





**Transforming livelihood through innovative agricultural reform: an insight into the adoption of system of rice intensification (SRI) in Nepal**

By

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## **DECLARATION**

I, Sadhana Rana, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted and will not be submitted to any other university for award of any type of academic degree.

Signature.....

Date: 25<sup>th</sup> August, 2015

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## **Abstract**

This study explains the ability of ground-breaking rice cultivation practice known as System of Rice Intensification (SRI). SRI is allowing Nepalese farmers to double not only the rice production but also to prove that the Nepalese farmers can adopt the agricultural technique and practices despite few obstacles on the way. SRI is high-yielding low input rice cultivation method that can increase rice yields. The result from the field visit shows that SRI can yield two-three times higher as compared to the traditional system of rice production in Morang district. The claims of improved livelihood only through SRI remain controversial due to widespread dis-adoption in some contexts. So, the study tries to understand whether SRI adoption has any impact on the welfare of villagers. The literature review shows that SRI, on the one hand, has improved the livelihood of poor farmers. On the contrary, one cannot deny the fact that SRI demands more investment i.e. more labor and machinery for large-scale cultivation. With the assistance of Agriculture service center, the study thus proceeded in three steps: qualitative questionnaire survey with the 35 farmers of Govindapur Village of Koshi Haraincha and Lohasur Village of Motipur VDC of Morang District. The second step involved the focused group discussion (FGD) among the villagers of Koshi Haraincha followed by the selected SRI Key Informant Interviews. The second and third phases of research method i.e. focused group discussion and key informant interviews test the consistency of sampling population i.e. the farmers' response and the view gathered from the respondents of focused group discussion and key informant interview respectively. The design of this intervention allowed us to check validity and data triangulation respectively. This study explores how the adoption of SRI has influenced the livelihood assets and how the availability of the asset has influenced adoption. Thus, the underlying premise of this study is the analysis of holistic perspective of how farmers have responded to the innovative agricultural reform in Govindapur Village of Koshi Haraincha Municipality and Lohasur Village of Motipur VDC respectively. From the field study on these two villages, it can be concluded that it is the access to physical and natural resources that determines the successful adoption of SRI technique for better livelihood. Govindapur village upon good access to resources has delivered good result on SRI practice than Lohasur village which lacks access to resources.

Keywords: SRI, Adoption, Dis-adoption, Livelihood, Innovation, Assets/Resources

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## **List of Acronyms**

AIS:	Agricultural Innovation Systems
CRSP:	Collaborative Research Support Programs
DADO:	District Agriculture Development Office
DFID:	Department of International Development
FAO:	Food and Agriculture Organization
FGD:	Focussed Group Discussion
FQS:	Forum for Qualitative Social Research
GAFSP:	Global Agriculture and Food Security Program
GDP:	Gross Domestic Product
GHG:	Green House Gases
ICRISAT:	International Crops Research Institute for the Semi-Arid Tropics
IFAD:	International Fund for Agricultural Development
ISIS:	Institute of Science in Society
MDG:	Millennium Development Goal
MOF:	Ministry of Finance
MOFA:	Ministry of Food and Agriculture
NARC:	National Agriculture Research Council
SLA:	Sustainable Livelihood Approach
SRI:	System of Rice Intensification
USAID:	United States Agency for International Development
VDC:	Village Development Committee
WCA:	World Programme for the Census of Agriculture
WFP:	World Food Programme
WWF:	World Wildlife Fund

## **1.Introduction**

### **1.1 Background**

Rice is synonymous with the food for Nepalese and even me. As they say, Home is where your heart is, for me it applies to food too “Food is what your choice is”, especially concerning daily consumption. By this, I mean Rice is the staple crop in Nepal, improving rice production would reduce the problem of food insecurity. People would still feel food insecurity if you grow another edible crop than rice abundantly. Nepal falls among the economically weak and also one of the countries with the incidence of food insecurity. As the majority of Nepalese are dependent on agriculture, it is imperative to improve the rice production for better economy. More than half of the population consumes rice. Even I cannot think of living a day without rice as far as I can have it. Asia possesses the history of cultivating the rice for thousands of years; the archeological rice recently discovered in South Korea dates back to 14,000 years old (Hossain and Fischer, 1995). It marks the rich rice culture even during hitherto. The crop cultivation and its consumption in Asia almost reach 95 percent. Traditionally, the cultivation of rice has been primarily concerned with the flooded field during the wet/monsoon season. Over the period, the flooded field tradition gained widespread practice, and people started believing that rice cannot perform well in the absence of large quantities of water (Parthasarathy, 1963). The farmers in the Govindapur community also agreed to the fact that they were suspicious concerning the rice field with less water (Field data, 2015). That’s the reason not all the farmers in Govindapur adopted SRI at once. In fact, there were only few farmers who tried SRI in their farms.

*According to Mohanty (2009), “The years between 2001 and 2007 marked the double increase in rice prices mainly due to declining stocks caused by slow rice production. The global rice supply fell by 44% from 147 million tons in 2001 to 82 million tons in 2008. Following the figures, an additional 59 million tons would be needed by the year 2020”.*

Due to massive urbanization and deforestation for the commercial purpose, the other production has to be sufficed from the reduced land, low water requirement, and less human

input respectively. It is, therefore, the development of the system of rice intensification (SRI) has potential to produce more by using less in an agro ecological sector.

The system of rice intensification as a method was practiced in 1983 by French Jesuit Fr Henri de Laulanie in Madagascar after three decades of research. The development of SRI has its basis on the observatory hit and trial rather than the scientific theory and prior reasoning. Moreover, the people are prioritizing and promoting it was not the typical agro-scientist. It could be the reason SRI faced difficulty in easy acceptance by the agricultural authorities even though the evidence propping up SRI was paramount (Uphoff, 2007). SRI fits well into the available varieties of rice that have been extensively used by the farmers. The SRI method could capitalize the productivity of land, labor, capital and water. Furthermore, the effectiveness depends upon the favorable conditions of soil organisms that could be achieved through the proper level of organic manure, balanced moisture and temperature to maintain the fertility of soil (Uphoff et.al, 2006).

Food and Fuel matters but not every food gains an equal attention to a daily consumption food as rice. About 3 billion people worldwide consume rice every day (Bouman et al. 2007; Satyanarayana et al. 2007) and provides 35-59% of the calories consumed by them (Neue 1993). Rice being the staple food poses the food insecurity due to the inadequate production. According to FAO (2015), staple food represents the main dominant part of diet that meets the energy and nutrient needs. Of more than fifty thousand edible plants, rice, maize and wheat meet the 60% of the world food energy intake (ibid.).

As the strategy for post-earthquake food security, FAO recently distributed 40,000 bags of rice seed for planting before the monsoon (The Himalayan Times, 2015). This signals that it's the rice that people usually think about when it comes to the food security issue. Though rice is one of the biggest contributors to the economy, Nepal still imports vast amount of rice from its neighboring countries. Following the National Bank of Nepal Report (2011-12), Nepal imported rice worth Rs 4.26 billion which later climbed to Rs 5.07 billion during the first seven months of 2012-13. In 1998, the USAID - CRSP program pioneered SRI in Nepal at the Khumaltar Research Farm (near Kathmandu). SRI gained the popularity due to multiple benefits due to productive farming practice than the conventional approach.

According to Zheng et al. (2004), farmers have to grow 50% more rice in 2025 to assure food security in rice consuming countries. More than half of the populations of Nepal reside in remote hill and mountain regions. Agricultural developments in these areas lag behind due to many reasons leading to food insecurity. Besides the concern for food security, majority of farm dependent people in Nepal adopts agriculture as the source of livelihood. Though there is the famous practice of distributing food or rice sacks during the period of famine and emergencies, these practices doesnot address the problem at their source.

Eradication of extreme poverty and hunger has been the topmost goal of Millenium Development Goal. According to the World Bank (2015), the MDG achieved to reduce by 50% the number of people living on less than \$1.25 a day from 2003 to 2011. Likewise, the first three strategies are an investment in agriculture thereby creating the job and social safety nets. Numbers of organizations and institutions are working on it. To name a latest one, we cannot deny the fact that World Bank started the renowned projects like Global Agriculture and Food Security Program (GAFSP) implemented Agriculture and Food Security Project (AFSP) for the year 2013 – 2018 as a significant step in the agricultural sector in Nepal. Its primary focus was the public-private investment in agriculture and concerned sectors to enhance the income and food security of vulnerable people in low-income countries. Despite the development efforts being made, we should not forget the fact that Agriculture is climate sensitive; well managed agricultural systems can not only reduce Green House Gas (GHG) emission but can also contribute to carbon sequestration. The climate smart agriculture increase the farmer's modification and adaptation to any climatic changes that poses the chance of GHG reduction thereby flourishing the productivity (Chapagain, 2014). Thus, the loci of agricultural production and SRI point towards the climate change adaptation knowledge and awareness to bring about the best result from the SRI technique

SRI was introduced as an experiment with trials in Khumaltar, Nepal in 1998 (Evans et al.2002). According to Uphoff (2006),

*SRI piloting in Nepal was one of the first attempts after Madagascar. The SRI trials did not boom at once, in fact it suffered many hit and trial due to the poor results in the initial phase as a result of poor water control where the aerobic soil conditions were not maintained.*

With the specific objective of increasing the yield in Nepal, SRI was formally introduced in 2004 by the district agriculture development office (DADO). The primary approach to train farmers in SRI technique was Farmer Field School (FFS). The trainees included the owners of the field, share-croppers (Adhiya in local language) , leasehold farmers, etc. (Uprety, 2013). Correspondingly, the trial carried out in Chitwan district revealed the increment in grain yield by 49 percent (8.8/ha) as compared to farmers traditional practice (Dhital, 2011).

Livelihood strategies frequently vary between individuals and households depending on differences in asset ownership, income levels, gender, age, caste, and social or political status (Krantz, 2001). Among the criteria mentioned by Krantz in the statement above, the asset ownership has an impact on the livelihood option based on SRI. It is true that SRI enhance the productivity but at the same time is also the demanding approach in terms of labor and mechanization for large-scale farms. Since most of the farmers surveyed are small and medium scale SRI farmers, their profitability from the rice determines their livelihood security. The improved transformations in farming systems increase the chance of profit (ibid.). SRI can be capable of replacing the subsistence-based farming systems for rural poor in Nepal as the system has the small dependency on the external input. This can even attract the non-farmers towards rice cultivation. Thus, in general, given the economic vulnerability of people, SRI is supposed to enhance the livelihood of people solely based on the rice farming as the only option for livelihood. However, the result of improved production via SRI can be neutral if the people possess a diversified source of income. So, in this study, I will look if the supposed benefit of SRI really matches with the Nepalese farmers' context in Govindapur and Lohasur practically. Since the impacts of SRI are debated too, the study intends to see to what kind of farmers can really make SRI a livelihood option. SRI is better understood as a knowledge-based system of rice production rather than as a technology because it is basically a set of insights into how to grow better rice plants, not requiring new machinery, chemicals or improved seeds (And it's really crucial for the farmers to know



their contextual profile i.e. their access to resources, the suitability of land, etc. before blindly following the SRI hearsay.

SRI today is practiced in more than 30 countries including China, Indonesia, India, Sri Lanka, Laos, Cambodia, etc. The studies have displayed the increase in yield by 30-50 percent using half the amount of water than in the conventional method respectively. SRI has gained the widespread attention as a pro-poor technological advancement in the field of agriculture sciences that could assist farmers to secure their food need while cutting the expenses on inputs (Berkhout and Glover, 2011). However, given its perceptible benefits, the adoption has been a bit lower along with the substantial disadoption in some locations (Moser and Barrett, 2003; Takahashi and Barrett, 2012). In the literature, Uphoff, Kassam, and Stoop remarked the progressive statements about the superior yield potential of a system of rice intensification (SRI). They state that the synergy among SRI use increases the harvest ceiling for rice, thereby ranking above the traditional method that exhibited as both socially and environmentally beneficial (Stoop et al., 2002).

Sinha and Talati (2007) supports SRI with the indication of enhanced yield performance even though the SRI handling in some of the areas contradict with the principles of SRI technique such as water control during the rainy season, regular use of compost instead of chemical fertilizers, and lack of mechanical weeding to vigorously aerate the soil. SRI is not a fixed package of practices but involves a set of interdependent agronomic principles. It is a system, and scientists are now looking at the fundamental plant physiological processes that can explain the SRI phenomenon. It is a set of six inter-related principles as below (Stoop & Walsum, 2013).

- i. Transplantation of baby seedlings aged 8-15 days old with three leaves is planted in a raised bed nursery for tillering and rooting.
- ii. The seeds are planted carefully without damaging the root tips. Single seedlings are planted with the help of rope or roller marker.
- iii. The wide spacing of seedlings with either 20 x 20 cm or 50 x 50 cm if needed. Quick, shallow and careful transplantation of single seedling per hill to get rid of any disturbances to root for plants proper growth.

- iv. Use of a simple mechanical hand weeder also known by the name rotary hoe to aerate the soil and control the weeds.
- v. Keeping the soil moist with enough water to enrich the roots, shoots and soil biota but not continuously always waterlogged especially during the growth stage up to the period of flowering and grain production
- vi. Use of organic manure

Farmers of South Asia top the list to accept and implement the SRI (Dahal, 2014). As most South Asians are rice dependent, the SRI would increase the yield with comparatively lower input such as water, fertilizer, and pesticide. Under this circumstance, SRI acts as a prospective rice farming practice to enhance the productivity with less input (ibid). SRI, thus, is a promising agronomical practice capable of addressing the issue of food security in the context of Nepal. Thus, the aforementioned discussions suggest that performance of SRI may vary from site to site and depends upon the condition of an area such as the location of land. Whether it's SRI or any other technique, the crop production system in Nepal is awaiting for positive change since ages. The majority of farmers in the agricultural sector hope to change the future of crop production for better livelihood choices.

## **1.2 Organization of the study**

The first chapter in the thesis gives the background and introductory information regarding the research topic and the information regarding the study community. The second chapter offers the also presents the detailed methodological aspect along with the conceptual framework upon which the study is based. The third chapter deals with the general findings regarding the livelihood capitals of the farmers in Govindapur community of Koshi Haraincha Municipality and Lohasur Community of Motipur VDC and how those capitals are related to the adoption of SRI technique. The fourth chapter sums up the study and concludes by analyzing the institutions and processes that affect the livelihood of farmers. In this section, the key finding from the study is linked to the research questions respectively. Thus, the usefulness of the thesis is expected to understand how the farmers have farmers adopted and reacted to SRI in relation to livelihood in Govindapur and Lohasur community respectively.

### **1.3 Statement of Problem**

The study of livelihood in the Govindapur village of Koshi Haraincha municipality and Lohasur village of Motipur VDC, as mentioned above in the introduction, serves as the impetus for this study. The deficiencies of both the food and nutrition wellbeing are stressful situation for the poor people of the hilly and mountainous region of mid-western and far-western region Nepal (WFP, 2013). Low agricultural productivity combined by the limited capacity of farmers impedes the agricultural development. In addition to it, crop damages due to natural disasters like the windstorm of June 2015 damages the whole commercial farm thereby stumbling upon the massive loss (Field Observation, June 2015). Thus, the mix of factors such as considerable food loss, inefficient natural resource management, poor governmental attention, regional disparities, mounting malnutrition and poor nutritional awareness, escalating food prices, poor safety net and high chances of occurrence of disasters directly and indirectly affects food security in Nepal (WFP, 2013).

