THE SYSTEM OF RICE INTENSIFICATION (SRI): COMPLICATING THE GLOBAL NARRATIVE

An exploratory, qualitative study based on fieldwork in Nepal’s Terai

by

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Abstract

The System of Rice Intensification (SRI) developed in Madagascar by French Jesuit and agricultural scientist Fr. Henri de Laulanie in the 1980s has since been propagated to over 50 countries worldwide. By transplanting younger seedlings, increasing the spacing between individual plants, irrigating intermittently and consistently aerating the soil, SRI promises to increase global rice production to twice the 3.7 t/ha currently experienced (Uphoff, 2003). Notwithstanding regional variance (Uphoff, 2003) and contestation of the results (Sheehy et al., 2005), SRI advocates in various countries posit SRI as an agro-ecological innovation that is an alternative to top-down, input-intensive agriculture, yet can greatly expand yields and farm incomes. These properties are argued to be particularly important in a world of rising temperatures and increased demand for foodstuffs.

In projecting SRI as a singular solution to current and future constraints upon rice production, however, little attention has been given to its translation and embedding within diverse socio-ecological settings. Given that socio-ecological and political climates vary greatly from region to region, my broad research question uses political agronomy as a theoretical framework to ask: what social realities are silenced in order to craft a narrative in which SRI can become a universal driver of agricultural development? Through ten weeks of participatory observation and interviews with farmers, NGO representatives, researchers and extension officers directly involved in SRI in two districts in Nepal’s Terai, (Chitwan and Morang), I was able to observe how SRI is enacted in unique settings. The aim of this project was to understand how SRI practices are institutionalized on the ground and whether broad characteristics lead specific types of farmers to gravitate towards, or be selected for, the adoption of SRI (such as land holdings or access to water and institutional channels such as bank credit and agricultural
extension). In asking these questions, this research aims to more adequately assess SRI's suitability as a global agricultural innovation.
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Nepali Terms and Measurements

- Adhiya – a sharecropping system whereby the landlord and tenant split the costs of inputs (fertilizers, pesticides and seed) and any crop yield by 50%.

- Tekkha – a sharecropping system whereby the tenant is required to give the landlord a set amount of paddy each year. The tenant keeps 100% of anything else they grow.

- Dhur – a unit of land measurement. 20 dhur are equal to 1 kattha. There are 16.5 square metres in one dhur.

- Kattha – a unit of land measurement. There are 20 kattha in 1 bigha. It is equivalent to 0.0335 ha, or 335 square metres.

- Bigha – a unit of land measurement. 1 bigha is equal to 20 kattha. It is equivalent to 0.67 ha or 6666 square metres.

- Maund – a unit of mass measurement used in Nepal. It is equivalent to 37.32 kg.

- Bitha – a unit of distance measurement in Nepal. It is the space between the outstretched pinky finger and thumb.

- Hatt – a unit of distance measurement in Nepal. It is the space between the elbow to the tip of the fingers.

- Parma - a term used to describe a co-operative labour system in Nepal, whereby all members of the community would help each other to complete work in their fields.
List of Abbreviations

BMGF – The Bill and Melinda Gates Foundation
CGIAR – Consultative Group for International Agricultural Research
CIIFAD – Cornell Institute for International Food, Agriculture, and Development
DADO – District Agricultural Development Office
DAO – District Agricultural Officer
EACU – Emergency Agricultural Coordination Unit
FAO – Food and Agriculture Organization
FAYA - Forum for Awareness and Youth Activity
INGO – International Non-Governmental Organization
IRRI – International Rice Research Institute
MoAD – Ministry of Agricultural Development (Nepal)
NARC – Nepal Agriculture Research Council
NGO – Non-Governmental Organization
NRP – Nepalese Rupee, equivalent to $0.012 Canadian Dollars. ($1CDN = 82 NPR)
SRI – The System of Rice Intensification
UN – The United Nations
USAID – United States Agency for International Development
VDC – Village Development Committee
WB – The World Bank Institute
WFP – The World Food Programme
Chapter 1

Introduction

1.1 – “Feeding the world” with modernity

The future of agriculture in a world facing challenges such as climatic changes, increasing income gaps between the rich and the poor, fluctuating food prices, increasing population sizes and a decline in fossil fuel sources is uncertain (Rosegrant et. al., 2014; Brahmanand et. al, 2013). Today, there are approximately 1 billion people hungry around the world (De Schutter, 2011, p. 304), and 805 million chronically undernourished (FAO, 2014). While food security is a global issue, the incidence of hunger is not equitably distributed – it is concentrated in rural areas, and felt especially by those dependent on small-scale farming (De Schutter, 2011, p. 306). The World Bank projects our global agricultural systems will “need to produce 50% more food to nutritiously feed 9 billion people by 2050”, while each increase in degree Celsius reduces cereal yields by 5 percent (World Bank, 2013). To adequately provide for a growing population, agronomist and geneticist Gurdev S Khush, a former Principal Plant Breeder at the International Rice Research Institute (IRRI), argues that a world grain expansion of 26 million tons per year is needed, with “less land, less water, less labour and fewer chemicals” (Khush, 2001, p. 820). Rice is considered to be one of the most important crops for global food security as it remains the staple food for about half of the world’s population, and accounts, on average, for half of household food expenditures in Asia (Pandey et al., 2010). To meet projected future needs, it is believed that rice production will need to increase by 50% before 2025 (Islam et al, 2014, p. 193). Expanding food production by increasing yields...
has had an overwhelming emphasis in food security discourses (FAO, 2013; Rosegrant et al., 2013) as increases in population without adequate increases in yield is believed to lead to scarcity, conflict and cultural disruption (Thompson, 2008, p. 20).

This Malthusian framing of current global food challenges dominates agricultural research and policy discussions. A growing population, it is argued, necessitates increases in crop productivity. Currently, the dominant discourse in agriculture is techno-modernist, which assumes that “the material and human environment [can] be bent to man’s will as long as he learn[s] to reason correctly” (Manzo, 1991, p. 7). With this underlying assumption, the dominant belief is that the environment (soil and seeds) can be changed to produce more food for the population through scientific rationality and deploying advanced technologies. This funnels research and funding into furthering agricultural mechanization, industrialization, and biological engineering - a case of “tailoring the plant to fit the soil” (Brooks, 2010, p. 46). International groups and donors such as the World Bank (WB), the United Nations (UN), The U.S Agency for International Development (USAID), the International Rice Research Institute (IRRI), the Consultative Group on International Agricultural Research (CGIAR), and the Bill and Melinda Gates Foundation (BMGF):

continue to stress aspects of production, supply and demand, and accessibility to groups and individuals based upon purchasing power or agricultural productivity and thereby aligning [food security] historically with mainstream, neoliberal development discourses about nations in Africa, Asia and Latin America” (Jarosz, 2014, p. 173).

Following the modernist logic of these institutions, meeting the needs of a growing population necessitates increasing crop productivity, with a perceived intention to
ultimately “benefit mankind” (Den Herder et al., 2010, p. 600). This “feeding the world”
trope (McMicheal, 2007, p. 37) is so pervasive and powerful that any “hidden transcripts”
(Mosse, 2005), or, in other words, any economic or political agendas, remains concealed.

The Green Revolution was an example of a modernist agricultural initiative.
Known to critics as the “science-based transformation of Third World agriculture”
(Shiva, 1991, p. 19), it is “an example of science-based innovations...repeatedly tested
and scientifically validated before being introduced to farmers” (Takahashi, 2013, p.
269). Using Norman Borlaug’s high-yielding crop varieties (HYV), many countries met
with “spectacular [agricultural] success” (Patel, 2009, p. 6), with total food production in
the developing world more than doubling between 1960-1985 (Patel, 2009). This
productivity boom was credited by advocates with averting “large-scale famines and
social and economic upheavals” (Khush, 2001, p. 815). From the modernist perspective,
the Green Revolution was important and necessary, as food production increased such
that the booming population could be sustained (Khush, 2001), affirming for many that
science has “a magical ability to solve problems of material scarcity and violence”
(Shiva, 1991, p. 19).

