashain* to pray their god. Therefore mostly *Tharu* people grow ricebean at least small amount in their field; in the case of not cultivation exchange other grain with ricebean. Similarly in the same community prefers ricebean vegetable in the social gathering. In all community there is tradition having soup from the ricebean if one get cold in the winter. This is medicinal values of the ricebean as perceived by the local.

6.6 Discussion and summary

Food is the primary purpose of ricebean cultivation in Dang. The production of ricebean has been helped to supplement the food basket of the resources poor farmers in the surrounding area of the district. Supplementation of food basket is considered very significant in such setting. Therefore it has not been growing for other purpose such as fodder and green manure despite its high potentiality in that purpose except for food. However, the entire ricebean growers use dry straw as animal feed for the dray season. The main reason not using the ricebean for other purpose is due to high importance food grain in the households. Due to the small landholding farmer do not want to grow any other purpose solely except with purpose of food.

Virtually ricebean growers are themselves consumers of it. According to the grower very less percent of the production goes for selling in the market. Therefore it is consumed mainly in the surrounding peripheral area of the district where it is produced relatively in large scale. In such areas it is important sources of grain legumes because other legumes are not easily grown due to poor land, irrigation facility and marginality. However it is not popular legume crop among other commonly grown legumes in Dang. Even where it is grown and consumed relatively large scale, it is not based on the preference. According to ricebean grower they consume ricebean because they do not have enough production of other pulses. If they have other legumes enough, they consume ricebean to save other legume for a sell because it is hard to sell the ricebean in the market. But in the large flat areas it is not grown and consumed.

There are different problem in the consumption of ricebean. Most problems are associated with seed characteristics. For example prolong cooking time; hard seed phenomena and poor digestibility are the main problem faced by the people in the study area. Although people don't know about low bioavailability of the nutrients in the ricebean, it is also significant constraints in the consumption of ricebean. The rich and higher class people do not consume it despite their own production. This is a social constraint of ricebean consumption.

These above mentioned factors are the main constraints in the consumption of ricebean which discourage farmer in its cultivation. It is likely to be adopted if these

problem addressed by the scientist while developing improved seeds of the ricebean in the future days.

7. Ricebean Marketing

In the farming system approach, product marketing is considered important exogenous factor. Being exogenous marketing aspect influences farming system from outside the farm boundary. Therefore it is largely beyond the control of individual farmer (Norman, 1978). Marketing aspects of the ricebean is therefore taken into consideration for this study in this backdrop. In the marketing aspect, basically channel of ricebean flow (if existing) in formal market, volume and time of transaction, selling prices, perception of the ricebean in the market, and problem and constraints in the marketing have been analyzed. The purpose of the analysis is to assess whether the marketing situation has contributed positive or negative roles in the production and consumption of ricebean in the district. Information for this was collected mainly from in the group discussion with the farmers and household interview with farmer and market interview with grocery shopkeepers. In the market center separate interview was conducted among grocery shopkeepers at *Tulsipur* which is nearest market center from both study villages.

7.1 Development of Market Center

In the past there were no established market center in the district; therefore, agriculture surplus products from subsistence agriculture were mostly sold informally. Even after origination of few market centers in the district, these were too small which could not receive all the agricultural product of the district. Grains like rice, wheat maize were sold to the middle men who later sell the collected amounts to the main market centers. But perishable products like vegetable, milk and fish was sold visiting each and every household. There was both tradition exchange and in cash. This kind of trend now is gradually decreasing over the years in the district with development and growth of market center in different parts of the district and conversion of subsistence level of production into professional and commercial at least in some crop; especially vegetable dairy fish and many more. Hover still that type of marketing practice has not ended up.

Periodic plan prepared by the DDC Dang shows twenty five general market centers in the district. Among which thirteen are the permanent and remaining twelve are temporary market centers. *Tulsipur;* headquarter of the *Rapti* zone and *Tribhuban Nagar Ghorahi*, district headquarter are two comparatively larger market centers.