*Nepal fall among the countries with highest malnutrition rate i.e. 41 percent of under-five aged children is undersized followed by 29 percent, underweight children. The occurrence of stunting in the hilly and mountainous region of the mid- and far-western regions is intense with rates above 60 percent (FAO, 2010).*

Rice being one of the prominent cereal crops in Nepal contributes to almost one-fourth of the GDP thereby generating substantial income and employment for the majority of the Nepalese people. More than 75% of the working population engages themselves in rice cultivation for almost half of a year. Rice accounts for about 50% of the country's total agricultural area and production (MOF, 2009). Though the agriculturally active population is on the verge of decline due to the increased outmigration and foreign immigration, there is still the considerable population who are surviving solely with the agriculture in Nepal. Out of the total cultivated area, Rice as a staple crop is grown in 47.98% of the area and contributes 21% of the national Gross Domestic Product (Upreti et al., 2012).

SRI is not much different than agricultural intensification. Some of the major differences lie in using the less area for more production, use of more chemical fertilizers instead of organic manure, etc. According to Raut et al. (2010),

*“Several factors bring relatively higher income from intensified agriculture such as intensive care of plots by farmers during their leisure time, use of high yielding varieties, high chemical fertilizer inputs compared with traditional cultivation system, high labor inputs and high market prices of the crops they have chosen.”*

Agricultural intensification once was considered significant for increased production and increased income thereby bringing the real hope to the livelihood of people. But later, the agricultural intensification was not considered suitable from the environmental sustainability aspects. According to Dahal et al. (2007), the agricultural intensification pose the threat to water body as the chemical with higher components of adverse chemicals such as nitrogen, phosphorus, potassium etc. would mix into the nearby water sources. This is among the many environmental adversities that can be brought about by haphazard agricultural practices. With the ever increasing knowledge and awareness, the globalized population today yearns for the secured and sustainable agricultural practices. The search for sustainability concerning the future generation needs may lead to the development of varied environment-friendly technique out of which SRI could also be the one.

Adoption of the technology followed by persistent practice touches the peoples live in a real sense than the introduction of it. Several studies show that the impact of SRI on a household is mixed due to the demand for more inputs like fertilizer, special seedlings, and more labor respectively. Furthermore, water control and management issues that possess high chance of raising problems about shared irrigation infrastructure. The co-ordination problem may eventually affect the adoption rates ultimately affecting the livelihood of those who adopted, didn't adopt / still continued with traditional farming or discontinued even after adoption. Exploring the livelihood considering the climate change issue would add value to this study. To add further, the conventional flooded method of cultivation being practiced by the majority of Nepalese releases large quantities of CH<sub>4</sub> (Wassmann et. al. 2004).Furthermore, low productivity urges the farmers to use the chemical fertilizers with N-content thereby releasing

more N<sub>2</sub>O gas from rice (Wassmann et al. 2004). It is therefore SRI can play an adaptive force for climate change for secured livelihood respectively.

#### **1.4 Objective and Aims of the Study**

The General objective is to understand how the farmers adopt SRI as livelihood option in the farming households in Govindapur and Lohasur Village. The specific objective is to understand how the adoption of SRI influences the livelihood and how the availability of the asset has influenced SRI adoption. The research questions to realize these specific objectives are basically derived from the literature review. The study has tried to make the most from the information gathered to identify opportunities and challenges for increasing adoption of SRI among farmers in two small communities of Morang District, Eastern Nepal.

#### **1.5 Research Questions**

In order to understand the specific objective, I have limited the research question into four sub-questions for analyzing the livelihood.

- What is the influence of SRI on the livelihood in the farming households in Govindapur and Lohasur Village?

Though SRI hasn't been practiced in a considerably large field in Govindapur, it's still benefitting the small and medium scale farmers. The farmers are able to procure benefit and channelize those benefits for further livelihood improvement. The advantages drawn from SRI are anticipated not just to be restricted to the on-farm activities but it also possess the potential of changing the daily life activities of a community i.e. how has been community benefitted. This also makes it suitable to know the view of non-adopters. Thus, this questions aims to know how the farmers transformed their livelihood strategies for the wellbeing.

- How significant is SRI compared to the conventional method?

This question tries to seek the reasons to the curiosity about what makes SRI better as compared to its traditional counterpart. The reasons could be the difference in yield, water requirements, level of understanding of SRI principles, cost of production in relation to

output etc. Understanding the significance of SRI to traditional method could reveal some facts regarding the dynamics of adoption, partial Adoption, non-adoption or even discontinuation.

- What do farmers perceive for the adoption of SRI?

The adoption of any new kind of technique or technology by farmers usually requires the willingness and motivation to begin. Along with the motivation, they may require technical training and also the belief in technology. There may be the existence of several factors such as availability of members of family like young family member, availability of time and resources , capital availability, perception of farmers towards that technology that trigger farmers to try or not try new technology. So, this research questions aims to receive the farmers' response to the SRI adoption.

- How compatible is SRI with small landholder farmers' available resources?

According to FAO (2001), "A farming system is defined as a population of individual farm systems that possess related resource base, activity pattern, households' livelihood and challenges, to cope up which requires similar development plans and policies". Farming System is a chain of interwoven elements such as soil, water, labor, livestock, crop, even external enemies like various plant and animal disease within its setting. So, all of these stated factors have to be taken in mind before and during the adoption. And many may fail to continue the adopted technology not because the technology is inappropriate but due to the inability to meet the conditions required for better SRI production. But the compatibility of resources can be seen in two aspects i.e. human and technology. The technology determines the need of physical and biological factors for instance: SRI also has its own technological/physical (for e.g weeder/spacing) need and biological need (e.g. organic manure, balanced water etc). But at the center of human and technology is the availability of resources to farmers.

## **Chapter 2: Research Methodology**

Given the descriptive nature of the study, I approached the qualitative method. Qualitative Research is a research strategy that usually emphasizes narrative rather than quantification in collection and analysis of data. As a research strategy, it broadly follows inductivist, constructionist and interpretive approach (Bryman, 2012). According to Bryman (2012), many people try to discuss qualitative research as opposite to quantitative research but the oddness of this idea is that qualitative research seems as being addressed what quantitative research is not able to capture. Bryman further mentions that the qualitative researchers emphasize in five key areas viz. observing through the eyes of research participants; description and context; flexibility and lack of structure; and concepts and theories as an outcome of the research process (ibid). The qualitative study was chosen viewing the fact that there were very few qualitative studies in this field. Besides these, I have also included few graphical representations of results.

## 2.1 Literature Review

### SRI Introduction in Nepal

The monsoon rain pattern highly influences the rice production in Nepal as rice is a hydrophilic plant. Due to the dependency on monsoon rainfall, the average rice productivity is limited to around 3 tons per hectare. Whereas the rice production in other neighbouring countries follows this pattern: India (3.4t/hectare), Bangladesh (4.3 tonnes/hectare), Vietnam (5.3 tonnes/hectare), Srilanka (4.1 tonnes/hectare) and China (6.5tonnes/hectare) (FAO 2012; NARC 2013). Though the data provided by FAO suggest that Nepal seems to lag far behind as compared to the neighboring countries. But however, the production factor not just depends upon land and rain. Instead, it deals with a variety of agronomical issues such as farmers' financial capacity, availability of agricultural subsidies, and agriculture extension services.

However, China has been the main player of SRI in combination with hybrid seeds (Uphoff, 2003). India has embraced SRI as one of the schemes of its food security program. The system of rice intensification is promoted in more than 39 districts in India whereas in Nepal; it's implemented in limited areas. The system of rice intensification (SRI) in Nepal was first championed by Rajendra Uprety as a District Agriculture Extension Officer in Morang and is still looking after SRI related activities in Morang district. It appears that Mr. Uprety's initiatives helped SRI to take the current form in Nepal. There are more than 35 districts where SRI is introduced and tested in Nepal. Some of these are 300 ha in Dang, 120 ha in Jhapa and 80 ha in Kailali. Test plots like these are successful in producing up to 12 tons per hectare, compared to 3 to 5 tons produced by the conventional method (The Nepali Times, 2011).





**Figure 1 SRI Field in Belbari, Morang (Photo Credit: Nelson Pokhrel, the fishery development officer at Agriculture Service Centre, Belbari)**

SRI could be a technology friendly and farmer's effort dependent methodology for increasing the productivity of rice through the balanced nutrients management practice. The researchers these days are more concerned about the welfare impacts of SRI. As SRI requires the considerable labor inputs than the conventional method, crop management, water control, etc., the adoption of SRI has led many farmers to leave the previous occupations and dedicate fully on SRI. The decline in the household income can offset the income increase from higher SRI yields (Moser and Barrett, 2003).

SRI can be said to have emerged through an inductive process that was shaped by intimate interactions between a scientist, farmers, and rice plants in farmers' fields (Glover, 2010). The

purpose behind this study is to present how the human asset interacts with natural or agro ecological capital to realize the adoption of SRI in the lives of people. I wanted to observe whether the farmers has grasped the theoretical identification of SRI and practiced it with experimentation. In addition to this, it is the question of concern to see if they are still continuing it or not. Critics like Sheehy et al. (2004) studied the yield potential of SRI using a theoretical model with field experiments in different locations in China and Madagascar, and came up with the conclusion that SRI has no major role in improving rice yields. Coming across the views of critics makes you even curious to study whether it's really a misleading notion or reality. Having a glimpse of farmers' interaction with SRI to check the criticism was also in my mind. Thus, I have checked the acceptability of farmers from the assets availability point of view. This paper tries to check the farmers' access to assets alongside the adoption of technique. The agricultural technique itself cannot function alone in the absence of supplementary elements. So, the study will also see if SRI sector in Nepal still needs study regarding the diffusion of technique for the betterment of livelihood.

## **2.2 The livelihood Approach**

This section sheds the light on the theoretical concepts upon which I endeavored to undertake this study. It is the challenge to absorb oneself into the subject matter unless the theoretical foundations have been well understood. The idea of livelihood defined by their assets gave birth to the framework for understanding the livelihood. The working paper of the Institute of Development Studies (1992) by Chamber's and Conway define livelihood as:

*“A livelihood involves the capabilities, assets (including both material and social resources) and activities to secure the way of living. A sustainable livelihood comprises the ability to cope and retrieve itself from stress and shocks to improve its assets and capabilities while recognizing the natural resource base.”*

The author states about the mixture of the diversity of people based on different types of assets available to them while emphasizing on the access to assets. There is an increasing record

these days where people engage in a variety of income generating activities other than agriculture to diversify the livelihood sources.

Scoones (2009) states:

*“The sustainable livelihood approach (SLA) offers a comprehensive framework for understanding the complex multi-dimensionality of poverty, from global to local level. It also draws on diverse disciplinary perspective and cuts across sectional boundaries, offering a tool of analysis that differs from previous monovalent approaches.”*

Among the many features, one of the main features of sustainable livelihood approach is the priority that it gives to the people and poverty thereby offering the logical analysis of livelihood. The purpose is to check the livelihood from the local perspective. It takes the important position in the study because I want to know the livelihoods in Govindapur and Lohasur Village from the farmers' point of view. The focus is on farmers SRI adoption and transformation in livelihood. It also presents the fact that how one reacts to the innovation. It is vital to reflect upon how the farmers respond to the technique intended for them. Certain standards constantly prepare the creation of knowledge, politics, followed by institutional histories and commitments (Keely and Scoones in Scoones, 2009). It is worthy to have the knowhow of how certain knowledge and innovations are made and how the produced knowledge is accepted. The sustainable livelihood approach focuses basically on the usefulness of development processes and actions and transcends beyond the traditional ideas and approaches to development. The livelihood approach promotes the importance of a solid understanding of the household economy, combined with attention to the policy context to achieve development goals (DFID, 1999). The vulnerability context is a crucial aspect of the sustainable livelihood framework as it places the livelihood strategies and outcomes into perspective and recognizes the reasons that restrain or improve people's capability to make a living. The capability to make a living is determined by different social, economic, institutional factors and the seasonality of the local area. So, it is not just about how and when the technology is introduced but it's also about how the situation in the area favors the adoption of technology such as the support the farmers get, the agricultural policies, the government mechanisms and functioning, etc. In most of the cases, the people's ability to progress is attached to governmental institutions and structures. So, the livelihood of people

in Govindapur and Lohasur Village will also be seen through their institutional access and facilities.

The comprehension of livelihood hugely depends upon how one has perceived or understood the livelihood. For the purpose of this study, livelihood comprises of the more or less fulfillment of assets and how those assets convert into livelihood outcome that is required for the means of living. Thus, the overall understandings of the approach as stated above render it significant for the study of people's livelihood in Govindapur and Lohasur village respectively.

The decision about where to invest the time and resources depends on a set of several factors. These factors include resource endowments, particularly agro-ecological characteristics of the target countries (Arezki & Deininger et al. 2011). For the System of Rice Intensification to consider as an innovative agricultural reform, the consideration of several aspect of livelihood such as human, social, physical, financial and natural capital should have played the effective role in the livelihood of people in Govindapur and Lohasur village. Well, it's the questionable thing whether people in the area are well known about these capitals or not. But to make SRI adoption fruitful, the association between these capitals should be well built.

The adoption of new technology represents a significant shift in a farmer's production strategy. Significant adaptation of the technology may be necessary before it performs well in the local production environment (Grilichhes, 1957). If people are successful to blend these livelihood assets to achieve the best livelihood then it can be said that SRI adoption has brought colors into their lives whereas the inability to improve the livelihood can be taken in other way. It is, therefore, the conceptual framework represented above motivates to have an insight into the livelihood facets that either smoothen or roughens the capability of people to capitalize the assets. It is therefore in any sort of livelihood intervention, the active involvement of concerned stakeholders, governmental agencies, political leadership, and the effective implementation of policies and practices are required.

### **2.3 Agricultural Innovation Approach**

The systems of innovation approach discuss a whole bunch of procedure rather than a single occurrence. Innovations are first-hand foundations of economic influence, either entirely new or as new arrangement of previously prevailing knowledge (Edquist, 1997:19). An innovation could be of either drastic or progressive that might bring the revolution to the products along with the improvement of production technique. In other words, the result of SRI as the innovation process has influenced one or any of the livelihood assets as a result of a change in the technique. Change in technique or technological development as a consequence can either be seen directly or are only observed by digging deeper into the beneficiaries. According to Edquist (1997), the innovation process entails the complicated procedures linking the several actors of the society. The possible complication may be the transmission of knowledge and how that knowledge translates into production process through the practical aspect. As we all know that the innovation and success don't follow the straight path rather it is loaded with ups and down while in the process of successful diffusion. So, the Edquist asserts that it may involve several stakeholders with the massive engagement of feedback from the science, technology, learning, plans and policies, demand and supply, etc. One cannot expect any innovation process to be prompt because it has to adjust itself in certain context and environment with the engagement of multifaceted players. The adjustment can take either shorter or longer depending upon how the particular host reacts to it. The system of innovation approach can further be related to the Scoones framework by seeing how the farmers have adjusted SRI, in which stages of adjustments are they, etc.

### **2.4 Relevance of Approach to the Study**

The livelihood and the agricultural innovation approach were reasoned best for this study to explore the role of System of Rice Intensification to influence the rural livelihood. The approach eased to get the picture of how the farmers adopt any kind of technology and how the adoption has influenced them positively or otherwise. It usually sees the choices made by farmers regarding the adoption and whether their choice is valid in terms of livelihood benefit or not.

### **2.4.1 Relevance of Livelihood Approach**

Livelihood Approach, by its name, visualizes the daily life realities, activities and challenges concerning poor people.