Alternatively, Raj Patel, an academic, journalist, writer and food activist, stresses
that “if success means an increase in the aggregate physical supply of grain, the Green
Revolution was a success. If success means an end to hunger, then the Green Revolution
was a failure” (Patel, 2009, p. 18). Despite the rise in yield that resulted following the
Green Revolution, the number of people without enough to eat has risen, demonstrating
that hunger may have more to do with factors such as poverty as opposed to lack of
While the technologies promoted during the Green Revolution did result in a greater farm productivity overall (Aase et al, 2010), it also resulted in the loss of traditional varieties, the reliance on chemical fertilizers, the neglect of soil fertility, and an increasing farmer dependence on others for agricultural inputs, knowledge, and ways of cultivating their crops (Thiyagarajan et al, 2013, p. 23). It led to “dramatic loss[es] of biodiversity and associated traditional knowledge, favored wealthier farmers, and left many poor farmers deeper in debt” (Altieri, 2009 p. 102), while “soil became a medium for chemicals to flow through” (Bernstein, 2012, p. 90).

Patel argues, this ‘green revolution thinking’ continues to influence contemporary agricultural developments (Patel, 2012), to which there is a growing dissent. Critics of the Malthusian-esque approach to food security issues demand a global shift in focus from productivity improvements to reforms in food distribution and land tenure systems (Patel, 2009; Shiva, 1991; McMichael, 2007; Van der Ploeg, 2013; Vivas, 2012; Sumberg, 2012; LVC, 2014). McMichael believes that “twenty-first century corporate agriculture privileges biotechnological solutions over the possibility of sustaining food cultures or reforming land relations to overcome hunger via democratic forms of social reproduction” (McMichael, 2007, p. 184). The focus on technical solutions for increasing productivity is problematic as “yields are not merely technical parameters. They also reflect the complex and intriguing interplays between the micro and macro levels, between the local and the global. In other words, yields reflect social relations as much as they depend on them” (Van Der Ploeg, 2013, p. 89). Reducing the yield issue to a technical problem silences broader underlying social relations.
As opposed to modernist agriculture, alternatives (i.e.: food sovereignty, agro-ecology, small-scale agriculture) “hold an important response to many of the new scarcities (food, water, energy, productive employment, etc.) that are threatening the future of our planet” (Van Der Ploeg, 2013, p. 13). Nurturing such alternatives requires revaluing knowledges and practices that do not fit into modernism’s narrative, and changing the meaning of successful farming to value “high levels of knowledge of ecological conditions, and willingness to devise and adopt better methods” (Bernstein, 2010, p. 71). The System of Rice Intensification (SRI) presents itself as such an alternative.

1.2 – SRI enters

It is in the above context that SRI has emerged over the past three decades as a projected alternative to Green Revolution models. While the latter relied on large institutional and government processes for dissemination, depended on the development of high-yielding varieties (HYV) and associated inputs of chemical fertilizers and pesticides, and benefited primarily larger commercial farms, SRI is argued to be an accessible and generalizable means to improve the yields of traditional rice varieties for smallholder farmers using less water, fewer seed, and no

Figure 1 – A demonstration of the difference in number of tillers and expansive root systems in SRI (left) and conventional (rice). Photo from SRI-Rice, 2015.
chemical inputs. In the context of Malthusian visions of impending hunger, SRI presents itself as a ‘silver bullet’ to complicated global food security issues while simultaneously addressing rural poverty, biodiversity and water scarcity.

As a form of agricultural production, SRI is essentially made up of variations of four main practices that differ from standard rice production. Whereas conventional rice production methods involve transplanting 30 day old seedlings in clumps of 7-10 in fields that are perpetually flooded, SRI advocates for the transplanting of 15 day old seedlings individually at a greater distance apart in fields that are intermittently flooded and drained. Although the overall effectiveness of SRI has been debated (Sheehy et al., 2005; Dobermann, 2004), these practices have been reported to increase yields in a number of locations around the world (Jayapalreddy and Shenoy 2013; Islam et al, 2014; Katambara et al., 2013; Laulanie, 1992; Stoop et al., 2002; Thakur et al, 2010; Thakur et al, 2011; Takahashi et al., 2013; Uphoff, 2007b; Zheng et al., 2011). These increases are attributed to SRI plants’ ability to develop deeper roots with greater activity, larger leaves with a spreading canopy for greater light interception, and an elevated rate of photosynthesis (Thakur et al, 2010, p. 95). According to Norman Uphoff, a retired professor at Cornell University and leading SRI advocate, the success of SRI challenges dominant discourses of development and agricultural innovation.

This debate raises important questions about the production and distribution of knowledge within agriculture, and who has the power to propagate this knowledge. On the one hand, SRI appears to challenge the status quo of standard agricultural practices as propagated by governmental agencies both internationally and, specifically, within South Asia. On the other hand, the framing of SRI as a simple yet comprehensive challenge to
dominant discourses of knowledge and development raises many questions. Notably, SRI advocates do not question the assumption that agricultural intensification is the pathway to solving food security challenges. Instead, they offer SRI as an apolitical agro-ecological technique to better meet this aim.

As my research indicates, while there now exists a global discourse of SRI as a simple and uniform set of cultivation practices, on the ground, SRI is necessarily embedded within diverse and rich yet unequal landscapes marked by distinct agro-ecological conditions and social relationships, including class and gender differentiations. This raises a strong tension between the portrayal of SRI as a universally appropriate set of agricultural practices on the one hand, and the complex enacting of SRI in specific locations on the other. For example, an individual’s socio-economic status, education, gender, and access to natural resources and other assets will influence whether or not SRI can be adopted, whether or not it is effective, how its effectiveness is measured, and who benefits the most from this change in agricultural practice (Resurreccion et al., 2013). Yet, the discourse of SRI as a universal ‘solution’ to food insecurity silences these important determinants of its potential success.

1.2 – Research question

At the broadest level, the research asks: what social realities are silenced in order to craft a narrative in which SRI can become a universal driver of agricultural development? My field work contributes to this aim by studying the experiences of SRI in two communities in Nepal’s Terai. I have intended to uncover some of the potential tensions (related to gender, class, and access to labour, assets, water, seed, and credit)
within the implementation of SRI that are made invisible in the global discourse, and how the power relations inherent in these tensions impact who benefits the most from SRI. The aim is not to dismiss SRI as a viable option, but to give a more robust appraisal of its suitability as a global agricultural practice.

1.3 – Theoretical framework

Although agronomic research has often been seen as ‘apolitical’ science, a long tradition in political ecology has noted how agricultural science has been wedded into projects of state building (Blaikie, 1985), and “it is impossible to escape the conclusion that agronomists and agronomic research were at the heart of the colonial states’ political and social agendas” (Sumberg et al., 2012, p. 4). Yet, the ‘apolitical’ projection of agronomic science made it difficult to question its ‘truth’ claims. This started to change in the 1970s with the rise of the neoliberal, environmental and participation movements in agriculture, all three of which opened discussion and contestation in agricultural research, alongside “growing criticisms of state-led development as inefficient, environmentally damaging and undemocratic” (Sumberg et al., 2012, p. 4). The outcome has been an emergent strand of literature sometimes labelled ‘political agronomy’ that seeks to understand how agricultural science is situated within power structures, including the institutional bases and discursive premises on which it makes truth claims (Sumberg et al., 2012).