Lamahi and *Bhalubang* are urban oriented market centers in the district. Other all permanent markets are rural market centers situated in different location in the districts. Besides these different sizes permanent market centers, nine occasional markets also operating in the district. Occasional market mainly operates in the fair and festivals Dang. The practice of periodic market (*Hat Bazar*) is not common in Dang as it is in the east and central terai.

Rural market center are the main collection center of the agriculture products and gives very few opportunity urban facilities to the customers. These center export collected product to the urban center from where the product is exported outside the district. Besides collection of the agro product urban oriented market center provides services and other facilities. Urban market center on the other hand carried both type of market function.

There are five special agriculture market established in above mentioned market centers in Dang. However none of them are working in their full capacity as expected during their establishment. Most of them are now running in lower performance. For example wholesaling agriculture market at *Lamahi* is operating only as periodic market center. Same situation also exist in other parts of the district for example agriculture market of the district headquarter and the periodic market of the *Kharini Ghat* have been closed. However two headquarter only situation is also there in the district headquarter. Similarly *Kharini Hat Bazar* has also not been running.

The entire agricultural products are affected with market and marketing process. Ricebean marketing could not be the exception in this.

7.2 Marketing situation of grain legumes

Ricebean being a grain legume, the over all market situation of all pulses and legumes has been discussed prior discussing specifically the market situation of the ricebean with purpose of giving broader context of market situation for the ricebean. Volume of transaction, source of area from where they enter in the market and position of the legumes based on selling has been discussed.

Lentil, pigeon bean, black gram, common bean, pea and green bean are some of the pulses commonly available in the local market. Their selling position and perception of the shopkeeper has been summarized in the table below.

Table: 7.1 Popular legume as perceived by the shopkeeper and their ranking by Farmer for the most selling

Rank	Nepali Name	English Name	Retail Price (in Rs.)	Reason for popularity
1	*Masuro*	Lentil	50	Cheap and easy to cook
2	*Rahar\ Adhar*	Pigeon bean	60	Good Taste, social prestige
3	*Mas \ Urd*	Black Gram	55	Cultural values and
4	*Chana*	Chick pea	50	Multiple use
5	*Simi*	Common bean	60	Social prestige and for different taste
6	*Kerau*	Pea	45	Multiple use and cheap
7	*Mungi*	Green gram		
..	Other pulses.	.....	.....	.....
15	*Siltung\ Jhiltung Jhilenge*	Ricebean		Less popular

Source: Field Interview, 2007

Lentil is most selling pulses in the market. Most of the shopkeeper during the interview claims that lentil alone usually goes almost one third of the total pulses sell in the market. Then pigeon bean and black gram come in the second and third position after the lentil. Shopkeeper claims that total selling of these two pulses is about half of the lentil sell. After these chickpea and broad bean come in fourth and fifth rank in the ascending order. Position of the ricebean is far below among most popular legumes in the market. Among twenty shopkeepers interviewed only three found sold ricebean last rest did not. The three ricebean seller also sold the very limited amount (55 kg). The figure on the right hand gives proportion of pulses sell based on the market interview.

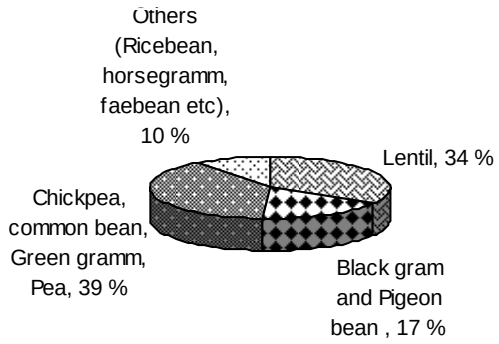


Figure 3.1 Proportion of legume sell in the market

According the shopkeeper different factors play the role on the sell of particular pulses in the market. Taste and prices is important determinant factor in pulses selling in the market. Cooking time and social roles and multiple usages of the pulses are also influences the legume market of the district. Cleaning, appropriate grading also affect on the choice of

particular pulses. Income and social hierarchy also affects the on the choices of pulses to be purchased by the consumer.