*According to Krantz(2001), the approach focuses on the livelihoods of the poor, since poverty reduction is at its core. The second is that it rejects the usual sectoral entry point (e.g. agriculture, water, or health) and instead begins with an analysis of people's current livelihood systems to identify an appropriate intervention.*

Krantz emphasizes on the use of livelihood approach to address the multiple issues related with poverty. It's true that livelihood approaches have gained widespread popularity after the researchers like Robert Chambers and Gordon Conway highlighted the concept. Since then, the development organizations like DFID have been using the same approach as a main basis of their livelihood studies. In his study, the livelihood approach has tried to address the farmers' relation with the existing asset and its usefulness of adopting the SRI technique. As these assets include the livelihood factor, these factors are also shaped by their interactions with the local institutions and the operationalization of policies in the Govindapur and Lohasur village. It is because the livelihood approach is deemed relevant because it is pro-poor and acts according to the result of livelihood study to accomplish the livelihood strategies.

### **2.4 .2 Relevance of Agricultural Innovation Approach**

The system of innovation approach discusses a whole bunch of procedure rather than a single occurrence. Innovations are first-hand foundations of economic influence, either entirely new or as a new arrangement of previously prevailing knowledge (Edquist, 1997:19).An innovation could be of either drastic or progressive that might bring the revolution in the products along with the improvement of production technique. Agricultural Innovation Systems (AIS) are defined as

“The network of organizations, enterprises, and individuals focused on generating new products, processes, organizations into economic use, together with the institutions and

policies that affect the way the different agencies interact, share, access and use knowledge (Hall et al, 2006).”

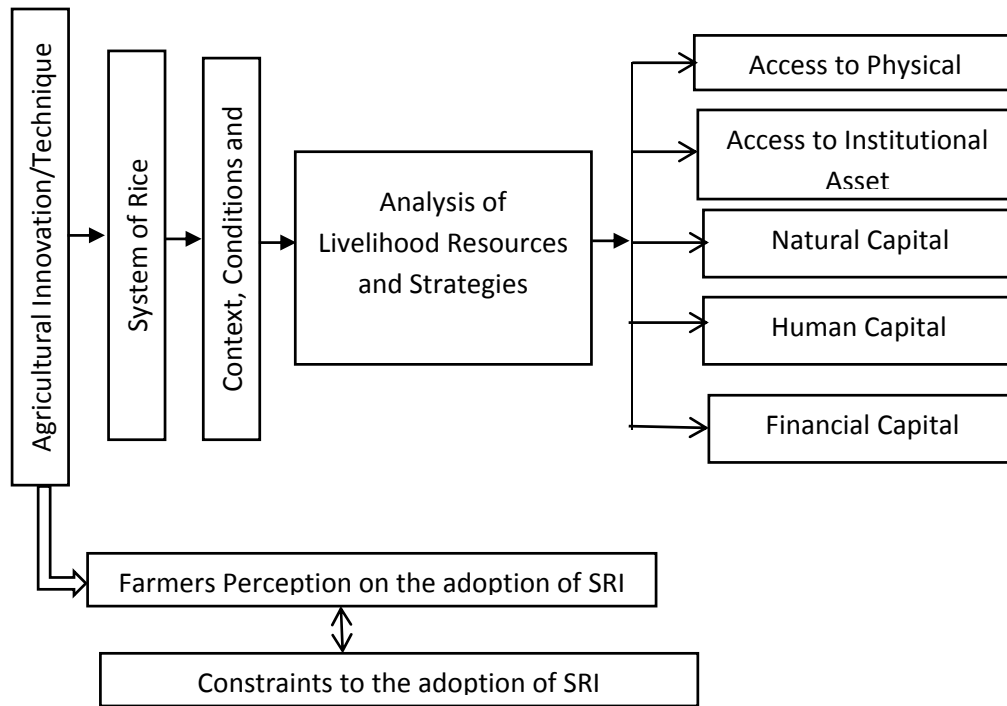
According to the statement made by Hall above, agricultural innovation doesn't merely deal with innovation as such but it is an interconnection among social, institutional, economic, and technical features. For any kind of innovation to succeed, the factors mentioned above along with the policy, legislation and development efforts play the vital role.

In other words, the results of SRI as the innovation process have influenced one or any of the livelihood assets as a result of change in the technique. Change in technique or technological development as a consequence can either be seen directly or are only observed by digging deeper into the beneficiaries. Thus, the study will see how the change in the practices of doing things affects farmers.

## **2.5 Conceptual Framework**

### **Livelihood and Agricultural Innovation Approach**

It is imperative to explain the major concepts that I will be using in the Thesis. The concept of livelihood can be speculated in a variety of ways in the development concern. To come close to the conception of 'sustainable livelihood approach', it address the basic needs approach via food security, poverty alleviation and reduction (Maxwell, 1998). Maxwell also exhibits an approach from the perspective of integrated rural development which encompasses from agricultural systems to participatory approaches in development. The study will use most of the important concept from the Scoone's sustainable livelihood framework. Based on the livelihood framework, the farmers' livelihood strategies and outcome in relation to SRI will be explored



**Figure 2: The Conceptual Framework**

I have sketched the conceptual framework based on the five key indicators as stated by Scoones (1998). Based on this conceptual framework, the study intends to see how SRI, the innovation in the agricultural arena impacts, both positively and other way around. The link of SRI connects to livelihood resources (natural, human, social and financial capitals) to embrace the multiple livelihood options such as agricultural intensification, livelihood diversification, etc. The farmers in Govindapur village do SRI and produce both for sale as well as the household consumption. However, in Lohasur village, the farmers have discontinued SRI due to numbers of challenges like lack of irrigation facility, lack of unification among farmers, etc. Predominantly, how the institutional aspects influence the farmers and their functioning will be discussed. For instance: the farmers in Lohasur village reported having no any working group or non-functional group as a result of which they feel that they are not being heard at the agricultural institutions. To sum up, the paper briefly



reflects upon some of the practical and operational side of SRI adoption from multidimensional livelihood perspective.

## 2.6 Scope of the study

The study was carried out on two communities viz. Govindapur, a village located in Koshi Haraincha Municipality, Ward no.6 and Lohasur village of Motipur VDC, ward no 6. Koshi Haraincha, also previously known as Indrapur, is a municipality in Morang District, the Koshi Zone of eastern Nepal. Koshi Haraincha is one of the relatively developed municipality of Morang district with the facility of electricity, water, schools, etc.

The table below gives the brief background of the study area:

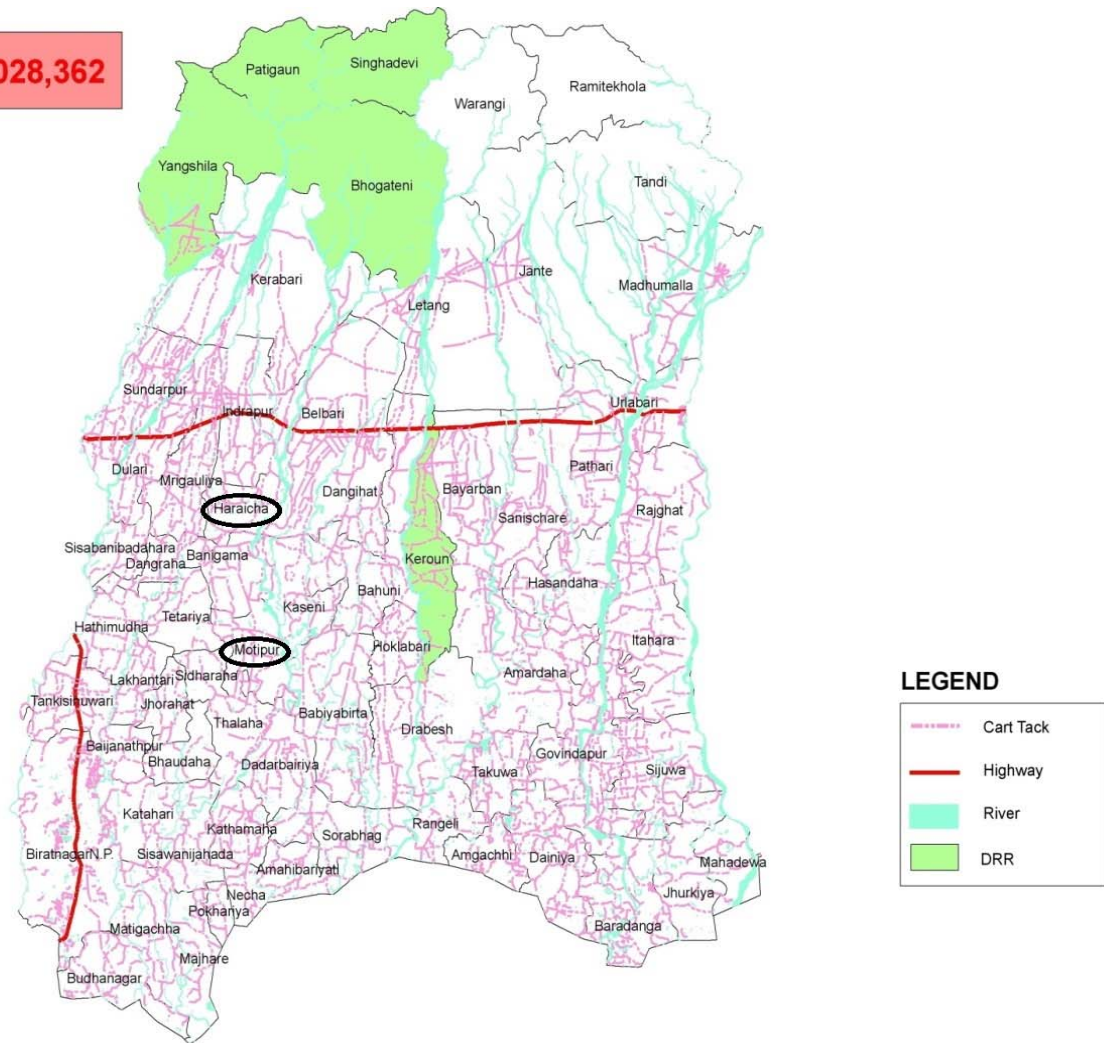
Table 1: Brief Background of the study area:

Study Area/Village	VDC\Municipality	Population Of study area	Total Number of Household	Irrigation facilities
Govindapur	Koshi Haraincha Municipality( Formerly known by Indrapur VDC)	27,122	6343	• Canal
Lohasur	Motipur VDC	4792	1209	• Water Pump

Before 2014, Koshi Haraincha used to be VDC but it was later merged combining two other VDCs viz. Mrigaulia and Indrapur. Agriculture is the main occupation of people in Govindapur. One can find numbers of small and large-scale agricultural enterprises in this municipality. Govindapur Village has the proximity to the city centers as a result of which there is a reasonably good commercial activity. The best thing the farmers in Govindapur village have is the irrigation scheme in close

proximities of their farmland. The proximity to the road facilities to the city opens up the door for farmers to sell their surplus products and count the opportunities to pave the livelihood pathways. This case, however, is not true with people of Lohasur Village.

**Total Population: 1,028,362**



Source: [http://flagship4.nrrc.org.np/sites/default/files/district-map/DRR\\_Morang](http://flagship4.nrrc.org.np/sites/default/files/district-map/DRR_Morang)

**Figure 3: An Area Map of Koshi Haraincha Municipality and Motipur VDC**

The circled area of the map represents the Koshi haraincha Municipality and Motipur VDC represents the study area. Lohasur village is situated in the Motipur, a VDC situated in Morang District, Koshi zone of eastern Nepal. The major sources of income of people in Lohasur village of Motipur VDC are from agriculture. Most of the elder generations lag far behind in terms of education and few of their offspring has dropped off the school due to the engagement in agriculture as the people. Thus in Motipur comparatively owned lesser land than their parents due to the issues like family division and splitting of properties/land. Land being their only source of property, most of them used to keep the land as mortgage to loan the credits from financial institutions. Correspondingly, inability to pay back the loan worsen their situation thereby affecting their means of production. Well, these are the inside stories that are not visible on the surface but touch and affect the livelihood of these poor farmers.

## **2.7 Selection of the study area**

Govindapur village of Koshi Haraincha Municipality and Lohasur community of Motipur VDC were mainly selected for the reason that one of these areas has well performed the SRI whereas one of the areas has discontinued despite adoption of SRI. The livelihood in Govindapur village seems better off due to the implementation of SRI whereas Lohasur village has lagged behind in terms of SRI adoption and improved livelihood. It makes it easier to compare how the impacts differ in terms of SRI adoption and lack of adoption respectively. The fact that Govindapur village is near from the city area makes it easier for agricultural income diversification. While on the other hand, the relative deprivation of infrastructure and facilities in Lohasur community limits the opportunities for access to diversified income.



**Figure 4: The Survey at the household who is an active SRI adopter in Govindapur village of Koshi Haraincha Municipality**

Another practical reason behind the selection of these two areas are proximity concern; these areas took almost an hour drive from the Agriculture Service Center, Belbari where I used to start my daily field task under the guidance and help of Mr. Uprety, the senior agricultural officer, and SRI pioneer of Morang District. In fact, Mr. Uprety made it easier for building rapport with the villagers who helped in the facilitation of data collection. The data collection was carried out as planned because the villagers' wholeheartedly welcomed the researcher. However, there was the possibility of bias too as the study was done in the locations near the agricultural service center, Belbari. There could have been other SRI Field as well where the result could be somehow different. But as far as the duration of the field trip is taken into an account, it is not unfair to have chosen the location close and convenient for the researcher.

## **2.8 Access to the field**

Most of the researchers don't bother to mention their fieldwork practice in their reports unless it's the detailed study like ethnography. It is important for one to gain the trust and acceptance of the participants in order to conduct one's research (Wasserman & Clair, 2007). The selection of field where the study is going to be conducted is not a difficult task. But when it comes to access, the interest and choice doesn't always work. Since my local supervisor had official relations in the related sector in Nepal, it made the access the informal one though the each and every step was taken formal. Normally for the new researcher the organization may become skeptic about how the outsiders as a researcher deal within their area and may not recognize their academic importance (Laurila, 1997). However, in my case I was privileged to have the convenient access to the Agriculture Service Centre and the field because of my local supervisor. The initial entry to the agricultural service center and contact with the field supervisor was made through the formal mail, phone calls to the people in the organization. The fields that I chose are also the field where one of my field supervisors has worked numbers of times; this made it easier to build trust and build rapport among the participants. In addition to it, it also saved time that the researcher needs to roam around village greeting people and making one familiar before collecting the data. Therefore, before embarking on the actual research on the field, I was provided the colleague who could assist my work. The colleague I went to field with was well familiar with few of the areas we went. Well, there is always the chances that if the colleague know few people in the area then the response of participants can be influenced by his/her familiar identity. To minimize the chances of bias, the colleague avoided to come along among the families where they were known to each other.

## **2.9 Choosing Informants**

To facilitate the research questions and objective, the informants chosen were those whose lives are influenced by SRI. The informants with the variety of characteristic gender such as age, gender, education, and income and farm size were taken into account. The ordinary method used to choose informants was snowball sampling. According to Bryman (2012), Snowball Sampling is a technique in which the researcher initially samples the small group of people, and these sampled participants propose other members who have the similar characteristics. Few of them were pre-informed regarding the arrival of the researcher for data collection, but few of them had the sudden information due to the snowball sampling method. However, the free time of informants were noted down and visited their house accordingly keeping in mind their working hours and comfort. Total of 35 people were interviewed following the semi-structured interview. The informants were of the mixed type, and some were typical to meet the need of research questions while some of them couldn't give the required information needed. Most of the samples chosen were small-scale farmers. According to the statistical division of FAO (2011), farmers having the size of land less than 2 hectares are known as small scale farmers.