In this spirit, this thesis examines the truth claims of SRI research, with an understanding that agricultural developments are not inherently “successful,” but become successful through specific and instituted processes. In a broad sense, I am asking how
SRI has been framed as a “successful” agricultural development at a global level, and what has been silenced in the process of making this representation ‘true’. To answer this, I will need to understand how claims of SRI’s successes have been made true through the actions of interested and invested institutions, groups, and individuals. These groups and individuals are diverse, spanning from international, regional and local institutions. The relationships between actors in the process of making success are governed by the distribution of power in terms of access to resources, such as educational, human, and financial. The process of making something a universal ‘truth’ requires the conscious and deliberate smoothing of individual contexts, problems and experiences into a manageable sphere of global reality, upon which a particular development, technology, or policy can act. Once this universal ‘truth’ has been developed, it can travel from place to place, akin to Mosse’s concept of a ‘traveling rationality’ (2007). Mosse applies the concept of ‘traveling rationality’ to particular development or policy initiatives that can travel, context-free, from one location to another. In the process of making a traveling rationality, the particular is silenced, and the general is amplified. This has an illusory element to this which must actively be maintained. He argues that it is:

> the work of professionals of all kinds … to establish (against experience) the notion that socio-economic and technical change is brought about by generalizable policy ideas; and that ‘global knowledge’ produced by international organisations occupies a transcendent realm ‘standing above’ particular contexts (Mosse, 2007, p. 2).

As I set out below, the global discourse of SRI – as a context free agricultural practice to improve yields – strongly reflects elements of a ‘travelling rationality’. My guiding research question in this thesis is to understand what individual realities and contexts
have been silenced, or rendered irrelevant, in the process of projecting SRI as a globally applicable solution to agricultural development challenges.

A framework of political agronomy is an apt approach for guiding this research. Political agronomy focuses on how everyday agronomic research is practiced, how priorities for this research are determined, the politics that govern how international and regional actors interact, how “the legitimacy of research is determined, and how the presentation and interpretation of results supports or counters particular narratives and policy framings, or promotes particular political projects and agendas” (Sumberg et al., 2012, p. 11). These are important questions when analyzing the narratives written about SRI, and how it is framed in particular contexts.

Framing refers to:

the particular contextual assumptions, methods, forms of interpretation and values that different groups bring to a problem, shaping how it is bounded and understood. Framing determines to a significant degree how much attention the problem receives, the approach taken to address it, and the eventual solution(s) that are proposed and adopted (Sumberg et al., 2012, p. 12).

This is important in the study of SRI, as it is framed to solve problems such as low crop productivity, water scarcity, lack of farmer autonomy, and rural poverty simultaneously, although, different aspects are stressed in different contexts.

Understanding how agronomic research priorities are determined is also important in political agronomy, as this information “is useful in analyzing why some challenging ideas and innovations are successfully integrated into the agronomic research agenda while others are not” (Sumberg et al., 2012, p. 12). It is concerned with how this knowledge is “produced, validated, communicated and used” (Sumberg et al., 2012, p. 12).
14). This is especially important in understanding why SRI is supported by many international institutions (i.e.: WB), but still struggles for acceptance in others (i.e.: IRRI). For example, what evidence is used for or against its ‘success?’ How are farmers included or excluded from these analyses? How is the decision of whether or not to support SRI in Nepal made? Who gains and who loses when SRI is promoted or blocked?

Political agronomy’s focus on the interaction between international, national, and regional actors, including the incentives and motivations behind these interactions, is useful in answering these questions. For example, IRRI, Cornell University, Nepal’s Ministry of Agricultural Development (MoAD), and the District Agricultural Development Office (DADO) in Morang all have different perspectives on and approaches to SRI’s successful implementation.

In addition to the concerns of political agronomy, the framework of political ecology provides a secondary set of questions to include in this research – with specific reference to the embedded practices of SRI in Nepal – as it addresses “the complex relations between nature and society through a careful analysis of what one might call the forms of access and control of resources and their implications for environmental health and sustainable livelihoods” (Watts, 2000, p. 257). It seeks to make “explicit consideration of relations of power” to uncover that there are “very likely better, less coercive, less exploitative and more sustainable ways of doing things” (Robbins, 2004, p. 12). For SRI specifically, political ecology allows us to ask questions which investigate the historical roots of food insecurity that a particular community faces as well as the social fractures that create a differentiated ability of households to adopt new agricultural technologies. The absence of this perspective in the current SRI narrative may be an
example of a “downplay[ing of] how contemporary global processes layer over previous historical connections, particularly those forged through capitalism and colonialism” (Moore, p. 654), which renders critical socio-political and economic aspects unimportant in food security conversations. A political ecologist alternatively would pay close attention to the relations that are involved in the cultivation of rice – the global and local climatic patterns, the variety of seed used and how it was developed, the source of natural and synthetic fertilizers, the price of rice on the market, and the government’s control of the market, agricultural policy, and foreign trade agreements. It would also consider the class and gendered relations through which inequities of access to land tenure and key agricultural inputs are fashioned.

It is important to ask these types of questions, as the “details of production relations can vary considerably, not only for historical reasons, but because of specific conditions in the technology of production and the conditions existing in the economy external to the actual process of production described” (Feldman, 2008, p. 447). For example, the impact of increasing migration in Nepal has changed relations in food production as it has led to an increasing feminization of agriculture (Blaikie, 2002, p. 1268). Also, while SRI is lauded as a way to solve the food crisis in Nepal, the fact that the agricultural surplus from the Terai is argued to be used to “feed the expansion of Indian capitalism” (Feldman et al., 2008, p. 452) is not mentioned. Socio-ecological dynamics are complex and vary across socio-cultural and political environments, yet SRI research thus far has not adequately addressed these issues (Resurreccion et al., 2013).
1.4 – Research methodology

The research was completed in two parts. First, I conducted a discursive analysis of academic literature to understand the history of SRI, how knowledge of the practice has been dispersed, how the discourse of SRI has been crafted, and who shapes it. This helped to place specific individual experiences in the Terai within a greater narrative of SRI across temporal and geographical spaces.

The second part of the study took place in Nepal over a ten-week period from the beginning of August until the middle of October. I chose two sites in Nepal – one in Chitwan District for 3 weeks, and one in Morang District for 6.5 weeks. I chose these regions as my contact in Nepal (WWOOF) suggested Mr. Chandra Prasad Adhikari as a very helpful research informant. I chose to leave Chitwan and go to Morang for the as Rajendra Uprety, the District Agricultural Officer (DAO) and a well-known SRI advocate in Nepal, was very encouraging and supportive of the research and welcomed me to his family’s home.

My fieldwork consisted of interviews with smallholder farmers and agricultural officials and researchers to gauge their attitudes, concerns and expectations of SRI. I was able to interview 62 farmers, 6 researchers, and 6 officials from District Agricultural Offices (DAO), the WFP, the FAO and the Ministry of Agricultural Development (MoAD). The farmers I chose to interview were chosen based on their interest, willingness and availability to participate in the research. Many were friends of my hosts and their neighbours. The objective of the farmer interviews was to understand (1) which farmers use SRI, which rice production method they switched from, why they began using it, and how they feel it is performing; and (2) how using SRI has shaped and is
shaped by relationships within and between the farmers’ families, communities, agricultural extension officers, NGOs and research institutions. Also, how it is shaped by larger social structures, including gender relationships, socio-economic status, access to assets such as irrigation, compost, seed and credit, and even simply how those individuals define SRI. The objectives of the interviews with the officials was to get a wider perspective on the impact and impressions of SRI in the region. It will also help me to understand how SRI becomes institutionalized on the ground (who drives SRI dissemination? How do farmers respond? How are farmers convinced to risk changing their agricultural practices?), and what international and domestic politics are involved in actively promoting SRI or not. It was also done to help put the experiences of the farmers into context, as it allowed me to learn who is supporting farmers through their SRI trials, which farmers the officials choose to support, and why they support them.