Lentil is popular in all income level people from lower class to higher class. Relatively cheap and easy to cook are the main factors responsible to its highest sell in the market. Socially higher class people with big income also purchase pigeon bean and black gram besides lentil. Good taste and social prestige are the main reasons for its attractions. Due to social prestige those who can not afford expensive pigeon bean regularly in their meal also buy it when guest is in the home and in the social gathering. However, normally poor and lower class people rarely purchase it due to higher prices and long cooking time. Relatively cheap and short cooking time promotes lower class people to purchase lentil. Chickpea and pea are multi usage legume grain. Besides *dal* they are also used heavily as vegetable and snacks (biraula) in the mid days. Therefore it is higher position among other several pulses.

7.3 Sources of pulses in the Market

Tulsipur receives the grain legumes from both local regional markets. Commonly consuming pulses come in the market from outside the district; mostly from the regional market center such as *Nepalgunj, Butwal,* and neighboring Indian market center however some grain is locally collected. Some legumes also come from *Salayan* district particularly the broad bean. However for the non split and non dehuled pulses such s chick pea, pea, horse gram, come from the same district. Grocery shopkeepers at *Tulsipur* buy them mostly from the big grain traders in the same market center and sometimes directly from the producers. In return the district exports lentil, chick pea, pea to regional market center

Shopkeeper says that in the absence of processing mills, local market import the processed pulses from outside the district. They explain that processing work such as dehulling, splitting, grading and cleaning, mills is necessary for the good product quality pulses to be sold in the market. It is because consumers' always want to buy quality product. It is the main reason of import of pulses from the regional market center of the neighboring district and nearby Indian market in spite of production of some in the district. *Simi dal* comes from the *Salyan.* Shopkeeper says that consumer

do not like low graded and processed pulses. For example, there is strong demand on the dehulled black gram and dehulled and split pigeon bean in the market.

7.4 Marketing situation of ricebean

Marketing aspect is also little known about ricebean as several other aspects such as cultivation and use. It is very difficult to find any research exclusively dealing with ricebean marketing not only in the case of Nepal but also elsewhere. However little information now is being available from some of the FOSRIN team. Bora et. al, (2007) says despite its non commercial level cultivation all the ricebean grower sell it with different actor of the market in the North East India. Andersen (2006) reports cross border marketing of the ricebean in *Illam*. Similarly Gautam et al (2006) discuss informal marketing of the ricebean in *Gulmi* district. Besides it is commonly available in the shops in the Kathmandu.

As most part of the country, ricebean is also not grown for the commercial purpose in most parts of Dang. Mostly it is produced in small scale which is often consumed locally in the producer household. However in some villages where it is grown relatively large areas most of the households sell the surplus production. Some of the ricebean grower go to nearby market center to sell the surplus but most of them sell within the village in exchange with other grain such as chick pea, field pea or other grain legume or other food grain in equal basis or some times with cash.

Out of 10 villages visited during the field work, ricebean is produced relatively large amounts at Rampur and Lamidamar where almost 50 percent of the ricebean growers sell it. Among which very few are only go to market to sell it. Out of 47 ricebean grower households seven household; five households from Lamidamar and two from Rampur, told they sell the ricebean to the proximate market center (Tulsipur) from these two places.

Contradicting with this general situation of the marketing, some participants in the discussion at *Bgrahapur Sishahaniya* had expressed different views regarding the ricebean marketing. According to them marketing is not the problem of ricebean production in the district and they used to sell some productions in the village and some in Lamahi about five years back when they used to grow it. They told that they

had no problem selling the surplus production. They sold average 30 to 40 kg ricebean in the local market around the 23 Rs per kg which was similar with that of black gram in that time. However they have stopped its cultivation since few years back from the paddy field due late rice plantation due to construction work on the main canal. Farmer says that ricebean do not yield in the late plantation.