## **3.0 Survey and Research Interview**

Questionnaires and Interview, the techniques that are at the heart of survey research occupy a major place in small scale social science research project (Blaxter, 2010). The study being qualitative, I chose to interview sticking to the qualitative research norms. In a qualitative interview the researcher wants rich, detailed answers; in structured interviewing, the interview generates the answers quickly for coding and processing (Bryman, 2012). The subjects and the order of the questions to be asked were already designed. The interactions with the farmers were quite successful which helped to create the knowledge that meets the most of the research questions. The interview played the influential role as the content represent the conversation and mutual interaction about the subjects applicable to research objective/questions. These days many pieces of research emphasize the study based on interaction rather than the one way asking and answering, also known by the term neutrality. In research, the term neutrality implies that an inquiry is free of bias or is separated from the

researcher's perspectives, background, position, or conditioning circumstances (Given, 2008). Being interactive during an interview increases the chances of flexibility in research i.e. one can question and respond according to the situation demand. The flexibility issue has been taken into consideration keeping in view the subjects that can be uncovered on the way in the discussion or interview. In addition to interviewing participants, the expert or the Key informant interview was also carried out to improve the understanding of the topic.

### 3.0.1 Key Informant Interviews

In order to conduct the expert interviews, the qualitative interview guides was used. The numbers of Key informant were 5. They are selected based on their knowledge availability on the system of Rice Intensification (SRI). Except Respondent 1, three of them were interviewed via phone and one of them via email.

**Table 2: Summary of Key Informants interviewed**

<b>Respondent no.</b>	<b>Position of Informant</b>	<b>Affiliated Organization</b>
1	Senior Agricultural Officer	Agriculture Service Center, Belbari, Nepal
2	Regional Director	Nepal Agricultural Research Council (NARC), Morang District , Nepal
3	Crop Development Officer	Agriculture Service center, Belbari, Nepal
4	Scientist, Plant Breeding	Nepal Agricultural Research Council (NARC), Morang District, Nepal
5	Co-Director/ SRI based Researcher	Everything Organic Nursery(EVON), Kathmandu, Nepal

### **3.1 Sampling Methods**

Though the study was carried out in Govindapur and Lohasur community of Koshi Haraincha and Motipur VDC, it was not possible to include all the farmers doing SRI in the area due to the limitation of sample size. Representative samples were drawn from the list of samples. The lists of farmers were provided from the Agriculture Service Center, Belbari. In order to select the respondents without any bias, a simple random sampling technique helped to select the targeted numbers as numbers were written to the each name obtained. Those numbers were then mixed and shuffled before drawing the numbers. This method was used to ensure that all the farmers have the same chance of being selected ignoring the specific characteristics of farmers. In addition to simple random sampling for choosing the SRI Farmer participants, the purposive sampling has also been engaged. The goal of purposive sampling is to sample cases in a strategic way so that those sampled are relevant to the research questions that are being posed (Bryman, 2012). Like the participants, the sampling sites and the organizations were chosen purposefully, this is not a probability sampling. Among the approaches of purposive sampling, the criterion sampling was used to sample the individuals that meet the particular criteria. It was done especially for Govindapur village where the SRI farmers were more than targeted number. However, in Lohasur village, the snowball sampling was followed to invite the respondents where one interviewee leads to another interviewee due to the low population density adopting SRI in Lohasur village. In Motipur VDC, the difficulties in coming across the partial SRI adopter lead to the use of Snowball sampling method. After having read about SRI in many social science pieces of literature, it's an important task to classify SRI before any study is done. It helps to analyze how this agricultural innovation named SRI performs. In my study, I have classified it as SRI adopters (those farmers still implementing SRI in their field) and partial adopters (those who have left practicing SRI even after the adoption). One can find many such terms in literature associated with SRI such as partial adopters, non-adopters, etc., but I have limited the terms on adopters and partial adopters.



At Govindapur village, a total of 20 households who were doing SRI were sampled whereas in Lohasur village, 15 households who adopted but discontinued SRI were sampled. 35 household is defined as target number to be surveyed or interviewed in both the communities. Of the total 35 farmers' respondents, 15 were women, and 20 were men. To represent the diversity in the sample, the farmers who adopted and discontinued despite adoption were taken into account. Since the survey was not done in random, different households from different geographical areas were selected to have the larger coverage. The households were selected based on purposive and snowball sampling. The door to door interviewing was done and for the maximum variation sampling the households from Lohasur village were also selected to show the variation in the result. The classification of small, medium and large scale farmers were done in accordance with the National bank of Nepal standard classification.

**Table 3: Classification of Farmers based on the size of land ownership**

Ownership of Land	Scale of farmers
0.49 Hectare – 1.5 Hectare	Small Scale Farmers
1.97 – 2.6 Hectare	Medium Scale Farmers
More than 4.5 Hectare	Large Scale farmers

Source: National Bank of Nepal (1987), “Some Important Statistics in Agriculture- Nepal”, Kathmandu, Nepal

### **3.2 Sources of Data and Data Collection**

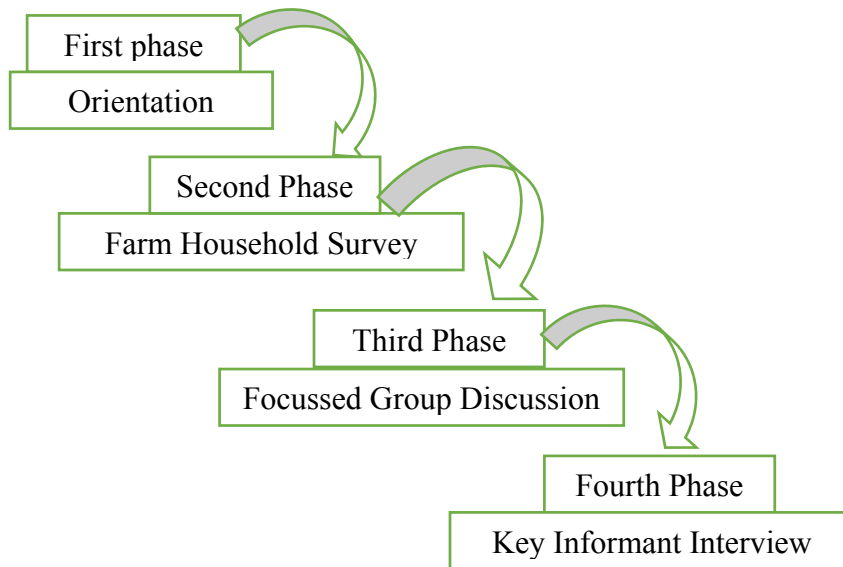
The sources of the data are from two corresponding but different sources. As a primary source, Household surveys served as a key unit of analysis followed by Key Informant Interview, focused group discussions and secondary interviews. However, the household surveys lack the flexibility to pursue particular issues in any greater depth or to capture in-depth contextual detail that a focus group can provide (Wolff et al., 1993). Therefore, the focus group discussion was chosen after the results from the survey had been analyzed to incorporate the remaining and in-depth understanding of the issues.

The secondary source of data was literature review that helped to shape the whole study by putting the perspective towards livelihood and innovative agriculture reform. The literature review also provided to serve the important theoretical tools within which the argument in the study has been shaped. To outline the literature review, books, magazines, articles, both printed, and electronic versions were as the secondary sources of data. Concerning book relating to SRI, there were negligible published books relating to SRI. Likewise, the documents from the Ministry of Food and Agriculture, Nepal (MoFA), the food and agriculture organization (FAO) were reviewed.

The primary sources of data were collected from fieldwork. The main tools used for the purpose of data collection were survey with the unstructured questionnaire, interviews; focus group discussions (FGD) were used. In addition to it, the experts and staffs at various levels were interviewed to manifest the evaluative outlook on the SRI regarding its operations and results. The semi-structured interview was conducted to let the respondents convey their views and ideas concerning the implementation and constraints. The suitability of semi-structured interview occurs from its flexibility.

□

The Phases of Data Collection are presented as a flow chart below:



**Figure 5: Flow Diagram on the Sequential Phases of Data Collection**

The data collection was conducted in four phases: orientation phase, farm household survey, focus group discussion and the key informant interview. At the first step in an orientation phase, some study reports related to SRI in the Govindapur village were studied. During the orientation phase, the field sites Govindapur village, and Lohasur village were visited with the help of a guide provided by the Agriculture service center. The guide also belonged to the similar field and was one of the interns in agriculture development offices. The main purpose of the visit was to explore and get familiar with the area. This helped to get some pre-idea regarding the area and build the rapport with the pioneer SRI farmers. Some of the initial observations such as irrigation scheme, their SRI Plot, an area to make organic manure were made.

The second stage of data collection was household survey along with semi-structured questionnaire and interview from a random selection of participants. The questionnaires were categorized to gain the perspective on their livelihoods such as different kinds of assets,

income sources, and livelihood changes due to SRI. The targeted population was surveyed but, however, few participants couldn't make it due to their unavailability. The survey was conducted face to face as this opened the way for further inquiry.

The third stage of data collection was focused group discussion. The Focused Group Discussions (FGD) was carried out especially in the Karjuna Village near Koshi haraincha. The venue for FGD was in one of the pioneer SRI farmers. The numbers of participants in the focus group discussion were 10. The Focus Group Discussion was successful due to the assistance from Agriculture Service Center, Belbari and my field supervisor who helped for all the arrangements. One of the pioneer farmers doing SRI was asked to ensure whether the group was representative of the cross-section of people in the community.



**Figure 6: The participants of Focused Group Discussion, also the member of Sayapatri Womens Group in Koshi Haraincha**

The focused group discussion was conducted on the premise of home compound of one of the pioneer lady doing SRI. The lady was informed that the focused group discussion (FGD) was targeted for both SRI adopters and partial SRI adopters. In the focus group discussion, there was involvement of those SRI farmers who just begun doing SRI. There was only one man in focus group discussion, and the rest were women. As the women SRI farmers belonged to the group called “Sayanpatri Mahila Krishak Samuha,” most of the participants belonged to the Sayanpatri Women’s Agricultural Group. The purpose and intentions behind the focus group were clearly stated that it’s meant only for the academic purpose, and it’s not about sharing the beneficiaries or related things regarding development project. It was vital to clarify this as in many cases people may expect something in return as the cost of their participation and information they shared regarding the livelihood and subjects being studied. So, their assumption regarding the study was made clear before moving forward on FGD. Since, the participants had good impressions and experience with the staff of Agriculture Service Center, all of them did their best to supply with the information and their relative experience with regard to SRI. The attempt to minimize bias regarding the representation of people was not that successful .As all the respondents who were invited have limited time availability due to their household activities. The male members were absent in the FGD due to their engagement in other profession as well. So, only one man appeared in the FGD.

While initiating the discussion for FGD, it was bit difficult at first for making the environment interactive. However, the probe questions like “Do you think there is any difference in your lives due to SRI” stirred up the discussion for the further interactions. Once the discussion started, the pace maintained throughout the focus group discussion as any sort of annoyance was not observed throughout the whole session. The decision to include partial adopters was important to capture their views about what motivated them to discontinue and whether have they changed their mind to continue with SRI again.

The focused group discussion guide helped to facilitate the discussion. It allowed checking the issues that were incorporated during personal interviews as well as the issues the questionnaire failed to capture. Thus, in addition to the data production, the focused group discussion most of all served as a quality control tool.

According to Bergman & Coxon (2005), *the social psychologists have demonstrated that people are often inconsistent: their behaviors seem inconsistent with stated attitudes or values, behaviors seem inconsistent with other behaviors, attitudes and values seem inconsistent with each other, etc.*

The method of data collection and data analysis are closely related (ibid). FGD as a data collection can serve to check the analysis with other two methods such as key informant interview and household survey. For instance: the views obtained from household survey on same question may vary from the views discussed in focused group discussion. So, we can analyze both the individual response versus collective response on the same issue to check the consistency of the respondents. FGD, thus, went according to the plan except the participation of only one male member. Similarly, the observation has been used side by side as a corresponding data collection tool. These includes visiting the rice field to view the reality as read and heard the nature of SR field, and how the field was maintained in agreement with the SRI principles.

The fourth stage of data collection was Key Informant Interview. Key informant interviews are in-depth interviews with a select (non-random) group of experts who are most knowledgeable about the organization or issue (Lavraks, 2008). The basic objective of key informant interview is the exploration of some issues in depth as information is delivered from the stakeholders or people from the concerned area. The reason for choosing key informant interview was to gain that information that otherwise are missing from the methods as mentioned above of data collection. Besides, it gives the idea to sneak peek at the things the researcher hasn't expected at all but are vital to the study. Regarding the selection of informants, the informants with the thorough knowledge of the field were selected. The informants selected were based on the related position and possessed both professional experience and expertise too. This is what makes the key informant different from the households surveyed as they do not just possess the information about field and farmers but the overall picture respectively. The key informants selected are mainly the government officials and representative of the specialized area. Contacting the key informants wasn't that difficult as my field supervisor had made available the names and contact of few informants.

In most of the cases, unless the researcher has formal letter and approval by concerned agencies, the key informant may hesitate to allot their time for an interview. However, the key informants were approached formally by sending emails and information regarding the interview pre-hand. The entire key informant interviews were carried out with a previous appointment via phone and email. I explained them the motive and use of interview information briefly. The two main techniques were followed for conducting key informant interview viz. telephone interview and face to face interview. The telephone interview was chosen due to the unavailability of key informants in my available schedule. However, the drawback of the telephone interview is the lack of face to face interaction that helps to investigate the issues further. Both telephone and face to face interview were carried out with targeted key questions along with the summary. The mobile phone recorder was used to record the response of Key Informants. Alongside the recorder, the note was also taken while interviewing. I was engaged in recording, asking questions and taking notes at the same time. The recordings and the main points were transcribed immediately after an interview so that if there're any new issues to be discussed then it reminds the new issues with other key informants in the same way.

### **3.3 Data Analysis**

For the purpose of data analysis, thematic analysis is employed to gather data from survey, focused group discussion, key informant interview and the few notes of informal discussion with the households. Thematic analysis is as a careful, detailed, systematic examination and interpretation of a particular body of material aimed at identifying patterns, themes, biases and meanings where the content is “coded” as data in a structure for addressing the research questions (Berg and Lune, 2012) . To carry out the thematic analysis, I transcribed the qualitative data generated from the field using the qualitative methods. The main purpose of transcription was coding. Bryman (2012) states coding as “the breaking down of data into their components parts to assign the labels.” Based on the livelihood study assets, I selected the core themes within the transcripts to further process the data. The main reason for choosing the core theme was to answer the research question or objective as a whole. The color code

was used to categorize the statements that would fit into specific themes. I started separating the data as soon as I gathered in order to reduce the pressure to categorize data in each theme later. In addition to transcribing and coding, I also used memos to have the reflective ideas about what I am learning by looking at the data.

### **3.4 Ethical Considerations**

Alan Bryman cites Diener and Crandall (1978) referring to four main principles of research ethics: harm to participants, lack of informed consent, invasion of privacy, and involvement of deception. The tools of qualitative research usually ties the bond between the respondents and the researcher as they are directly involved in knowing their lives. The selection of techniques for gathering information from the respondents may affect the participants being studied. This is, for this reason, the ethical issues needs to be taken care of both before, during and after research. I took into consideration the questions like: does my any of the research activities harm the participants in anyway? Am I respecting their right to privacy and level of comfort? Am I putting them pressure anyway to achieve my research objective? Thus, the study started with the informed consent about my study purpose, introduction regarding the research, their aims of participation and how am I going to use the information.