1.5 – Research parameters

1.5a - Positionality

A major limitation of my research was carried with me in every interview, conversation, and walk through the village and town. My body itself carried physical evidence of my foreign origins, and my mother tongue furthered my outsider status. While being an outsider certainly distanced me from the experiences of those whom I interviewed, in other ways, the distance allowed a certain perspective that may be useful in the conversation about SRI. In no way is this research representative of all voices in the Terai, Phulbari, or Karjuna – this research is a representation of my own experience and analysis, which has been influenced by the conversations I had throughout my
fieldwork. My analysis of the information gathered has sifted through my own academic and personal biases, values and experiences, and is no more ‘true’ than any ‘truth’ claim I analyze in this research. The intention is not to make claims of truth, but to complicate a universalizing narrative.

My foreign origins and language were a major barrier in interviews, and interviewees most likely consciously or subconsciously adjusted their answers for me on this basis. Another limitation was the power position of my contacts and hosts. In Phulbari, I stayed with Chandra Prasad Adhikari, a “leader farmer” in the village, and a chair of the Nepal Organic Farmers Co-op. The farmers I interviewed knew I was staying with his family, so it is important for me to assume that some of their responses were tempered to safeguard themselves in case the interview was shared with Chandra. In Karjuna, it was well known that I was staying with Govinda and Laxmi Acharya, two powerful individuals in the community. Govinda, as a Junior Agricultural Technician (also, the only government position holder in the village), has unique access to improved seeds and knowledge about effective agricultural practices. Laxmi’s power lied in her family history – her ancestors were once the landlords of the village, and her parents still own and rent out much of the land to others. Consciously or subconsciously, interviewees would most likely have tempered their answers in order to maintain existing relationships.

Having Asmita Khanal (Phulbari) and Sunita Karki (Karjuna) as translators, two young Nepali women, was incredibly helpful in the interview process, as it allowed for the interaction to have an immediate initial friendliness. Often, the interview would start as a casual conversation between the women and the interviewee, especially because
Sunita Karki was born and raised in Karjuna. While this was helpful in making the interviewees feel comfortable, at the same time, it was impossible to conduct an interview that existed fully in the present. Each conversation carried with it a long history, and an established relationship between the translator and the interviewee, with a clear power balance. This was less the case with Asmita, as she was living in Chitwan, but her family was from Gorkha District. In this way, less history was involved in those interactions. Having prior relationships was both beneficial and limiting, although it is difficult to pinpoint the precise ways in which these histories operated.

1.5b - Opportunistic style interviewing

While I list opportunistic interviewing as a limitation, it is also a strength of the research, based on its intentions. This research does not presume to claim anything with absolute certainty. The goal was to meet as many people as possible, to receive as many perspectives as possible. The interviews were conducted in an opportunistic fashion and not with any randomized sampling technique. This was a pragmatic option, given my time and financial constraints, as well as my initial unfamiliarity with the sites. In an attempt to have a variety of perspectives, as many interviewees were friends or family members of my hosts (Brahmin and Chhetri), I tried to diversify the sampling by choosing to approach homes that were characteristically or known to be Tharu, Tamang or Dalit. That said, the constraints of the research prohibited the application of systematic sampling. I would only now be in a position to craft such a study.

1.5c - Various interpreters
Although it is not ideal, the people translating for me changed several times for pragmatic reasons. At various times, Asmita Khanal, Chandra Prasad Adhikari, Govinda Acharya, Rajendra Uprety, Thubkten Norbu and Sunita Karki translated my questions and the interviewees’ answers. Thubkten Norbu is an old friend who accompanied me on one of my interviews in Kathmandu. Asmita Khanal is a Master’s student at Rampur University in Chitwan. Herself and Chandra accompanied and translated for me at various points during my stay. In Morang, my translator was predominantly Sunita Karki, a Class 12 student living at her home in Karjuna. Due to transportation needs, Rajendra Uprety and Govinda Acharya, who were my hosts in Biratnagar and Karjuna respectively, would occasionally translate for me when the opportunity arose to speak with an individual. Another limitation is inherent to foreign language translation. Every question and answer was interpreted through another person’s experiences, history, knowledge, vocabulary, and summarizing biases. This involves a conscious or subconscious selection of information, which will have differed from translator to translator.

1.5d - Evolving interview style

As my fieldwork progressed, my interview style evolved. I started with a scripted list of questions, and moved to a more fluid back and forth, where interviewee answers led my next question. In both cases, I recorded everything that the farmers said with pen and paper. By the end of my fieldwork, I did not carry a notebook during the interview, and instead, wrote down everything the interviewee said afterwards, with Sunita’s help. While this undoubtedly created differences between the interviews, as they would have
had different feels, I decided to shift because I started to notice my paper and pen acting as a physical and emotional barrier between myself and the interviewee. While maintaining the consistency of the research was a priority, it came second to the comfort, safety and enjoyment of the interviewee. When I was interviewing officials and researchers, I tended to use a small voice recorder, unless they asked me not to (FAO and WFP representatives asked for the conversation not to be recorded).

1.6 - Summary

These limitations and inconsistencies in my research methods make it impossible for me to make conclusive claims about the effectiveness, experience, or suitability of SRI in the Terai. Yet, the opportunistic, flexible, and friendly nature of the interviews and observations allowed me to ask broader and more exploratory questions, allowed me to make many contacts in the region, and gave a very broad picture of SRI in Nepal. This was the goal of the research, and is an essential part in order to delve more deeply into a specific, structured and deliberate research plan in the future. I was able to meet many farmers, make many friends, and introduce myself to the major actors in rice research, policy and dissemination in Nepal. This research, therefore, is far from conclusive – it is introductory, explorative and inquisitive – yet it was able to deliver important insights into the translation of SRI from a global discourse to locally embedded practice. Each individual I interviewed raised new questions and concerns, which is essential in order to understand which aspects of the global SRI narrative farmers and other actors in the “frontlines” of SRI implementation contest.
This thesis will address the research questions in six sections. In Chapter 2, I will give an overview of the global SRI narrative as projected in academic literature, by NGOs and other global institutions. Chapter 3 introduces some of the contradictions in SRI, as well as some questions and aspects unaddressed in the literature. Chapter 4 will outline the current status of SRI in Nepal, and will begin to narrow in on Nepal’s Terai, providing a brief socio-economic and agro-ecological contextual framing for the fieldwork. Chapter 5 analyzes and discusses the interviews conducted, with particular attention to the divergences between lived experiences and the global narrative. Finally, Chapter 6 is a brief conclusion, which will summarize the major findings and offer potential directions for future research.

The outcome of this research is to complicate the global narrative of SRI in order to give a more robust account of how this agrarian practice can potentially impact the lived realities of rural farmers in a multitude of ways beyond yield changes. While my research is specific to Nepal, and the diverse socio-ecological and political environments of farms around the world make it impossible to directly transfer lessons from this research to other locations, I hope that the questions and complications this study raises will affect how and on what basis SRI is disseminated, institutionalized and accepted. The research intent is not to dismiss SRI as a viable agricultural development, but to raise questions in order to ensure that the potential benefits, burdens and risks associated with it are distributed equitably between individuals at multiple levels and scales of production.
For proponents, SRI offers a veritable revolution in global rice production. Depicted as a farming system that overturns the conventional agronomical norms of rice cultivation, advocates such as Norman Uphoff argue that SRI demonstrates that basic presumptions about optimal rice cultivation may be wrong (Uphoff et al., 2013, p. 3). By promoting SRI globally and thus correcting these prevalent misconceptions, advocates argue, it will be possible to address the major environmental and social concerns that marred the Green Revolution while – simultaneously – delivering higher yields than conventional agriculture. It is on these grounds that SRI has variously been promoted as a solution to food security, environmental degradation, climate resilience, imbalanced knowledge powers, and rural poverty in an increasingly uncertain future.