Channel of flow

Flow of channel describes how the productions finally reach to consume. Depending on the involvement of the market intermediaries, it can be formal or informal. In the formal marketing farmer sell the product to the retailer. Then production goes to different marketing actor before reaching finally to the consumer. Many marketing actors involve on the formal marketing from collection to processing cleaning grading and packing. But in the informal channel producer themselves, search consumer. For the producers formal marketing more easy than informal to sell the agriculture product.

As mentioned above some amounts of the surplus ricebean enters in the formal market from different villages. But in the absence of organized market, it goes from informal channel. Joshi et. al. (2007) says that there is no established market channel for this crop as it is not grown so widely for the marketing purpose. There is problem finding the ricebean traders in the market. The big grain traders who normally collect different type grains in the market are very reluctant to buy ricebean. They do not easily accept ricebean as other common grains. Shopkeepers explain that due to very small production it is not feasible to buy and store the bean even for short time. Further they don't know about its market situation in the higher market. In that situation they do not want to take risk. Therefore it is very hard to sell ricebean in the market without prior consulting the buyer and catching the informal channel.

Therefore despite possibility getting better prices in the market, farmers do not prefer to go to market to sell their stuff. They try to sell the bean in the village either in exchange or as far as possible because it is difficult to find the buyer in the market and there is great chance getting less prices in the bargaining. Therefore farmer only go to market if they could not sell the bean in the village.

Farmers have only one option to sell it directly to the grocery shopkeeper with informal channel to sell their produce in this situation. Farmers choose the grocery shop with prior made relation to sell the ricebean. Mostly they want to sell in the shop from where they buy other essential goods from the market. Sometimes farmers also select the buyers who are from their own village and locality. Farmers feel free to such prior know people on setting the price of their produce with shopkeeper.

The collected ricebean is entirely sold in the same market. Grocery shopkeepers say that if it was sold to big grain traders it might go to the higher market. But grocer no mater whole seller or retailer sell to in the same market. People from the surrounding area who do not grow ricebean currently but used to grow in the past previously mostly buy and consume it.

Knowledge and perception about marketing

To explorer the ricebean seller and to know much about market and ricebean marketing, I went several shops covering the all location in the market where I asked about the ricebean. Most of the shopkeepers told that they know very little about the ricebean. Some of them told that they know the bean but they have not sold it yet so don't know much about it. On the queries why they do not sell ricebean some of them told, it is not possible to buy ricebean easily as they don't know the whole seller and source of processed ricebean in the market. Similarly they also told that they don't know the ricebean producer the production area in the district because of its limited production. Some of the interviewer also told that it is not easily sold even when they try to sell it. However those shopkeepers who sold the ricebean did not mention any problem regarding selling the ricebean.

Not only in the market but also in the villages' ricebean is considered problematic crop in the marketing and could not get good prices in the market. Therefore farmer try their best to sell the entire surplus either exchange with grains or in cash as far as possible in the village. In some places it is also seen mixing the bean with black gram to obtain higher prices of the black gram. In most of the places they harvest the both crop and collect in the same place, thresh and store together. Therefore mixing purpose is not always to receive higher prices. Mostly farmer mix the bean with black gram in the cultivation and harvest and store together due to little cultivation.

Prices

As Illam and Gulmi ricebean farmer in Dang also normally sell the produce in the immediate month of the harvest. In that time they get 25 rupee per kilo in the market but it is less about 5 to 10 rs if they sell it in their own village. Selling price of the ricebean in Dang is more or less comparable with *Gulmi* (Bhandari et. al), *Illam* (Andersen, 2006) and north east of India (2006 Bora et. al, 2007). However compared with black gram in the same village and nearby market center it has quite lower price. Farmer says that they get 10 to 15 rs less per kilo in ricebean than the black gram.

The farm gate prices of the bean of course may move up as other grain in the market in the later part of the season. Grocers who are the main market actor in the ricebean marketing at Tuslsipur say that farmer may get 5 to 10 rupee per kg more in the later period which is less than that of Illam (Andersen, 2006). However most of the surplus of the ricebean grain is sold just after the harvest and is not stored for long. They also told that they sell around 50 to 60 kilo ricebean each year without any problem in the 2 to 3 months which is normal transaction period compared with other common legume such as black gram.