The confidentiality of the participants are thoroughly taken care of i.e. the respondents was and will remain anonymous while presenting the result of the study. Likewise, before the survey and interview, the participants were told that they possess the right to withdraw from being the part of a study at any time they want. Thus, despite the study topic not being sensitive, the ethical issues were well addressed wherever necessary.

### **3.5 Positionality**

Positionality is decided by where one stands in relation to 'the other' (Merriam, Johnson-Bailey, Lee, Lee, Ntseane, & Muhamad, 2001). During the entire preparation of this study the fact that my positionality as a graduate student studying in the villages of Nepal stayed in my mind. Positionality is often linked with reflexivity i.e. a well-informed consciousness of the affiliation between the researcher and the participants (Strater, 1996). The methodological choices I made for collecting the data also reflects some degree of reflexivity. Since I spent



my entire life in Nepal, I have the few ideas of the agricultural and farming lives and also have several experiences concerning the agricultural study during my bachelor degree. I undertook this study to develop an understanding of how the local people accept the new techniques and technology and how those techniques affect peoples' lives individually. But at the meantime, I reminded myself the questions like how does my positionality as a researcher studying the livelihood of SRI farmers affect them? How did my positionality affect the respondents? As many respondents expected me to hear their farm-related issue thereby wanting me to act as a mediator between the agriculture service center and farmers though I already clarified my roles at the beginning of the interview. I wished that my position as a graduate student studying the SRI adoption and farmers livelihood would well establish me with the respondent farmers and expert key informants.

The backgrounds of the researcher such as age, gender, social background, the organization they belong to determine their positionality and the respondent may response accordingly. Such an outlook sounds rational, and at least in few areas of the grounded logic, i.e. people have a tendency to incline towards those with whom they communicate some degree of cohesion. The idea of positionality remained active throughout the data collection process in the study. But however, due to the proper acquaintance with the Agriculture service center and the relation of field supervisor in the field area, the informants responded carefully.

### **3.6 Reliability and Validity**

#### **Reliability**

The main concern to understand reliability is: Do it generate the similar result under the similar condition. It means that one should get the same result upon using the same methods and techniques. In terms of qualitative study, only the internal reliability is applicable. One of the widely used methods of internal reliability is test-retest method in which the test is repeated to get the same result. In this regards, Bryman cites Le Compte and Goetz saying that it is impossible to freeze the social setting and circumstances of an initial study to make it replicable (Bryman, 2012). As the qualitative results are based between the contextual interaction between the researcher and the participants, there is always the high possibility of context being changed in the future i.e. the people, their way of life, surrounding or livelihood may change to the extent that it becomes difficult to replicate the project exactly the same way. Thus, unless the situation and context remain the same, the result of this study shall not be replicated.

#### **Validity**

According to Bryman (2012), internal validity ensures whether there is the good match between the researcher observations and the theoretical ideas they develop. The validity in research usually denotes whether it measures that its supposed to measure. The data can be reliable without the validity but however if it is not valid, it's not reliable. Validity also helps to crosscheck whether the interpretation made earlier matched with the reality of field observation. The study tried to check the validity and reliability in few areas. For example: I noticed that many farmers who did SRI before and left now have no remembrance of how was s/he benefitted before from SRI. Likewise, few don't keep the figure of how much do they produce, etc. Thus to correct this, the information will asked to either their spouse or children. Likewise, few poor farmers seem to underestimate what they produce as they might have thought that I belonged to the Agriculture service center and would take some action upon hearing their problem. So, upon feeling that they are undervaluing what they actually produce then I again made the purpose of my study clear to get the actual figure. Thus, to avoid the validity problems, each and every question were made clear-cut.

### **Chapter 3: General Findings and Results**

This section will present the findings after the data acquired from the fieldwork. The findings will be linked to the livelihood assets and the agricultural innovation approach. Adopting any agricultural innovation requires one to engage in it for a particular period unless the benefit of the change is used the individual, family or the community. The utility of adoption depends upon the extent of utilization of innovation by continuing the adoption once the adoption decision has been made (Namara et.al, 2003). The livelihood opportunities in two different villages of Koshi Haraincha and Motipur are different in terms of their access to the assets rendering them either to cope up with the vulnerabilities or face the vulnerabilities. Their access to asset reflects their adoption pattern that would serve as a main unit of analysis. I will formulate the result and discussions following the each research questions. Landholdings in both Govindapur and Lohasur village possessed the only small area of land. As a result of which many has adopted SRI as a subsistence crop rather than a marketable commercial crop. The study showed that those who have adopted SRI had their production increased by 50% per harvest as compared to the conventional farming that lead to the increment of household food sufficiency. At the same time, many farmers are engaged in other professions in peri-urban and urban areas alongside with the agriculture that broadens their livelihood options. Among the family members, men topped the list of working beyond their villages while the young members were not available in the village either due to the study or job search. Though the livelihood options of people in Govindapur and Lohasur have diversified into multiple portfolios, the income from SRI for most of the farmers have been the primary source of income for most of the farmers in Govindapur village respectively.

### 3.1 The influence of SRI on the livelihood of the farming households in Govindapur and Lohasur community

This section will try to describe the links between the livelihood assets that are relevant to this study and their link with the system of rice intensification and agricultural innovation respectively. Most of the SRI farmers in Govindapur reported that they can save laborers as compared to the traditional method if it's done on the small scale farms, the family members as labor were sufficient; they did not need to hire an additional labor from outside. However, for the large-scale farmers they told that they needed more laborers during the transplanting and harvesting season.

**Table 4: Comparative Table on the Livelihood Assets**

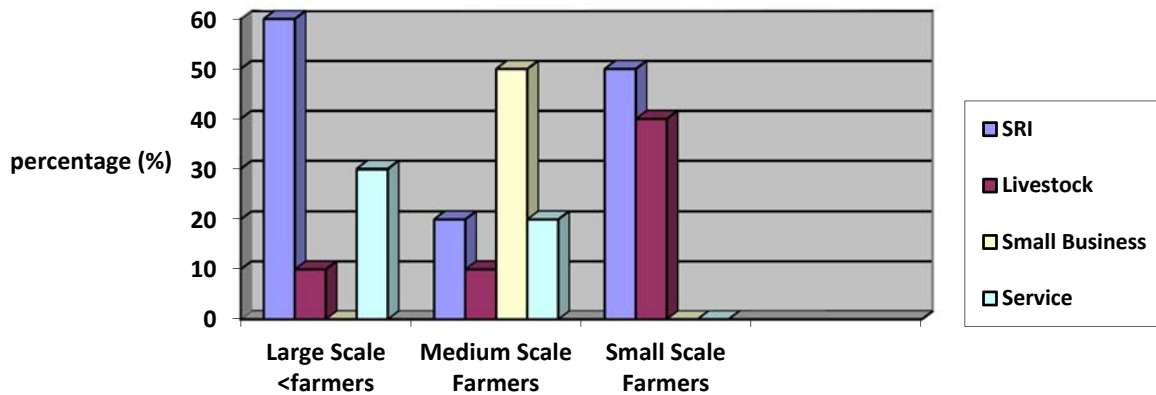
<b>Livelihood Assets</b>	<b>SRI Farmers in Govindapur</b>	<b>SRI Farmers in Lohasur</b>
Labour Needs <sup>1</sup>	Hire Labour, Perma <sup>2</sup>	Hire Labour, Family Labor
Access to SRI Farming Equipment	Weeder, Tractor, Transplanter, etc	Few Weeder in Few households
Access to Transport and Marketing Facilities	Well managed transportation systems to nearby cities	Poor Transportation and Marketing facilities
Access to Education for Children	Good Access to school with ability to pay tuition fee	Most of their children are drop out and help in farming
Access to Irrigation	Facility of Canal	Lack of Irrigation facility

This section describes the links between the livelihood assets that are relevant in this study and their link with the system of rice intensification and agricultural innovation respectively. Most of the SRI farmers in Govindapur village reported that they can save laborers as compared to the traditional method if it's done on the small scale farms, the family members as labor were sufficient; they did

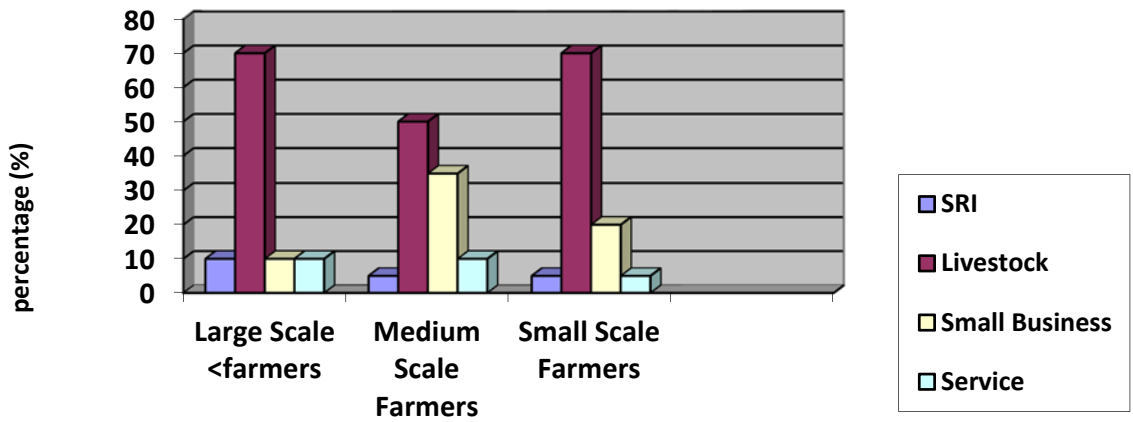
<sup>1</sup> The Labor need usually depends upon the size of the farm

<sup>2</sup> Perma is the culture of labour exchange in the community

not need to hire an additional labor from outside. However, for the large-scale farmers they informed that they needed more laborers during the transplanting and harvesting season. They also use the traditional system of labour exchange called Perma. In Lohasur, most of their children are drop out and they help their family members in agriculture. The main reason behind inability to continue education was none other than financial constraint. Beside Financial issues, their inability to pay for hired labour caused them to use their own children as sources of labour. Correspondingly, the access to transport and marketing facilities has impacted their production and sale. The rice sacks of farmers in Govindapur are easily taken by wholesaler from cities whereas in Lohasur, the rice sacks often remain in store for several months. With regard to irrigation facility, the well managed canal systems in Govindapur have highly motivated farmers to adopt SRI than the farmers in Lohasur village.



**Figure 7(a) Diversification of Livelihood sources of people in Govindapur Community**



**Figure7(b)Diversification of livelihood sources of people in Lohasur Community**

Farmers’ livelihood strategies in both villages were extremely diverse as shown in the figure above. Both the villages were introduced with SRI but Koshi Haraincha moved had higher rate in terms of SRI adoption and implementation whereas Motipur has lagged far behind with regard to SRI adoption and implementation. Both of the villages have diversified sources of livelihood, the farmers did not only grow rice but also perform other activities categorized as livestock, small business, ploughing service.

According to the figure 4, In Govindapur Community, 60% of the large-scale farmers do SRI, whereas only 20% of the medium scale farmers do SRI, the figure of small scale farmers doing SRI is comparable to large-scale farmers mainly due to the investment in labour Whereas in Motipur, only 10% of the large scale farmers do SRI as opposed to medium and small scale farmers where only 5% of the total households interviewed do SRI. Of the many reasons behind inability to adopt SRI, poor irrigation facility, livestock invasion on crops as SRI only has single seedling planted in the field, poor exchange of ideas among the farmers with regard to SRI are some. In the similar manner, the small farmers who are not doing SRI is mainly due to the fact that their small land and its SRI production becomes complicated to gain the benefits from SRI. Likewise, one of the active farmers in Lohasur village stated that:

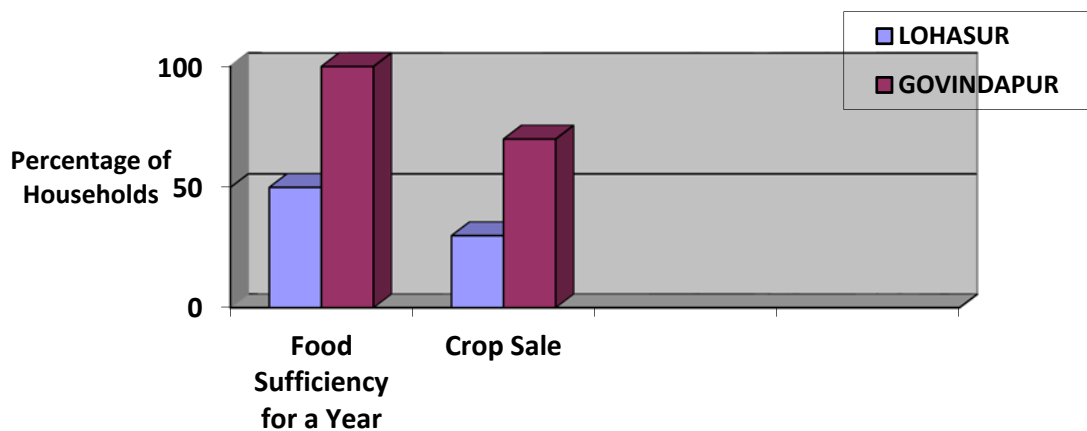
*“The new technique demands capital input and mechanization which we are unable to afford. The transaction cost in addition is demotivating many farmers for large-scale production.”*

*.It is due to the poor road network and hard accessibility to nearby market that the harvested grains are stored for several months in Lohasur VDC, Motipur and those unsold grains are then invaded by rats thereby causing farmers in loss.”*

*Field Survey, 2015*

### 3.1.1 Food Security

In accordance with Cornell Chronicle (2015), SRI received the recognition and award named as “Olam Prize” for Innovation in Food Security. The award was granted based on the availability, accessibility and adequacy of food .What makes SRI different from other methods of crop intensification is its higher yield. The face of food insecurity status has transformed SRI from food deficiency to food sufficiency in one of the study area i.e. sufficiency not just to join hands to mouth but in terms of commercialization in the nearby markets too.