Such claims have caught the attention of various NGOs and international organizations, as well as donors such as Jim Carrey’s Better U foundation, the leading funder of SRI-Rice, a network of SRI researchers, practitioners and advocates. As an example of the claims made on behalf of SRI, consider the following monologue that is voiced over an introductory video on the first page of Better U’s website:

Here’s a grain of rice. Small, common, everyday grain of rice. Yet it can change the world when its potential is unlocked by something extraordinary. When its potential is unlocked by SRI, System of Rice Intensification. Simply put, SRI is an unprecedented sustainable methodology any farmer can learn and adapt to achieve remarkable results. It requires 90% less seed, 30 – 70% less water than typical methods, needs no chemical pesticides, herbicides or chemical fertilizers, yet still increases rice yields 50-100% and often times even more. The rice it produces is not a GMO. It is more resistant to drought,
storm damage, climate changes, and pests. Truth is, rice is the grain that can change the world and SRI is the key to unlocking its full potential. Already in over 50 countries, this unprecedented methodology is eradicating hunger, decreasing poverty, conserving water, diminishing global warming, enhancing the financial livelihood of millions, reducing malaria, reviving the Earth’s soil, enhancing biodiversity and environmental quality, and ultimately benefitting the health of millions and millions of people. And it all costs the farmer next to nothing. Really. So, here it is. A small common everyday grain of rice. Now all we need are the researchers and volunteers that will teach farmers the method that will unlock its potential and change the world. So what we need now, is ‘U’. (www.betterufoundation.org)

While this excerpt is clearly a donor agency’s advertising and promotional rhetoric, it is an accurate reflection of what is written by SRI advocates. Advocates argue that such claims are not simply rhetorical, but are backed by over 15 years of research, over 400 published articles “and with empirical results reported from over 50 countries” (Uphoff, 2014, slide 3), predominantly sourced from civil society to boot (Jagannath, 2013). The purpose of this chapter is to establish SRI’s institutional and global position as well as provide the basis of their claims. This will be essential in understanding the controversies surrounding such claims which will be explored in Chapter 3.

2.1 – What is SRI? Current popularisation and historical development

“SRI is the key to unlocking [rice’s] full potential.”
(www.betterufoundation.org)

Ezra Berkhout and Dominic Glover describe SRI as “a method of rice cultivation that has been claimed to greatly enhance the vegetative growth and grain yield of rice in the context of smallholder rice farming, while consuming substantially less water, without the necessity to adopt expensive modern technologies or external inputs”
(Berkhout and Glover, 2011, p. 13). The current popularisation of the techniques associated with SRI are predominately credited to Fr. Henri de Laulanie, a French Jesuit-cum-agricultural technician. He was trained at the Institute National Agronomique in Paris and then joined the seminary in 1941. In 1961, at the age of 41, the “father of SRI” (Berkhout and Glover, 2013, p. 30) was sent to Madagascar to work as an agricultural technician with a mission to develop self-reliant ways for poor rural households to reduce their hunger and poverty (Uphoff, 2007a, p. 87-8). Although his posting was intended for ten years, he ended up working and living there for the rest of his life (Berkhout and Glover, 2013). He claimed that the development of SRI was a surprise born of a series of accidents (Laulanie, 1992) and two decades of observation and experimentation (Uphoff, 2007, p. 87-8). Laulanie explained that he accidentally fell upon SRI while working with Malagasy colleagues through empirical experiments, which he contrasted with conventional theoretical approaches to agricultural innovation (Laulanie, 1992). The method was developed in 1983-1984 as unforeseen circumstances required two batches of seedlings to be grown and transplanted in a month as opposed to just one, as is the common practice (Laulanie, 1992). Berkhout and Glover clarify that these “unforeseen circumstances” were the late arrival of seasonal rains, which “caused a delay in seeding the rice nursery at the training centre” (Berkhout and Glover, 2011, p. 30). By transplanting younger seedlings into the paddy, Laulanie and his colleagues noticed a marked increase in paddy production (Laulanie, 1992), leading them to believe they had developed a method that could potentially improve farmers’ rice production. Thus, the most popular story of the birth of SRI.
This story has, as Berkhout and Glover note, “a dose of artistic licence” (2013, p. 31), as besides the transplanting of very young seedlings, none of the SRI practices were discovered by accident that day (Berkhout and Glover, 2013, p. 31). While SRI is largely understood as being discovered by Laulanie, “in fact it was compiled by him from various existing sources and each of the individual elements has precedents in rice cultivation practices from different times and places” (Berkhout and Glover, 2013, p. 4). This indicates, “on one hand, that SRI is not as original or radically novel as it has been portrayed, and on the other hand that it rests on a reasonably firm foundation of knowledge and practice in rice cultivation” (Berkhout and Glover, 2013, p. 4). For example, planting 1-3 seedlings was already a recommendation from the time of the Green Revolution, planting in rows and lines was associated with the use of rotary weeders and the idea of intermittent irrigation pre-existed Laulanie in Madagascar, as “some farmers achieved good results by allowing their rice fields to dry out from time to time during the vegetative growth period” (Berkhout and Glover, 2013, p. 31). Improving irrigation management “was not entirely unprecedented for Madagascar” (Berkhout and Glover, 2013, p. 31). That said, the initial practices, including “young, single seedlings, widely spaced, growing in unflooded soils, etc. – are a kind of ‘signature’ for SRI” (SRI workshop, 2014). Since then, “SRI has diversified into a whole suite of practices: for rain fed (unirrigated) rice production; for crop establishment by direct seeding rather than by transplanting; indeed, for many crops beyond rice ---wheat, millet, sugarcane, legumes, etc” (SRI workshop, 2014, p.2).
From its inception in the 1980s, SRI, which is not considered a technology by its proponents, but a set of practices (Uphoff, 2007b), has been controversial (Thakur, 2010). Mainstream agricultural authorities did not accept SRI methods, a difficult method to promote “in a world…where financial interests reinforced focus on input-centred innovation” (Uphoff, 2007b, p. 45). In response to this lack of support, in 1990, Laulanie and his Malagasy friends developed an NGO called “Tefy Saina” (“To Improve the Mind”) in order to spread SRI concepts throughout Madagascar.

2.2 – SRI Principles and Practices

2.2a – SRI Core Principles

Although slightly different iterations of SRI principles have been outlined by Laulanie (1992) and Styger et al. (2014), Uphoff gives the most concise and encompassing version as follows:

- The use of healthy seedlings (which accounts for the nursery management component as well as early, quick and gentle transplanting);

- Optimal plant density (which explains the wide spacing of seedlings planted singly); and

- The promotion of aerobic soil conditions (which underpins the irrigation practices and soil disturbance) (2003, p. 39)

These principles allow flexibility in the way they are interpreted, but they are the foundation of the practices of SRI, which follow.