In the absence of any agencies and organization and market mechanisms, ricebean price is not fixed by any mechanism and agencies. Buyer and sell set it on their understanding. Shopkeepers who sell and buy fix both selling and buying prices themselves keeping huge gap between them because they mostly buy the product on the request of the farmers. Farmer has very less bargaining power in setting the appropriate prices than their counter part shopkeeper. Farmers say that many times shopkeepers refuse to take the bean if prices could not be fixed in the bargaining. Therefore farmer feels compel to sell the bean even in the lower prices rather than bringing back to home.

This situation should also be viewed from other perspective. Grocery shopkeeper buy the ricebean on the request of produces compromising the proper grading and cleaning quality. Therefore they keep higher margin between buying and selling for taking the selling.

7.5 Marketing Constraints

The above analysis shows that marketing situation of the ricebean is not good condition. Different factors creates problem in the ricebean marketing. The following points summarize the main market constraints of the ricebean.

- Asymmetrical information about ricebean among shopkeeper and other people
- No formal marketing channel and problem of selling the surplus production in the market
- Availability of other popular legumes and pulses in the market to which ricebean can not compete.
- No availability of improved seed it in the market
- Farm gate price
- Varietal mixture (non uniform grain size) lower quality grain

Gruère et. al (2006) argue that for the good marketing of the underutilized crop sufficient information regarding the place, quality of the product, time of sell is necessary to have to all the actors and| consumer of the market. In same time it is also necessary to have the information of different characteristics of people who demand the product. Despite this very few people in the market center and in the village other than cultivating the ricebean were known about it. Specially poor farmers, elderly people grow and consume it locally. However it is not known by the different actors of the market particularly the shopkeeper. According to Gruère et. al in the absence of the information the product it is not demanded in the market despite the great potential of the crop. As a consequences demand of the ricebean in the market is far below due to asymmetrical information among market actors. Therefore it is necessary to expand information to all actors and consumer to solve the market imperfection.

As mentioned above there is no formal market channel of ricebean in Dang. Ricebean is not collected by the traders in collection center who normally collects other major cereals and legume grains in the market. In this situation farmer do not know how to sell the surplus in the formal market who is the main actors of the ricebean trading in the market. Alternatively they find themselves grocery shopkeeper themselves as ricebean buyers and request them to buy their produce. This leads the shopkeeper

upper hands on setting the price of the product. This has promoted the shopkeeper to pay less to farmer who is real producer of the bean but sells in high prices.

Consumer prefers the bold and uniform grain size pulses. Lower quality grain is normally not demanded in the market. Shopkeepers explain that price and the choice of pulses being purchased is influenced by the proper grading, good looking and cleaning. But in the absence of these ricebean do not get good price and demand. Differential flowering traits of the local landraces farmer compelling to harvest the ricebean grain with different size. This further compounds the problems.

Farmer usually sells the surplus legumes product just after the harvest of the crop as result get lower price. Farmer sell the ricebean as other grains in the immediate month of the harvest due different reasons such as to pay the debt or to reduce the risk of insect pest during the storage. So farm gate prices have also been considered as constraints by farmers.

In the market center there are different types of pulses available with high grading quality, colur and texture where ricebean needs to compete with them. But it is hard to compete with high quality grain without any processing and grading. People usually do not care much about the nutritional and environmental significance of the crop when buying the grain. They only care the economic matter of the product. Therefore this is also constraints on ricebean marketing.

7.6 Discussion and Summary

In this chapter marketing situation of the ricebean has been analyzed in the broader context with other commonly grown grain legumes and easily available pulses in the market. The above discussion shows that volume of ricebean transaction is far below and not comparable with other pulses in the market. Ricebean comes only exceptionally in the market where limited traders and consumers involve in buying and selling it. Therefore it is hard to buy the ricebean from the market even in its pick season. Almost seventy five percent of the ricebean sell occurs within the village where it is produced. Only 25 percent of the total sell goes in the formal market.