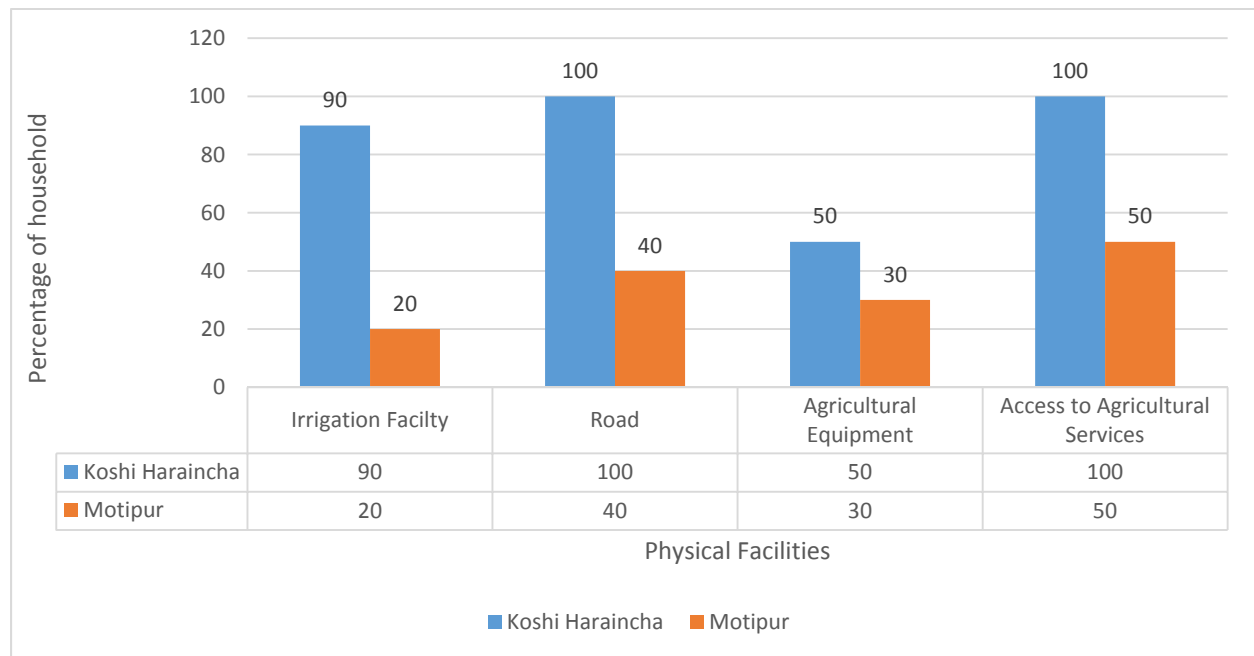
**Figure 8 Food Sufficiencies and Crop Sale through SRI**

According to the household survey, the farmers doing SRI have an access to food all year round in Govindapur. To change the sample size into the figure as mentioned in the graph, the numbers of cases were considered to simply calculate the percentage. The total numbers of respondents were used as a base for calculating the percentage. Based on the figure, more than 60% of the farmers

sell the crop produced from SRI in Govindapur village. The figure is not satisfactory in case of Lohasur where only half of the households of the total household surveyed have an access to food mainly due to the ownership of poor agricultural farm land. So, it's obvious that if they cannot produce enough for food then they have very little for sale.

### 3.1.2 Access to physical asset

The livelihood survival strategies also depends upon the availability of the physical assets around them. According to IFAD (2001), the access to asset is vital for inclusive growth and poverty reduction.



**Figure 9: Access to Physical Facilities in Govindapur and Lohasur Village**

For the purpose of this study, four physical assets were taken into accounts such as irrigation facility, road, agricultural equipment, and access to agricultural services. In Koshi Haraincha, almost 90% of the respondents have access to the irrigation facility as opposed to 20% respondent in Motipur. As they reported was mainly due to the availability of irrigation canal in front of the houses of respondents in Koshi Haraincha whereas in Motipur people are struggling to manage the water for



irrigation . Those who can manage water pump use the ground water for irrigation whereas the poorer people are stressed due to the lack of access to groundwater.

Likewise, in case of road facilities, people in Koshi Haraincha have their profit from SRI saved and invested in the communal road. The investment depends on the area of the house that is shared with the road whereas, in Motipur, people are dissatisfied due to the poor road access and market network. Among the other reasons, the hindrance in the physical facilities led people in Motipur not to adopt SRI. They also informed that they have to store their harvested crop for more than six months sometimes due to the poor road and market connection.

In terms of agricultural equipment, the farmers in Koshi Haraincha can buy the agricultural equipment they need. Almost 50% of the respondents replied that they have access to the agricultural resources in Koshi Haraincha mainly due to the increased purchasing power parity; this also indicates their improved livelihood. Those who have farmed SRI on a large scale want to give credit to SRI behind the improved livelihood whereas the small-scale farmers have the mixed response to their improved livelihood. The small and medium scale farmer signals towards the diversified sources of income for their better livelihood along with the gains from SRI. Only the 30% of the respondents have access to the agricultural equipment due to their low income from both the agriculture and other sources of livelihood. In addition to it, they are not much used to borrow the equipment from their neighbor as according to the respondents they don't prefer borrowing the things from the neighbor rather they wouldn't use it. Thus, the access and use of agricultural tools and equipment has a visible impact on SRI production i.e. one is better off as compared to its counterpart Motipur.

### **3.1.3 Access to Agricultural Services**

#### **Institutional Access and Access to Extension Services**

From the figure no. 9, it indicates that almost all the households interviewed in Koshi Haraincha have an access to the agricultural services. According to the Crop Development Officer in Agricultural service center, Morang, Nepal “ The Agriculture Service Center is trying its best to reach the farmers in need and also address best to the farmers who comes with their farm-related problems and issues. I also directly observed the interaction between the farmers and the officials in the Agriculture service center and was very impressed by the welcoming gesture of staff in the

service center. The service center was always flooded with farmers and their problems. It is because the farmers always get their solution from the service center. Morang District being one of the districts with largest agricultural activity, the service center has managed itself very remarkably.



**Figure 10: The seeds ready for distribution to farmers in the Agriculture Service Center**

However in Motipur, only 50% of the farmers have access to the agricultural service center. There are several factors contributing to this situation. As Lohasur doesn't have good road facility to come to the service center readily. Likewise, many farmers in Lohasur expressed that they don't have a functioning farmers group or association as a result of which there is no active group to take the initiative when it comes to solving the farm-related issues jointly. So, what happens is every person approaches the issues individually which is difficult for service centers to look at each case separately though they try to address each case as far as possible.

The extension services and monitoring are done quite frequently in both Govindapur and Lohasur. However; in Lohasur more women are active in agriculture rather than men. So, sometimes due to the multiple household tasks, women's mobility to improve their agricultural knowledge is limited. The improved access to agriculture extension services doesn't just solely depend upon the farmers or institution itself. It, therefore, depends upon the successful interaction among the farmers' availability and institutional availability to them. According to Eames and Adebowale (2002), the improved livelihood of the rural people depends upon the accessibility i.e. availability, affordability, and social inclusiveness to incorporate socially, politically and economically disadvantaged group. The well offered agricultural services can help to improve the way how they use the assets. Addressing to the changing context of farmers requires the innovation and its contextual implementation through the proper interaction among the stakeholders such as policy makers, service providers, agriculture officers, and the farmers respectively.

### **3.1.4 Natural Capital**

#### **SRI resistance to Climate Change and other Environmental Hazards**

According to one of the senior SRI Farmers in Govindapur, Koshi Haraincha Grain yields are increased by an average by 20-50%. The higher rate of production per unit of land lessens the strain towards cultivated land at the outlay of other ecosystems. These days the effects of climate change are more visible than ever in the environment. The most common damage found as a result of climate change is heavy rainfall and the storm that leads the rice plants to plunge into the ground. This can be shocking to the poor farmers as well as large-scale farmers. The collapsed crops are further rotten thereby making it difficult to harvest. So, according to Rudra Bhattarai, the soil scientist of NARC, Morang, Nepal: "one of the major benefits of SRI resisting the climate change is the deeper root systems and stronger straw which makes the plant resistant against the strong winds and storm (Field Interview, 2015)" In addition to strong roots and straw, SRI has also shown the best result to resist the pest damage. Due to the change in temperature and unusual rainfall pattern, there are high chances of increasing the pest despite the use of the low amount of agrochemicals.



**Figure 11: Preparation of organic manure out of cow dung using the local technique in home for using in the SRI Field**

Correspondingly, SRI plants according to the soil scientist of the NARC possess the root systems that go deep into the soil as a result of which the roots can get the enough soil moisture and nutrients. It especially plays the vital role in the dry areas where the rainfall pattern predominantly varies. In addition to this benefit, most of the SRI farmers use the homemade organic fertilizer. According to the senior officer of Agriculture Service Centre, the farmers are well trained to use the homemade organic fertilizers. Some of the organic fertilizers they use are vermicomposting, manure from livestock, etc. The technique thus saves the quality of soil from further degradation. Raut et al. (2010) states soil degradation as:

*“Soil degradation implies a decline in soil quality due to anthropogenic activities. It has mainly three principal processes: physical process includes crusting, compaction and erosion; chemical process includes nutrient depletion, leaching, acidification and salinization; and biological process includes depletion of soil organic matter and reduction in soil biodiversity.”*

Almost all of the farmers interviewed in Govindapur village of Koshi Haraincha municipality and Lohasur village of Motipur VDC are small landholder farmers who are not just motivated by the aim of agricultural benefit but they also possess the feeling of connection or ownership to their land. And since SRI primarily uses organic manure, most of them find it suitable to do SRI from the perspective of maintaining the soil quality and to prevent it from further deterioration. Well, this was just the small example among many other SRI beneficial factors. The minimum uses of chemical fertilizers retain the biotic component of the soil thereby enriching the soil health. According to the study conducted in Nepal in the mid hills of Nepal, Methane (CH<sub>4</sub>) and Nitrous Oxide (N<sub>2</sub>O) are among the greenhouse gases emitting from the agricultural intensification practices (Raut et al., 2010). As SRI are no more flooded with water leaving the room for no anaerobic action can help lessen the release of few possible greenhouse gasses such as methane and nitrous oxide. The use of organic fertilizer further generates the soil organic carbon thereby contributing to the carbon sequestration as well. Thus, SRI may have the bonus to the natural asset by proving its resilience towards the climate change, tolerance towards the drought and storms, pest control, and the adverse temperatures respectively.

### **3.1.5 Human Capital**

Contribution to the farmer’s knowledge and the knowledge application in the SRI Field

There is no doubt that the system of rice intensification (SRI) has definitely improved the farming governance. The governance literature believes problem-solving and opportunity creation as joint and interactive responsibilities of all party: state, market, civil society (Kooiman, 2003). According to Kooiman, by opportunity creating he means that the governmental responsibilities are handled keeping in mind the private needs and responsibilities whereas by problem-solving he means that the private sector are also concerned to fulfill the public needs. The literature on livelihood approach revolves around the fact that there is the kind of tradeoff between the public and private sector. This

trade-off has created the opportunities for farmers to grow from multidimensional perspective whether it's the knowledge creation or knowledge diffusion. The agricultural innovation approach emphasizes an access to sustainable farming as an ethical issue as it cares not just the people but also the environment. In addition to it, the SRI as the agricultural innovation approach not just focuses on quantity but also prioritizes the quality i.e. how the food is produced.

In Govindapur, almost 90% of the people are involved in the farmers group called "Himalaya Krishak Samuha" which is one of their robust capitals. The main reason behind the strong functioning of the group was none other than the feeling of cooperation to each other. The famers in Govindapur are quite encouraged to adopt SRI as a new technique. In the due course of adoption and taking the responsibility, the farmers have formed the group called "Himalaya Krishak Samuha" translates as "Himalayan Farmers Group" promoting the agriculture resource development in rural areas . The farmers groups exchange the agricultural ideas and are there for each other whenever needed. The group is led by the senior and experienced farmer of Govindapur community. According to the senior farmer, the group is well functioning and acts a contact point for almost all the farmers in Govindapur Village. They try to solve the common agricultural problem via the group whether it is the need for labor or access to any kind of assets.

In the context of Lohasur village, more than 90% of the farmers responded that they don't belong to any of the farmers group. They told that sometimes the programs are carried out on nearby village development committee office but not all get to attain the program due to the poor communication by village members. By this, they mean that villagers don't inform every household in the fear that they might progress ahead than the counterpart. Currently, there are no functional groups for solving the problem collectively. They also had the feeling of contention with each other as most of them are victim of rampant livestock invasion in their farms. Despite the repeated request not to let the livestock haphazardly, the neighbor would let their livestock attack the crop of neighbor for grazing. So, one of the respondent added that "How will we do SRI if that single seedling is eaten by livestock?" In addition to rampant grazing, they too have the problem of theft of agricultural products. So, these are some of the known reason from survey that had led to the dysfunctional group in Lohasur. One of the farmers stated the fact that most of the farmers prefer to work individually, they don't prefer to share the ideas with each other because they fear of each other

progress. So, their lack of solidarity among the community members suggest that they are seriously in need of motivational training for carrying out their work effectively. However, upon their request, I managed to form the group with the member of 16, and upon their consultation I named the group as “ Lohasur Women’s Group” as 70% of the respondents were women and all of the respondents suggested to create the women’s group though there were also few males in that group. The group was then notified to the official responsible for forming groups in Agriculture Service Centre, Biratnagar, Morang District. It is yet to know whether the group is working or not.

Beside the group, the farmers are satisfied with the labor force they needed in their farms. The labor is managed from both the family and paid/hired labor. The hired labors are mainly needed during the transplanting, weeding and harvesting season. The paid laborers were typically used by the old aged farmers who are more than 70 years old whose children are away from them either migrated to city in search of job or education. In terms of family labor, only the grown up adults were seen helping their parents and only if they are free or not engaged in either education or work. There was no any incidence of child labor noticed and heard.

All the respondents surveyed in his study admitted that they really do need the help of each other or appreciated the help they had with each other at one point or the other. The support was either in the form of an exchange labor called “*Perma*” or through the farmers groups or neighbors. One of the women farmers in Govindapur told that her sister in law helps her in the farm during the transplanting, applying fertilizer and weeding. For the famers in Koshi Haraincha, they have proved the slogan “Unite we create, Divide we fall”. Their social unity acts as the strong social asset to solve and celebrate together any sort of agricultural matters.

### 3.1.6 Financial capital

#### Income Assessment from the sources of livelihood

SRI possesses the better yield, but very few possess an idea about how the income or financial assets are channelized to gather other assets. In this study, the impact of SRI on income is the main area of concern. As most of the respondents have the diversified sources of income in addition to SRI, its bit challenging to gather the data on how actually do they earn from SRI as most of the respondents doesn't possess the sole SRI income information. Most of the farmers responded that they do SRI on small plots, and they sell whatever is left after the household consumption. The study was only limited to those who did SRI; the non-SRI farmers were not surveyed or interviewed. Most of SRI farmers are involved in vegetable farming, horticulture, and they have equally satisfying income from those diversified sources as well. The farmers were not able to respond the exact income from SRI as most of them were small and medium scale farmers with multiple sources of income. But however, most of them stated that the production has increased by four fold.

Table 5 Table showing the crop yield through Conventional and SRI Method in Govindapur

Mode of Transplantation	Yield (Tonn per Hectare)	+Tonn/Hectare	Percentage Increase
Conventional Method	7		
SRI	10	+3	42%

SRI production increases by fourfold as compared to the traditional method of crop production According to the field data (2015), the crop production through SRI has increased by fourfold as compared to the traditional method. The farmers are extremely satisfied relating to the increased production as they are also able to increase their income from crop production remarkably. The farmers in Lohasur felt reluctant to provide the yield data as most of them are partial adopters and many of them didn't remember the exact yield.



## **Access to Credit**

An access to credit is a crucial medium for the poor farmers to invest in the income generating opportunities for their livelihood. The credit facility reduces the financial vulnerability of farmers to their wellbeing. According to the farmers' response from focused group discussion, the farmers stated that they require credit especially for the farming inputs such as buying the machines and equipment, paying the wages, buying the fertilizers, transportation fare, and other market-related functions respectively (Field Visit, 2015). According to the survey result, all the farmers in Govindapur and Lohasur have an access to credit especially through the nearby microfinance and credit services. The favourable part of the credit facility is they don't need to keep the collateral to receive the credit.

One of the beneficiaries of the credit services states that the agricultural credit facility has helped him boost his agricultural production and has helped in breaking the vicious cycle of poverty in his family. He was quite successful in using the credit to expand his agricultural investment. Due to the location of markets in the vicinity and even the bigger city Biratnagar and Itahari, there are lots of saving and credit agencies available to offer the credit. Surprisingly, all the farmers possess the good loan repayment status too. There were only negligible farmers who are still paying the loans.