2.2b – SRI Practices
There are a number of practices that extend from these principles. When SRI was initially conceived and presented, it was in terms of “a concrete set of practices” (SRI workshop, 2014). While the number and category may vary, generally, the six most widespread and most often cited practices are as follows (Uphoff, 1999; Stoop et al., 2002, p. 252 as cited in Berkhout et al., 2014; CIIFAD, 2014):

1. Raising seedlings in a carefully managed, garden-like nursery.

2. Transplant very young, at the 2-leaf stage (about 8-12 days after germination).

3. Widely spaced, single seedlings, often planted in grid patterns (typically 25 x 25 cm and possibly wider, dependent on temperature and soil fertility).

4. Fertilize with organic matter, and add chemicals and fertilizers only as needed.

5. Apply alternate wetting and drying irrigation during the vegetative growth phase to promote moist, aerated soil conditions, sometimes including dry periods of 3-6 days; and

6. Early and regular weeding, typically 3-4 times, manually or ideally using a mechanical rotary weeder which churns and aerates the soil.

SRI advocates claim that there is a synergistic relationship between the principles and/or the six practices, as they have observed that farmers who adopt all of them will obtain optimal yield in their paddy (Styger et al., 2014). This is a highly contested claim, as it would suggest that “the individual component practices of SRI are not just complementary or mutually supportive but that they interact and multiply their individual effects” (Berkhout et al., 2014, p. 39). The idea of synergistic relationships is important in the SRI debate, as it was raised by Willem Stoop in 2002 as something that “could contribute to a shift in what have been considered agronomic ‘yield ceilings’” (2002: 250).
as cited Berkhout and Glover, 2011, p. 40), “thus expanding the physiological potential of rice through changes to crop management methods” (Berkhout and Glover, 2011, p. 40). In his on-station experiments in Tamil Nadu, Kalimutu Senthilkumar found that “the combination of young seedlings or direct seeding, mechanical weeding, green manure application and conventional irrigation gave the largest yields in both season under controlled experimental conditions” (Senthilkumar, 2008, p. 86). In their review of SRI studies, Berkhout et al. found that when compared to using improved seeds or varieties alone, the “complete SRI package has a larger marginal effect on yield” (Berkhout et al., 2014, p. 8). This was based on two studies – one conducted by Uphoff (2002) and another by Menete et al. (2008) – which found that the highest rice yields per hectare were achieved when four SRI practices (young seedlings, aerobic soil conditions, single seedlings and organic fertilization) were used together (Berkhout and Glover, 2011, p. 55). These studies also found “a progressive increase in yields as the proportion of SRI practices increased” (Berkhout and Glover, 2011, p. 55). While in practice, farmers who pick up just one or two of the practices are considered ‘SRI farmers’, in general, it is believed that the most optimal yield will occur when all practices are employed together and followed precisely (Uprety, 2014, personal comm.).

While advocates stress that farmer innovation and experimentation is encouraged, these six practices tend to be accompanied by more detailed recommendations. For example, in an important first step, the land preparation, Laulanie suggests that 3-4 months prior to planting rice, farmers obtain a sticky mud without clumps or weeds (Laulanie, 1992, p. 5). After ploughing, the fields should be puddled and homogenized through treading or trampling. One cycle takes 3 days, and he suggests moving through it
three times, every 3rd day “devoted to the removal of non-rotting weeds” (Laulanie, 1992, p. 6). He urges the weeds stay in the field to add to the organic matter.

The practice of transplanting young seedlings involves further recommendations and best practices as well. Advocates stress the importance of avoiding “transplant shock,” or in other words, ensuring the roots of the very young seedlings receive little to no trauma (Uphoff, 2013, p. 4). It is important to transplant the seedlings before their 4th phyllochron of growth in order to minimize this trauma (Uphoff et al., 2013). Laulanie believed that “the younger the plant is, the shorter will be the period for catch-up after the trauma of transplanting” (Laulanie, 1992, p. 13). This requires the seedlings to be handled carefully, and that farmers aim to “reduce time between removal from nursery and planting in the rice paddy…[to about] 30 minutes (15 is best, 60 is maximum)” (Laulanie, 1992, p.5). He believes that completing the job in such a short timeframe is possible, and is simply “a matter of organization that should be taught to farmers” (Laulanie, 1992, p. 5). This belief, while held by Laulanie and not necessarily explicitly held by contemporary advocates, complicates the claim that SRI proponents make about valuing farmer knowledge and farmer cultural practices.

Laulanie also specified the way in which the roots are to be pressed into the soil, which he stressed should be laterally, with its “small roots in the soil horizontally just below the surface (1-2 cm)” instead of in “traditional transplantation”, in which the seedling is planted deeply and vertically. When they are planted this way (‘traditionally’), the ends of the roots are turned upward in the shape of a “J” which causes a shock that requires a week to get over (Laulanie, 1992, p. 5). The shallowness of the planting, he
explained, is so that the lateral adventitious roots can easily be sent out from the plant (Laulanie, 1992, p. 5), strengthening the plant in place.

Laulanie stressed the importance of accuracy and efficiency in transplanting as he believed “apart from physiologic or climatic stresses, and pest and disease attacks, there are only two traumas which may affect our SRI: they are transplanting and weeding” (Laulanie, 1992, p. 13). He urged that for effective transplanting, farmers “should be well trained every year, for several years, at the beginning of the transplantation season” (Laulanie, 1992, p. 6). He thought training should include aspects such as how to level the field, how to place the plants in the field correctly, how to hold the seedling in their hands, how to move one’s feet while stepping between the lines, how to move the ropes guiding the straight lines to keep them exact, and how to inspect the rope, ensuring there are no knots present which would change the square or rectangular pattern of the paddy (Laulanie, 1992, p. 6). While advocates such as Uphoff and Uprety explicitly claim to trust the farmers’ abilities to carry out their own practices and experiments, Laulanie emphasized the need for farmer education even for very basic tasks, such as “how to move one’s feet.”

Best practices in spacing, specifically, how to efficiently ensure the young seedlings are equidistance apart, are also widely circulated. The first SRI spacing method was developed using ropes tied between sticks driven into the edges of the paddy field, but other methods have since been developed, such as “marking (scoring) the surface of the field using a simple wooden rake with ‘teeth’ spaced the desired distance apart (20, 25, 50 or more centimetres)” (Laulanie, 1992, p. 6). Spacing “depends on the farmer’s choice”, and “every farmer should decide according to his own experience what kind of
spacing suits him best considering the variety of rice grown, the soil quality, the microclimate, the transplantation density, and his own know-how in rice cultivation” (Laulanie, 1992, p.7). He noted that with better soil quality, higher yields are possible with wider spacing, even up to 50 cm (Laulanie, 1992). Yet, he proposed that farmers start with 25cm x 25cm and up to 33cm x 33 cm.

Aerobic soil conditions are an essential part of SRI. In rice, this means that unlike ‘usual practice,’ paddy fields are not to be kept flooded – instead, farmers are encouraged to practice what Laulanie called le minimum de’leau, or “just enough to keep the soil moist but more aerobic than saturated” (Uphoff et al, 2013, p. 4). SRI practices challenge the commonly held view that rice is an aquatic plant. Watering practices that include alternative wetting and drying, or intermittent irrigation, advocates believe, increase the aerobic nature and therefore productivity of the plant. The principle behind this is that “both roots and beneficial soil organisms grow better in aerobic soil” (Uphoff et al., 2013, p. 4). Sometimes this involves the farmers alternating between wetting (during irrigation) and drying (allowing the soil to dry completely in between irrigation events) until cracking. Laulanie states that “during the whole tillering period, it is sufficient to add 1-2 cm of water to the rice paddy in the morning” and that, when the rice field is dry by the afternoon, this benefits the roots and microbial environment as they will have access to oxygen (Laulanie, 1992, p. 3). When the rains fall, air is then pushed downward, increasing the abundance of oxygen below the rice paddy’s surface (Laulanie, 1992, p. 4). As water will not be readily available on the surface of the water, the roots continue to travel downwards, expanding the root system in general, and increasing the soil area available from which to mine nutrients (Laulanie, 1992, p. 4). Laulanie observed
that “Malagasy farmers are victims of a universal believe in the country: that ‘water is the main nutrient of rice.’ Believing this statement, they do their best to maintain a maximum amount of water in their rice paddies” (Laulanie, 1992, p.3). Yet, intermittent irrigation is not a new concept – it was introduced in Asia 300 years ago in order to increase yields (Keiser et al., 2002), and also, it is argued by Berkhout and Glover, had existed in Madagascar specifically as a common practice before the introduction of SRI (Berkhout and Glover, 2011).