Many factors are responsible in poor marketing of ricebean. Some of the most influential marketing constraints of ricebean in Dang are asymmetrical information among the different actor, informal marketing channel; unorganized market, lower grain quality and absence of the processing mechanism in the market. Among them some factors are related with market mechanism, some policy issue and others with traits and breeding.

These constraints have not only made limited the volume of ricebean sell in the market but had affected ricebean production farm negatively. Due to poor marketing farmer in the village do not want to cultivate ricebean in the villages but choose more market competent crop. They only cultivate ricebean if they could not grow other crop in the marginal land. Therefore marketing aspect of the ricebean is also responsible non adoption of the ricebean in Dang.

8. Conclusion

Ricebean is largely neglected grain legume in research. As a result there are no modern varieties of ricebean, capable to compete with other grain legume in production, use and marketing. However it has great potential to increase food basket of the resource poor farmer by cultivating it in the unused land by major crops. But due to different problems it is ill-adopted. This study was therefore carried out to understand the role of ricebean in the farming system of Dang district. The main aim of the study was to examine the factors which creates problem in its adoption in the broader context both inside and beyond the farm. Therefore besides cultivation, use and marketing aspects are also analyzed in this study. The theoretical base for this study is Farming System Approach.

Cultivation, use and marketing analysis of ricebean finally led me to understand the role of ricebean in the farming and food system in the case of Dang District. The evidence clearly shows that its role is area selective. In the surroundings Dang where ricebean is grown relatively in large scale, it keeps great significance both in the farming and in the food system. The main reason of relatively large scale cultivation in the surrounding areas of the district is due to availability of enough inaccessible land not used by the major crops where it comes around third position on the total legume production. However, it has very limited role in more accessible flat areas. In the more accessible flat areas people do not prefer to cultivate it because other legume can be easily grown there. But exceptionally, some people grow it in the limited area and consume sometimes as a new taste.

There are different constraints of adoption of ricebean in its cultivation. Farmers do not prefer it for the cultivation even in the unused land. They try their best to avoid it with other crops as far as possible but if they do not succeed to avoid, they grow it but provide least efforts in the cultivation and input. Unfavorable traits such as differential flowering, excess vegetative growth and shattering are the main constraints on the adoption of ricebean in the local cropping system. Farmers suggest that ricebean could be adopted more effectively if the traits preferred are included in the improved seeds. Other problems are the problem of seed access, absence decision power of sharecropper on the choice of crop, small landholding etc. These all discourage the farmers to adopt the ricebean in their farm.

Virtually ricebean growers are consumers themselves. Different food items are prepared from the ricebean based on the socio cultural setting. However it is not preferred legume for the consumption. Ricebean growing farmers give first priority in selling it and if not sold, they consume it in the household. Strong taste and long cooking time are the main constraints of the consumption. Farmer also consider digestion problem on ricebean. Lower social value of the crop also discourages the rich and socially higher class from consuming it.

Most of the productions are consumed in the same household, but some farmers also sell it. Most of selling occurs in the same village in the exchange. But some farmers also go to the market to sell it. Selling ricebean in the market is difficult task due to some market reasons such as unorganized market, informal channel supplying the ricebean in the market. But some of its own characters such as different size of seed, also makes problem in the marketing.

The expectation about the ricebean as important source of food during the food shortage period (*anikal*) has not found very significant in the case of Dang. Generally it is not stored for long rather consumed in the immediate month of harvest. However it has very significant role to supplement the food basket generally and legume basket particularly of the resources poor farmer. My analysis clearly indicates that consumption of legume would significantly decrease if ricebean were not grown in marginal area. Therefore it has strong role both to strength food and nutritional security and to keep balance in the farming system. Ricebean is considered as an alternative crop to supplement the legume food basket of the household.