### **3.2 Significance of SRI as compared to traditional method**

The common trend regarding any technical adoption is that any new techniques or technology will replace the old one. The replacement will invite the new way of doing the things by transforming the function more effectively and competently. In case of crop production through SRI and the traditional method, both the technologies are running parallel to each other. It is because those farmers who are not well compatible with SRI still are continuing the traditional method of farming. The system of rice intensification to many farmers appeared as the modification of farming technique and ideas rather than the radical change. So, as far as the significance of SRI to the traditional method is concerned, people still have mix response due to the suitability factor and context respectively. Those are satisfied with SRI are those who can conveniently follow the SRI principles and well adapt to them. So, the significance of SRI is for those who have well adapted the SRI than those who attempted to adopt but couldn't continue. So, from the field study, it is proven that the farmers in Govindapur community have well adapted SRI and SRI is significant to

them whereas the people in Motipur couldn't adapt to SRI or follow the SRI principles due to several aforementioned factors discussed above. SRI has multiple significance whether it's higher yield or better adaptability to climate change, the rice produced from SRI are often sold with higher prices according to the local farmers in Govindapur as the SRI often uses the organic manure.

### **Shorter growing season**

According to the study done in Govindapur Village in Koshi Haraincha Municipality, the farmers mentioned that the crop grown through SRI is ready to harvest in 1-2 weeks, and sometimes even three weeks earlier than the crop grown through the traditional method. The shorter growing season has opened up both the environmental and economic advantages for farmers. Farmers can repeatedly utilize the field for a short-season crop like vegetables and other cash crops. A shorter growing period cut down the water need and the crop's exposure to pests and storms that arrive late in the season.

Since SRI was introduced to farmers with the intention of achieving more output with the fewer input costs, and also to guarantee the food security thereby improving the livelihood. If farmers are successful to improve the productivity and yield income better than the conventional method, then it can be considered success. However, there could be some cases where farmers are unable to follow the entire SRI principles then it could form a good basis of evaluation regarding why SRI didn't work for certain population and context respectively. Well, simply following the SRI principle could not be the Key to SRI success, there could be equally challenging factor to hinder its success such as availability of natural base such as water, location of farm such as slope, household members engagement to farm and off-farm activities, technologies used etc. that can influence the intensity of production.

### **Acknowledgment to SRI Management Method**

The main supporting idea that makes SRI robust in terms of livelihood study is none other than its management method. As we discussed in the literature review, SRI is followed by the set of principles. So, this study also found that those who have followed best the SRI principles have achieved the greater success. According to the Regional Director of NARC in Morang District, Nepal "the difference only lies in the cultivating and nurturing environment of the crop." Some of the examples include the methods of transplanting, pest management, watering, reduced crop cycle

and improved plant position. The soil scientist of NARC states: the procedures followed in the system of rice intensification cut down the plants dependability on the external supplies that otherwise could have been needed by the traditional method of rice production.” He thus pointed towards knowing and acting how soil nutrients are well balanced through the practice that can positively influence the whole soil biota. However, many critics argue that the technique is requiring the high cost such as modern equipment, high labor cost have less chance of being successful to bring out sustainable agriculture transformation. Most of the farmers in Motipur agreed that SRI consumes considerable amount of time and effort as compared to the traditional method but meanwhile they also acknowledged the fact of higher production on the cost of time and effort invested. For them, what limited SRI practice is none other than the investment in labor, labor and water management was crucial to them in addition to the occurring damages like theft, rats, rampant grazing. But however, they are looking forward to doing SRI if canal is constructed for irrigation. The farmers in Govindapur rejected this fact that SRI consumes all the time and effort leading to the problem of the mono-cropping community has managed to do SRI along with keeping the livestock, fishing, and other farm related activities. The criticism faced by SRI demands the vigorous research in the field otherwise the growing critic may affect that farmer’s willingness to adopt SRI.

### **3.3 Knowing the Farmers Perception on the adoption of SRI**

The adoptions of any new sort of technology are intended for the growth and development. The rate of SRI adoption varied in a considerable amount in both the communities. The Govindapur community in Koshi Haraincha has well adopted the system of rice intensification whereas the Lohasur communities of Motipur are far behind concerning SRI adoption though both of them were introduced with SRI. The result of focused group discussion showed that the scale of adoption depends upon the availability of supporting technology such as mechanization of agricultural tools, efficient government policies in terms of farmers’ benefits like subsidies, and good farmers’ education and extension facility for the societal acceptance of that technology. This noteworthy adoption pattern among these two communities in the same districts speaks about not just the technological suitability to follow SRI principles but also signals towards socio-economic issues.

As most of the farming techniques are successful under the similar context and environment, sometimes the community factors also have an impact on it. For example, the formation of some farmers' group for taking collective action, its connection to the market center and so on. The technology adoption in these two communities can be perceived as communal differences. The attitude of people in the Govindapur community of Koshi haraincha was welcoming and they continued to practice SRI despite the occurrence of problems from time to time, whereas in Motipur, the behavioral intentions towards the SRI seem to be influenced by the lack of resources. Also, the increasing number of partial adopters and non-adopters has also influenced the communal decision to discontinue SRI.

From the field study, it was found that 90% of the respondents in Govindapur Community are SRI adopters, i.e. they practice SRI by following more or less the SRI principles. Most of them are active SRI adopters where they seek to practice SRI in its full potential, whereas, in Lohasur community of Motipur, the figure is quite opposite. Only 10% of respondents have continued or recently left doing SRI due to issues like lack of canal for irrigation, tools and equipment required for doing SRI such as weeder.

What is urging the adoption of SRI is a question to give attention to. From the farmers' point of view in Lohasur Village, it's the quest for the low investment and high productivity which can drive any farmer for a new agricultural experiment. If the input is time and cost consuming, it will distract farmers from the adoption of technology. These days the higher level of food awareness among consumers leads farmers to grow things organically. People want the food that helps them to live longer and are produced while taking care of the environment. Due to the presence of the majority of poor and middle-class people in Nepal, they need something that incurs the low cost but meanwhile having good quality. Correspondingly, due to the increase in the number of health-conscious population, people are willing to pay the high cost for the food that is produced organically with less environmental and animal harm. Many farmers who have the good institutional access to the nearby agricultural offices and are informed have the knowledge about the organic food demands of the aware population. The informed and educated farmers readily adopt the technology to meet the need of market demand. Of course, they would see their beneficial aspect too. But the poor and marginalized farmers may not have information regarding the changing demands of people,

policies as a result of which they don't seem ready to continue the technology they have been trained with.

The demand for organic and environmentally healthy food is growing day by day on one hand whereas, on the other hand, it is equally challenging to meet the farmers' agricultural demand to realize the adoption of technology. According to the experienced SRI adopter of Govindapur Community, to practice SRI in the large scale demands the basic tools such as rice transplanter machineries to produce the rice in a huge scale. As there is the huge spending on labor, not all farmers are ready to afford the cost. Approach to the assets in the farming communities of Govindapur and Lohasur are diverse. As we already discussed in the access to physical assets above, it reveals that the access to assets directly influences the mindset of people to accept or reject the technology. People will only accept certain new things when they find it beneficial and convenient to use. From the focused group discussion, farmers expressed that SRI is beneficial but it's bit hard to maintain the stability each season as agriculture in Nepal is usually rain-fed and high rainfall sometimes cause water logging thereby causing the root to decay. One of the lady farmers named expressed in FGD that last year she happened to face huge damage in crop production through SRI due to the heavy storm; she only had the vegetable left that year. She told that the farmers don't possess any modern mechanism to withstand the natural calamities. On one hand, there's the calamity factor behind the stability of SRI whereas, on the other hand, in Lohasur community they face the problem of proper marketing facilities of what they have produced. Few farmers in Lohasur community expressed that most of the time the rice remains stored in the storage for more than five to six months as a result of which they feel that their income is affected due to the slow sale of rice. The stored rice sacks, on the other hand, are sometimes cut by the mice or rats that increase their workload too. Thus, the success of SRI in Lohasur community of Motipur VDC would be realized only when the market failures are corrected which is not possible through the local level, only the policy reforms can address the issues of market and other physical facilities.

### **3.4 Understanding the constraints to the adoption of SRI technique**

The adoption of technology is not always straightforward. The SRI adopters are not just the one who have readily adopted or not adopted. The study done in Govindapur and Lohasur village reveals that there also exists the kind of adopters who takes a considerable amount of time to adopt or let's say they are on and off concerning adoption. The farmers in Govindapur are highly motivated when the extension officers regularly visit them and often visit their field as monitoring. Through the monitoring both the parties can also put forward their farm-related issues for further improvement. So, it sounds that farmers often need guidance to carry on the SRI technique they have adopted. Based on this logic, the farmers in Lohasur Village may need the same for them to enable to adopt SRI. But since they already lack the basic agricultural infrastructure to carry out SRI smoothly, it's not under the jurisdiction of agricultural extension officers who could promise them to fix irrigation canal and related problem. It is something related to the development policy of the village development committee or the local government as a whole. But however, agriculture service center can pressurize the concerned authority to fix the basic agricultural infrastructure to smoothen the adoption of technology respectively.



**Figure 12: Brief Group Discussion after Survey in Lohasur Village of Motipur VDC**

The attitude of farmers towards the risk of SRI in Lohasur is also a socio-cultural problem. As it is upon the self-aware cattle owners who shouldn't let their livestock rampantly into another farmer's field but according to the respondent they enjoy letting their cattle on the field as they don't have to go far away to fetch the fodder to the livestock. The control to this sort of behavior requires the regulations to tighten the uncontrolled grazing of crops by civilizing the farmers through some sort of motivation programs. Thus, for both the quick and slow adopter, it signals towards the governmental policies. One of the active SRI adopter in Govindapur states that they are really disappointed by the fact that some of the agricultural policies are not being supportive towards the poor farmers, he gave an instance of decrease in subsidies by the government that they used to receive for fertilizers. In the similar manner, a lady farmer from the same village stated that she

needed to invest a lot initially for doing SRI and due to the financial limitation she happened to grow crop from the conventional method last year despite knowing that SRI possess the good yield. But from this year, she is again planning to carry out SRI as her son is sending some money from abroad, and she can invest some money on SRI. This sort of instance signals towards the need of some initial investment to carry out SRI in case of large-scale farmers. The sustainability issue is always there in SRI, but it cannot be guaranteed that every farmer do care about sustainability i.e. every farmer may not be aware due to the lack of knowledge. The majority of farmers only care sustainability if it's profitable to them for e.g. Large Scale production of organic manure may take a longer time and effort that may demotivate farmer to make organic manure. The point is there should be some system that accredits farmers for doing the sustainable farming practice. Unless the government provides some sort of incentives to farmers for adopting sustainable technology, there are fewer chances the farmers feel accountable to the environment or the government. However, the farmers are still in its infant stage when it comes to sustainability perspective assessment in farming. In addition to it, measuring the sustainability requires not the production and productivity but it takes into account the socio-cultural, environmental and moral issues.

### **3.5 Compatibility of SRI with small-scale farmers**

The life of the smallholder farmers mostly dependent on agriculture is directly influenced by the time and effort they spend on agriculture. With the introduction of SRI in Madagascar, the agricultural world waited to see if it works in other parts of the world under varied circumstances. But SRI didn't just work but it proved magical to many small-scale farmers. Similar is the case with farmers of Govindapur village in Koshi Haraincha Municipality. The local farmers in focused group discussion agreed that SRI has proven successful in Govindapur village to respond to the previous burden of high input, dissatisfactory output problem. The poor farmers in Nepal have always suffered from the poor performance as compared to the pre-investment made. The Local farmers in Govindapur agreed that they heavily relied on the chemical fertilizer on the past to improve the productivity. The prolonged use of the chemical fertilizers would have made their land infertile for their generation to use. Not just the reduction of seeds and water fascinated the smallholder a farmer; the best part is only one woman can handle the land for farming. All the women participants



involved in focused group discussion were active SRI farmers who could handle the field alone. Most of their husbands were engaged in other sectors in addition to the farm.

What they wanted to try was the compatibility factor. Surprisingly, the farmers who didn't even attend farmers' field school also performed best by learning with the colleague. According to the focused group discussion, the farmers heard the rumors that it required more labor but in reality, it was opposite for smallholder farmers as they could easily manage the labor from the household in a small farm. But for the farmers who were doing SRI in Motipur, only few of them had weeder which led many not to do SRI because weeds expand faster in SRI technique than the traditional flooded method of rice cultivation mainly due to the wider spacing left during plantation. There is also further advanced equipment like a rotating hoe, but majority of small-scale farmers couldn't afford to buy the rotating hoe. Furthermore, SRI was found best compatible for those small-scale farmers with the open door to irrigation facility, land ownership and the situation of the farmland near by their home. In the same Govindapur village, one of the farmers land was located in the lowland where there can be the problem of water logging during heavy rainfall.

According to Uphoff (2002),

*SRI has not taken the full-fledged shape, and the technique is still under construction with the efforts particularly of farmers. It is a premature attempt to give a specific conclusion to SRI the process itself being in formulation and reformulation. As Such, it provides a platform for the students of innovation systems.*

In the aforementioned statement, Uphoff highlights SRI being the progressive process rather than a full fledged technique. It suggests that farmers can still come across the unusual situations despite following the SRI principles. On the other hand, the farmers can still make SRI better through their own innovative technique in accordance with need. Besides Farmers Field School Training, there was no specific education program as such to educate farmers except the guidance and instructions of extension and agricultural officers. Therefore, those who happened to miss the farmers' field school learned from their neighbor or relatives to do SRI. After all, what they wanted to try was the compatibility factor. Surprisingly, the farmers who didn't even attend farmers' field school also performed best by learning with the colleague.



**Figure 13: Use of manual weeder in their own SRI Field; Weeder is one of the must equipment for SRI Field management**

According to the focused group discussion, the farmers heard the rumors that it required more labor but in reality, it was opposite for smallholder farmers as they could easily manage the labor from the household in a small farm. But for the farmers who were doing SRI in Lohasur, only few of them had weeder which led many not to do SRI because weeds expand faster in SRI technique than the traditional flooded method of rice cultivation mainly due to the wider spacing left during plantation. There are also further advanced equipment like rotating hoe but majority of small-scale farmers couldn't afford to buy the rotating hoe. Furthermore, SRI was found best compatible for those small-scale farmers with open door to irrigation facility, land ownership and the situation of the farmland near by their home. In the same Govindapur village, one of the farmers land was located in the lowland where there can be the problem of water logging during heavy rainfall so she was unable to practice SRI in the swampy land during rainy season. Many agree that with SRI the workload is quite lessened due to the less time required for the field management which allow them

to invest time in other yields like vegetables, livestock etc. Besides some of the challenges, SRI proved its compatibility with small-scale farmers especially from the labor requirement point of view.

Despite having the numbers of benefits as compared to the traditional rice cultivation practices, SRI still poses some limitations that we cannot ignore. The study from Govindapur and Lohasur village revealed the fact that many farmers have discontinued SRI due to some reasons (Field data, 2015). One of the reasons is different farmers practice SRI under varied conditions. So, it's an undeniable fact that some of them face the situations where SRI is not well suited or adapted. The limitation doesn't mean that SRI is ineffective, but the fact that farmers are discontinuing to do SRI poses the serious questions regarding its adoptability. Therefore, the concerned stakeholders and authorities from the government of Nepal should turn their attention towards the extensive research behind the problems of discontinuation of SRI respectively.