Ensuring accurate timing of watering has been a challenge for farmers who are not able to control their access to water. While alternating the wetting and drying period is deemed important, it is more specified than this. It is imperative that the rice plants receive plenty of water at the reproductive stage, the stage where the grains are filling. If not, there is the potential for the grain cases to be empty (Uprety, 2014, personal comm.).

Controlling weeds is of crucial importance for farmers using SRI – weeds flourish without the suffocating presence of flooded paddies. In cases where weeds are able to grow uncontrollably, SRI fields will yield less than ‘conventional’ or ‘traditional’ practices. To control weed growth, “soil-aerating mechanical weeding should be done, starting at 10-12 days after transplanting. The operation should then be repeated at 10-12 day intervals, if possible 3 or 4 times until the canopy closes” (Uphoff et al., 2013, p.5). Laulanie stressed that the weeding be done early in order to ensure a good return (Laulanie, 1992, p. 7).

In flooded rice fields, it is generally necessary for farmers to weed once a season. Flooded fields ease the process, as the weeds’ roots are loosened. The frequency of weeding required in SRI and the associated increased burden of labour is often cited as a
major roadblock in farmers’ willingness to try SRI in their fields (Uphoff, 2007b). It is in this arena, however, where much innovation on the farmers’ part has been conceived. Uphoff attributes farmers’ experimental spirit to the fact that SRI is not presented as a final product, but “as an opportunity, for which further thought and innovation on their part are expected” (Uphoff, 2007b, p. 54). Tefy Saina developed a $2 weeder that requires two people to work it, and various farmers in many different countries have developed their own versions of the rotating hoe, or cono-weeder, or in one case, a weeder able to cover four rows at once (Uphoff 2007b, p.54). Not only does this arguably destroy the weeds, but the “active soil aeration amplifies the passive soil aeration achieved by keeping paddies not continuously flooded” and buries the green manure to promote beneficial soil organisms (Uphoff et al., 2013, p. 5). Some studies have shown a shift in gendered labour roles, as the use of a machine encourages the men to become involved in a role occupied traditionally by females (Thiyagarajan et al, 2013).

However, not all farmers believe the mechanical weeder makes weeding easier. Senthilkumar’s farmer survey showed that in one of their two study locations, 40% of farmers were dissatisfied with the weeder because they found its weight made it difficult to handle. The women were unable to operate it in heavy clay rice fields, so “farmers employed more costly male labourers for weeding” (Senthilkumar et al., 2008, p. 91). This raises questions about how SRI changes labour divisions between genders, and the possible negative impacts this could have on female labourers, while at the same time, potentially benefitting male labourers who are able to take advantage of niche skills.

It is also important to recognize that while farmers are encouraged to choose whichever of the six practices suit them, the mechanical weeder is only suited in fields
planted in a grid-like fashion, with rows wide enough for the weeder to move through. This suggests that some of the practices do indeed need to be embedded and practiced together.

Originally, SRI was developed with synthetic and chemical fertilizers. When the government of Madagascar cut these subsidies, these fertilizers became too expensive for Malagasy farmers to purchase. At this point, Laulanie began to recommend compost in the SRI fields over inorganic inputs. This turned out to both further increase grain yield and reduce household costs (Uphoff, 2007, p. 87). While organic fertilizers (including compost, green manure, animal refuse) are presented as ideal, Uphoff recognizes that, “there are some times and places where some use of chemical fertilizer with SRI methods will be beneficial for farmers and compatible with soil-system health” (Uphoff, 2007b, p. 45). In combination with SRI, chemical fertilizers can increase yield, although, SRI proponents do not generally encourage this because they represent costs to the farmer and the environment (Uphoff, 2007a, p. 90). This is why SRI promotion emphasises organic inputs where and when they are available. Where they are not available, farmers are encouraged to produce biomass for organic inputs on non-arable land (Uphoff, 2007a, p. 91), or even minimal chemical fertilizer use (Uphoff, 2007a, p. 90). Uphoff emphasizes that organic fertilizers are “important, but not [an] exclusive version of the original system” (Uphoff, 2007b, p. 45). A study conducted by Nippon Koei, a Japanese consulting firm, found that using organic fertilizers and compost resulted in 78% increase in production with a 50% reduction in fertilizer input (Uphoff, 2007a, p. 91), demonstrating the effectiveness of organic fertilizers over inorganic fertilizers.
SRI practices have not been shown to dramatically impact traditional and conventional rice harvesting methods, although R. Jayapalreddy and Shenoy argued that in Andhra Pradesh SRI rice fields reached maturity 10 days earlier (110 days) than traditional methods (120 days) (Jayapalreddy and Shenoy, 2013, p.2). While there are no harvesting recommendations specific to SRI, Laulanie suggested that “to facilitate maturation, the rice field should be completely dried up at least fifteen days before the harvest” (Laulanie, 1992, p. 8).

2.2c - Flexibility in SRI practice adoption

Not all SRI farmers need to adopt all six practices – even adopting one of the six practices, advocates argue, will lead to improvements in rice yields (Rajendra Uprety, personal comm., 2014). However, it is believed that the greatest increases in yield are experienced when all six practices are used in combination. This is explained by advocates to be due to the synergistic relationships that exist between individual SRI practices, a claim that has been contested (Glover, 2011). Yet, as a small number of adoption studies have observed, “relatively few farmers adopt all the practices of SRI” (Berkhout and Glover, 2013, p. 5). Styger acknowledges that “there are a number of other practices that have become established in many locations where SRI is implemented” (2014, p.10). Uphoff contrasts SRI from top-down agricultural technologies as it encourages farmers to innovate and experiment – he argues that SRI would not have been so successful without important innovations developed by farmers themselves while implementing SRI on their fields (Uphoff in Thiyagarajan, 2013). For example, farmers have adjusted the way seedlings are nurtured in nurseries, have
experimented with direct seeding, and have developed new methods to mark fields for
accurate spacing during transplantation (Uphoff, 2007b). Farmers have also been able to
save labour time through developments in mechanization (i.e.: mechanical transplanters
and weeders) (Uphoff, 2007b).

This flexibility in approach contrasts with Laulanie’s original vision of SRI
practices which indicated that to get best results, “everything must be done perfectly from
the beginning until the end, including the farmer’s practices, the climate, and the soil
environment” (Laulanie, 1992, p. 19). Contemporary researchers and advocates decidedly
differ from this approach, claiming that “the central theme of SRI [to be] whatever works
for the farmer” (Uphoff, 2007b, p. 45), encouraging practitioners to adjust the practices
as much as they deem necessary to fit their specific context.