There is limited use of the ricebean in other purposes except the food because the ricebean grower needs more food in the household. But its dry straw is used largely for the animal. Therefore, farmers usually give it to milk-cattle because they think that it is more nutritious for the animals.

In sum ricebean keeps great potential as source of pulses, fodder and even green manure but needs more research with participatory approach. Further some interventions is also seems necessary make ricebean more popular and more adopted.

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Appendices I

Household Interview Guidelines

General Information
Name of the respondents Sex

Relation with household head Age:

Occupation 1 Agriculture, 2 Service, 3 Businesses, 4

No. of member seasonally working of farm

Size of land holding

Household details

Relation with household head	Age	Sex	Education	occupation		Marital status
				Major	Subsidiary	

(Code, 1 male, 2 female, 1 Illiterate, 2 literate, 3 SLC, 4 BA 1 single, 2 married, 3 divorced)

Overall Agricultural Information

Types of crop grown in the household

Land type/ crop grown	Types of crops grown	
	Summer	Winter
Bari		
Khet		
Kitchen garden		
Others specify		

Types of legume cultivation in the household

Name of the legume crops	Use in the household

Cropping Pattern

Season/land	Khet	Bari	Kitchen garden	others

Cropping calendar (Annual and Seasonal)

Year/	Bari	Khet	Kitchen Garden
2007			
2006			
2005			

Information about livestock

Livestock	Types		Annual income (in Rs)
	Local	Hybrid	

Did you sell any crop in last year? ……. (1 yes, 2 no)

If yes give the following information.

Name of crops	Volume of sell	Value (in Rs)

Where do you normally sell your product?

……..(1 do not sell, 2 from home, 3 at local market)

What is the staple food sufficiency situation of the household?

…… months

How do manage food for the rest of years?

…….

Information about the ricebean

Did you grow ricebean last year? ..... (0 yes, 1 No)

If no, when did you grow it in the past? … (1, Not at all, 2……..years before)

What were the reasons of not growing it any longer?

If yes give the following information

How much of your land is under the ricebean cultivation? .....

Cropping pattern

Land type	Crop Combination	Cropping system

Did you sell it last year? ..... (1 yes, 2 no)

If yes, give the following information.

Volume	Sell price	Total

Where do you normally sell your product? …… (1 from home, 2, at local market)

What types of seed do you use? …….. (l local, 2 improved)

Do you use insecticide, pesticide and fertilizer in these crops? …… (1 yes, 2 No)

If yes give the following information?

Types	Name	Expectations

How environmental factor affect the production of ricebean?

Environmental Factors	Positive effects	Negative effects
Soil		
Rainfall		

Do you manage these problems by yourself? ……..(1 yes, 2 no)

If yes mention them in details?

What are other problem and constraints in cultivation?

Use and Value of ricebean in the household

Name the commonly grown grain legume and rank them

Commonly grown legume	Taste	Nutrition	Used for dal	Total

How often eat it? ..... (1 daily, 2 weekly, 3 one month, 4 three month)

How you use it?..... (1 curry soup, 2fried, 3 others specify)

Time of using it ……. (1 in the morning, 2 mid day meal, 3 in the evening)

Mode of using it …… (1 sole, 2 mixed with other crop)

If mixed with give the details

Do you follow any processing before using it? …… (1 yes 2no)

IF yes, name the processing.

Which problem do you face in its home consumption?

Which characteristics do you want on the new seed?
(to facilitate recalling: yield, cooking time, taste, disease, weed pest, sowing period, pod length, number of seed on pod, season of planting, harvesting, storage, consumption and marketing etc)

Use	First	Second	Third	Fourth

Appendices II

Interview guidelines for the shopkeeper

1. Which Legumes do you sell? List them

2. Where these legumes come from in the market for sell?

3. Could you rank these by most selling?

4. Is there any selectiveness in the legume? Yes 1, No 2

Characteristics of People	Name of Legume

5. Do you sell ricbean? Yes No
If Yes,
What characterize people do bye it?

6. What are the preferred traits of the legumes for the market purpose? List them separately for the ricebean and in general.