## **Chapter 4: Conclusion and Summary**

### **4.1 Conclusion**

To review the livelihood through innovative agricultural reform, the following objectives have been addressed: how the adoption of SRI has influenced the livelihood assets and how the availability of the asset has influenced SRI adoption. With the purpose of evaluating the relation between assets and adoption, the study relies on the livelihood approach and agricultural innovation approach. Firstly, I identified the influence of SRI on the livelihood in the farming households in Govindapur and Lohasur village. I tried to describe the livelihood asset as drawn in the conceptual framework and their link with the system of rice intensification and agricultural innovation respectively. Secondly, the significance of SRI over the conventional method has been briefly discussed to see how the invitation of new technique and ideas transforms the way of things in a progressive manner. Finally, I analyzed the farmers' adoption decision and constraints of SRI. The descriptive analysis showed that the proper availability of assets plays the crucial role in the adoption decision. The highest adopters were among those with good access to assets and also the one with small land holdings as it's easier to carry out SRI in small land from the labor requirement perspective.

From the study in Govindapur and Lohasur village, it can be concluded that if well managed the system of rice intensification can emerge as an economical approach to ensure the food security and reducing the poverty. It not just benefits the humankind but also leaves both short and long-term positive effects on the surrounding environment too. The result from Govindapur displayed that SRI has challenged the practices of high water requirement for rice cultivation thereby lessening the need of more electricity for using the groundwater pump. The result from the field study supports the adoption of SRI as it not just address the farmers but also address the governmental agenda in the multidimensional aspect of food, agriculture, and environment.

What we all are waiting for is the government's action and agenda to accomplish SRI, not just in few limited area but the country as a whole. In Govindapur community, the farmers' association named as "Himalayan Farmers Group" is playing the tremendous role to accelerate the exchange of SRI techniques and ideas among the farmers not only in their area but also to other places. According to the one of the active SRI adopter, he has been to many places aligning with Agriculture

Service Center, Belbari to teach other farmers regarding how to effectively carry out SRI. In addition to this, the association has set itself as a model for practicing environmentally friendly farming practices. Farmers group are quite active in taking the community development engagements. This is visible from the addition of the communal properties like black topped road from the contribution of each household.

Though the study from Lohasur village of Motipur didn't expose the tangible benefit from SRI, it was mainly due to the poor adoption rate. The poor adoption rate is mainly due to the behavioral and psycho-social aspect of the technique adoption. The main reason behind signaling towards their behavioral aspect is their inability to realize the benefits of SRI due to the lack of education. Besides educational factor, it's also the bitter reality that they lack all of these: tools and equipment, poor knowledge about agricultural support policies, conservative attitude and lack of solidarity among the community farmers; field specific constraints such as irrigation and haphazard grazing; unaffordability of input and labor cost etc. So, sometimes these sort of psychological factors should also be taken into account to address the inside issue of technology adoption. Any agricultural innovation doesn't guarantee its successful implementation; the success of innovation depends upon the effective diffusion and long-lasting adoption.

The mixture of adopters and partial adopters in both of these villages and their diversified sources of income makes it bit difficult to evaluate whether it is the impact of SRI that has made the SRI adopters better off in Govindapur village. The study comes up with the conclusion that farmers have advanced their technique of crop production which benefits both the human and natural being for the short and long term. SRI has shifted the focus not only to increase the production but to enhance the sustainable practices thereby making the farmers more aware and educated. The research efforts, farmers' education, proper information dissemination and frequent monitoring by the concerned personnel of Agriculture Service Center, Belbari has well realized in Govindapur village whereas Lohasur village needs some improvements to uplift their present deficiencies. But to realize its highest outcome, the bottlenecks to achieving the full potential in other areas needs the governments' attention and action. The agricultural policies in Nepal are at its best its equitable distribution has always been the issue. It is, therefore, the equitable development policy needs to be

exercised both by the local and central government for facilitating the adoption of techniques like SRI. Thus, the sole responsibility of adoption of SRI technique doesn't just rest upon farmers and local agricultural authorities rather it's a joint venture of concerned stakeholders.

The assessment of this study can be helpful in the related area in the number of ways. The study is carried out in two villages where one is bit better-off than the other in terms of access to assets. The compositions of farmers were also made up of the farmers with access to resources and inadequate access to assets. So, the community with the access to the resource has come up with different analysis than the one with poor access to resources. It is, therefore, the assessment of this study can be relevant to other related scenario.

#### **4.2 Limitations of the study**

The first and foremost constraints in the study was the availability of statistical profile of Govindapur Community of Koshi haraincha municipality and Lohasur Community of Motipur VDC as a result of which much of the background information regarding the area is not provided in this study. Secondly, the duration for the field was not long enough thereby putting pressure on the researcher, administrative staff with whom I sought the help, and also some farmers who needed to invite participants for an interview. In the similar manner, it was difficult to reach out to the government officials for key informant interview. The mail was sent to 7 people proposing for an interview as a key informant, hardly one of them replied despite mentioning all the things about study very clearly. However, this was somewhere expected viewing the current situation of Nepal. People are still living in Trauma due to the recurring earthquake and its aftershock. However, the eastern region where I went to the field was not much affected in comparison to the physical and mental harm in the central region of Nepal.

### **4.3 Recommendations**

Given the fact that SRI can play an important role to improve the traditional system of crop production, the following recommendations are made following the observation and results of this study. The recommendation below also represents the voice of farmers in Govindapur and Lohasur village.

1. The SRI farmers in Govindapur Village yearn for agricultural mechanization. Mechanization of Rice production should be done to reduce the workload of medium and large scale farmers. But the mechanization should be done in a way so that it doesn't reduce the prospect of poor laborers to undertake agricultural activities. The mechanization should be done recognizing the levels of farmers' viz. Small, medium and large scale farmers so that every farmer can afford the mechanization process depending upon their need such as the size of the farm. There should be the sufficient agricultural engineers for the country for the stable facilitation of services like mechanization.
2. The diversity of farmers and their fields should be well acknowledged by the local agricultural and extension officers. The difference in SRI performance between the Govindapur and Lohasur proved the theme "One Size doesn't fit all". So, there should be the tailor-made extension facilities and programs to respect the diversity of farmers and their farms. For this, Pilot study of the area should be done to determine whether the area possess the good access to assets that would lead to the success of agricultural innovation.
3. The study on Lohasur suggested that upon the availability of irrigation and transportation facilities, the farmers are looking forward to following SRI. The water management hindrance is not just for people of Lohasur; rather few farmers of Govindapur are seeking the solution to controlling water in their low-lying land where rice field remains continuously submerged during the rainy season. So, there should be the irrigation facility in Lohasur Village and some technique for water control in low-lying areas in both of these villages.
4. The results in the study suggested that farmers lack the sufficient organic manure than what they actually need in their SRI Field. Though they told that use vermicomposting along with recycling of rice straw and manure from the livestock, vermicomposting takes considerably long time (5 to 6

months) to prepare. In addition to it, despite having the knowledge of vermicomposting, few farmers don't go for it due to the odor it creates. Mentioned above is one of the many pre-conditions. It is therefore even within the SRI sector, the pre-conditions for doing SRI should be well analyzed before introducing it in any new area.

5. Last but not the least, the partial adoption rate of farmers in Lohasur showed the inability to adopt SRI. It signals towards the need of extensive research on SRI. So, there should be proper field-based analysis regarding the performances, hindrances and the opportunities of SRI. There should be the monitoring and evaluation of SRI Fields. All the mentioned aspects points towards the active institutional policies. The policymakers should address the institutional context of agricultural innovation. If not addressed, there should be the pressure by the civil society and concerned stakeholders to deliver the services. The Government should always inspire both the private and commercial farmers by enacting the farmer-friendly agricultural policies.



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## Appendices

### *Appendix 1 Household Survey*

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I want to explore your livelihood relating to the System of Rice Intensification (SRI) before its introduction and after its adoption. I want to know how SRI affected your lives and what more do you expect to make the adoption of SRI successful

#### **General information**

Sample no:

Date:

Village:

#### **Respondent Information**

- 1) Name of Respondent:
- 2) Sex: Male (0) Female (1)
- 3) Age:
- 4) Education (Years):

#### **Household Information**

- 5) Please provide information about the members of your household. Please provide sex, age, education and occupation for each member.

S. No	Members	Sex	Age	Education	Profession
1					
2					
3					
4					
5					
6					
7					

#### **Questions Related to SRI Adoption**

- 6) Have you ever owned SRI method?
  - a. Adopted SRI
  - b. Never adopted SRI
  - c. Adopted but discontinued SRI (Partial Adopter)

7) When did you adopt SRI? If yes, what made you to adopt SRI?

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8) If not ever owned SRI or discontinued, why?

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9) What area of agricultural land do you own? \_\_\_\_\_

10) What area of agricultural land do you cultivate now? \_\_\_\_\_

11) Do you use traditional method or SRI method? \_\_\_\_\_

12) If it's traditional, what made you to retain the traditional method? \_\_\_\_\_

13) If it's SRI, what area of land do you cultivate with SRI? \_\_\_\_\_

**Questions Related to Assets Needed for SRI Implementation**

14. Do you have sufficient water for SRI in your field? Yes/no

15. When do you practice SRI?

- 1) Rainy Season
- 2) Dry Season
- 3) Both
- 4) Never

16. Are there any fluctuation in the need of assets depending on seasons? Yes/No

17. If yes, how do you solve the asset related problems?

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18) How many sack of rice did you sell before the SRI program per season?

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19) What portion of rice (sack) do you sell and how many sacks do you use for household consumption per year?

---



20) What are the operating cost of SRI farming in both the dry season and wet season?

Expenses	Dry Season	Wet Season
Seeds		
Fertilizer		
Pesticides		
Labor		
Other (such as maintenance, natural calamities damage etc.)		

21) Do you share what you learn concerning SRI or other agricultural information? Yes/ No

22) What do you suggest to fulfill the asset related requirement for farmers?

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### **Social Capital**

24) Are any members of the household participating in any of the social organizations?

a. Religious Groups b. Labour union c. Farm related organizations d. Water user/forest/NRM group f. Women's group g. Other (specify)

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25) If you need any farm related support, who would you call for?

a. relatives b. neighbor c. religious groups' d. community leaders, Other

---

26) Which organizations have you joined since participating in the SRI program (new memberships if any)?

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27) Are there any organizations that you have left participating since your involvement in SRI?

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### Financial Capital

28) Please mention your sources of household income. Please estimate the amount earned from each one (if possible).

Income source	Amount

29) What was the main source of income in your family before the adoption of SRI?

---

30) Do you have the credit facility? Yes/ No.

31) If yes, have you ever borrowed for investment in SRI? Were you able to repay the debt?

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### Physical Capital

32) Please mention the assets you have added since adopting SRI?

Asset	Added	Lost

33) How has the access to infrastructure changed after an adoption of SRI?

Utility	Increased	Decreased	Same
Electricity			
Irrigation facilities			
Drinking water			
Road/Transportation options			
Schools			
Other			

**Perceptions on Climate Change, Mitigation and Adaptation**

35) Have you heard about Climate change?

- a. Yes (1)    b. No(2)

36) Have you experienced any of the following impacts on your farming practices?

- a. None                                  b. Low rainfall                                  c. Flooding
- d. Increase in Temperature    e. Reduction in Crop yield.                                  f. Water Shortage
- g. Drought e. Others (specify).....

**Questions related to vulnerability context**

37) Is the income from SRI enough based on the expenses on SRI?

- a) Not sufficient b) just hand to mouth for survival c) some saving after expenses d) good saving

38) Do you have any problem with the irrigation? If yes, how has it affected to practice SRI ?

39) Please rank your top four perceived risks to sustaining income increases from SRI farming?

Risk	Ranking
Irrigation Facility	
Drought	
Market Price fluctuations	
Pests	
Flooding	
Transportation Facilities	
Other	
None	

40) How long do you store the crop after harvesting? \_\_\_\_\_

41) Do you have good storage facility? Yes/No

42) Does the production from SRI allow you and your family to consume all year round Yes/No?

43) Do you contribute either financial or physical services for communal benefit?

## *Appendix 2: Focus Group Discussion Guide*

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**Attendee:** The number of participants in FGD will be 10. The participants were gathered with the help from the Agriculture Service Center, Belbari. However, snowball sampling was employed to gather 10 participants. The pioneer farmers along with the new farmers who have received the trainings on SRI will be selected. During the selection process, the gender diversity will be addressed. Besides, the SRI adopters with their affiliation to some organizations will be sought.

**Informed Consent:** The participants for focused group discussion will be invited by sending the informed consent letter requesting for their time and availability. The device used will be audiotape. So, the participants will be informed that what they state will be recorded.

**Moderator:** The researcher belonging to the same country as the participants will play the role of moderator/facilitator.

**Data collection:** The discussions will both be noted handwritten and recorded.

**Venue for Focus Group:** The home compound of one of farmers will be used as a meeting place upon the agreement of home owner. The participants will be pre-informed regarding the time and location of FGD. The tentative time allocated for FGD is 60-90 minutes with the possibility of extension up to 30 more minutes if needed. The participants will be asked if they need the break in between.

**Pre-meeting preparation:** The required arrangement will be planned to ensure that the discussion area is free from any sort of sound pollution. The Seating will be arranged to ensure the comfort and convenience for group discussion.

**Opening the FGD:** The moderator will begin by introducing oneself and will state the purpose of the discussion. Participants will be asked if they can allocate an hour of time. The moderator will ask each participant to introduce each other. The discussion will be based on the questions that will be extracted during the field study, prepared questions and the questions pops up from the discussion at the mean time. The discussion will respect the diversity of each participant so that no one feels discriminated.

Discussion guide: The discussion guide presented below serves to shape the FGD. Referring to the data collected from the household survey and expert interviews, the discussion questions will be formulated.

Engagement:

- Each Participant will be requested to share their experience related to SRI within the limited time frame
- Engagement device: Presentation of SRI performance of Govindapur and Lohasur village

Exploration questions:

- The general question will be first put forward. Since the respondents in Govindapur didn't have concrete answer to the question of improved livelihood via SRI. The common question: Do you think there is any difference in your lives due to SRI" was put forward.
- Despite SRI having much higher productivity and income, why are people still sticking to the low yielding conventional method? What opinion do you have on this?
- How do the farmers deal with the uncertain adversities like calamities? Who are responsible and liable to compensate in such situation?
- Can you list the suggestions to facilitate the SRI adoption in an area with minimal availability of assets?

Exit question:

- Is there any thing that you as a SRI adopter want to share? Feel free to share, the floor is open.

*Appendix 3: INFORMED CONSENT*

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My name is Sadhana Rana, the student from Norwegian University of Life Sciences (NMBU), Ås pursuing Masters in International Development Studies. The main objective behind my arrival in the village is to carry out the study on livelihood concerning adoption of system of rice intensification (SRI) in Nepal. The title of my study is *Transforming livelihood through innovative agricultural reform: an insight into the adoption of system of rice intensification (SRI) in Nepal*.

I would humbly request for your kind co-operation by participating in this study. The study is purely meant for an academic purpose. I would therefore comply with the confidentiality and anonymity. The response which you want me to keep confidential would remain confidential between you as a respondent and me as a researcher.

If you wish to participate in FGD, please see the following date and venue.

Date:

Venue:

Allocated Time: 60 – 90 Minutes

Thank you for your kind cooperation,

Signature.....

Date.....



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