2.3 – SRI advocacy

Concerted advocacy on behalf of SRI began in the mid-1990s, following a
relationship forged between Cornell University and Tefy Saina. In 1994, Tefy Saina
began to work with Cornell International Institute for Food, Agriculture and
Development (CIIFAD) on a project to limit slash and burn agriculture in the forests of
Madagascar. Upon learning of SRI, and after three years of evaluations and trials,
CIIFAD’s project staff “became convinced of its utility” (Styger, et al., 2014, p. 4). Since
then, Cornell University, and specifically, Norman Uphoff, a professor emeritus of
Governance and International Agriculture at Cornell and the former director of the
CIIFAD, have been heavily involved in the global propagation of SRI.
Norman Uphoff became acquainted with SRI in 1993, and since then, has been the driving force behind CIIFAD’s involvement. Since the 90s, the network of international SRI advocates has grown, with Uphoff writing and co-writing many academic, presentation and workshop papers and programs on SRI, with topics ranging from its ecological and productivity success in different regions across the globe, (Uphoff et al., 2003; Stoop et al., 2002; Thakur et al., 2010; Uphoff et al., 2007a) to the way it challenges dominant discourses of development and agricultural innovation (Uphoff et al., 2007b; Uphoff, 2012).

In response to “the increasing importance of SRI [as] a climate-smart, yield-increasing methodology”, the SRI International Network and Resources Centre (SRI-Rice) was established in 2010 by the Better U Foundation and CIIFAD, and currently operates under International Programs of Cornell’s College of Agriculture and Life Sciences (SRI-Rice, 2015). Its mission is to “advance and share knowledge about SRI and its derived practices and principles, and to support networking among interested organizations and individuals around the globe” (SRI website, 2014). Its explicit objective is to advance the knowledge on SRI methods and practices, to make this knowledge more widely available, and to strengthen the international SRI network (SRI-Rice, 2015). Uphoff acts as a senior advisor to SRI-Rice, which carries out its activities with funding from Jim Carrey’s Better U Foundation (BUF), as well as from the Ohrstrom Foundation, the Bridging Peace Fund, and Marguerite and Norman Uphoff (SRI website, 2015). SRI promotion and research is the main focus of the Better U Foundation’s donations (Better U, 2015). Even though much of Uphoff’s focus has been dedicated to SRI, and his work to the promotion of it, he claims that he and his network
“are not trying to promote or ‘market’ the use of SRI” and that “they have no personal stake or advantage in its dissemination” (Uphoff et al., 2013, p. 11).

It is interesting to note the vast diversity of actors involved in SRI. It has spread rapidly, and been supported technically and financially by a mix of researchers, government officials, and some “heavyweight development organizations” (Berkhout and Glover, 2013, p. 13) such as the World Bank, the Asian Development Bank, the WWF, Africare, International Fund for Agricultural Development (IFAD), Cornell University, and Jim Carrey. Governments involved include those from India, Nepal, China, the Philippines, Vietnam, Cambodia, and articles and trials have been written about SRI in various countries in East Asia, South Asia, Southeast Asia, Southwest Asia, North Africa, Sub-Saharan Africa, Latin America and the Caribbean (CIIFAD, 2015). Many countries have started national SRI networks, such as “Bangladesh, Cambodia, India, Indonesia, Japan, Laos, Philippines, Nepal, Madagascar, Sri Lanka, Thailand, [and] Vietnam” (SRI-Rice, 2015). The World Bank, in collaboration with SRI-Rice and CNS-Riz in Mali, is working on a project called *Improving and Scaling up the System of Rice Intensification in West Africa*, which is part of a larger West African Agricultural Productivity Program (WAAPP) (SRI-Rice, 2015). The International Rice Research Institute (IRRI) is also involved in this particular project, although they have stated their hesitations with SRI (IRRI, 2008). SRI’s promise to be accommodating to a variety of actors as far removed from each other as indigenous labourers in rural Nepal and scientific research directors at IRRI offices may be a strong point in enabling it to spread widely, however, it may also indicate a weakness in the definition and understanding of the practice itself.
2.3a – SRI in contrast to modernist agriculture

In their own terms, SRI advocates’ main concern is to “[reduce] the vulnerability of resource-poor households through interventions that are environmentally-benign as well as more productive” (Uphoff, 2007, p.87). To solve these problems, Uphoff believes that “…we need to start thinking outside of the many mental and technical ‘boxes’ that have been developed over the years, and within which we have become comfortable in our thinking and work” (Uphoff et al., 2013, p. 3). The ‘boxes’ that Uphoff refers to are modernist, technocratic approaches to improve agricultural productivity, such as the Green Revolution, which “depended on making changes in genotypes and then increasing the use of external inputs” (Uphoff, 2007, p. 96).

While Uphoff concedes that the Green Revolution “was important in its time”, he also states that the improved productivity it catalyzed has “[lost] momentum with declining rates of growth” (Uphoff, 2007, p. 87). Further, he states:

many inputs in the name of “modern” agriculture have had negative effects on soil systems – use of heavy machinery compacts the soil, ploughing reduces the soil’s organic matter and nitrogen stores; large applications of inorganic fertilizer and agrochemical crop protection alter the diversity and balance of species living within soil systems, making these ultimately less fertile, less resilient and more vulnerable to crop losses caused by pests and diseases (Uphoff, 2007, p. 45).

SRI is positioned in “explicit contrast with fossil fuel dependent Green Revolution methods,” based in agro-ecological principles as a “sustainable, low external-input production system” (Glover, 2011, p. 219). Uphoff claims that it “[introduces] a more farmer-centred strategy for making further agricultural improvements” (Uphoff, 2014, slide 27), as it is “not [presented] to farmers as a set technology…[opening] SRI up to many adaptations and innovations by farmer-users, who often but not always are
collaborating with NGO or government staff in a collaborative manner” (Uphoff, 2007b, p. 45). Even from its origins, SRI was different, as it did not begin “in the laboratory, but on farmers’ fields” (Prasad, 2009, p. 3) and is constantly changed by the innovation of farmers in what has been called “a striking case of ‘land to lab’, reversing the usual ‘lab to land’ presupposition” (Thiyagarajan et al., 2013, p. 147). Although still aiming at yield intensification, SRI positions itself as “a set of ideas and insights… all focused on how to get more benefit from available resources” (Uphoff in foreword of Thiyanagaraja et al, 2013), as opposed to a technology. It views farmers as “adopters [rather] then adapters” (Thiyagarjan et al, 2013 p. 12) and aims to increase yields “within the context of [the crop’s] multiple interactions and their interdependence with other organisms”(Uphoff, 2007b, p. 86). Uphoff stresses that farmers have been extensively involved in devising SRI methods, “instead of being devised by ‘experts’ and then ‘extended’ to farmers” (Uphoff, 2007b, p. 55). Unlike modernist strategies such as the Green Revolution, SRI positions itself as a “grassroots innovation, with truly South-South cooperation,” promoting the concept of “knowledge as commons” (Prasad, 2009, p.1). It is positioned as a “low external-input alternative to dominant Green Revolution approaches to plant improvement and crop management” (Berkhout and Glover, 2011, p. 43). It also deviates from neo-liberal privatization of research approaches, as is seen in technological developments such as biofortification efforts (i.e.: Golden Rice) (Brooks, 2010), as:

SRI entails no intellectual property rights, nor patents, nor royalties, so this knowledge is free to anyone who wants to work with it. It is not a fixed technology, as further extensions extrapolations and modifications in both practices and thinking are expected (Uphoff et al., 2013, p. 12).
While the advocates of SRI do widely believe it to be an extremely important aspect of improving food security, Uphoff recognizes that “there will be no ‘silver bullet’ to overcome the many challenges that we are facing,” (Uphoff et al, 2013, p. 3). This, however, contrasts with some of the propagation of SRI – such as the Carey Foundation quote cited above – that precisely characterises SRI as a silver bullet solution to food security in an age of climatic change.

Agro-ecologists have long known that there are alternatives to modern agriculture, as “intensification that depends essentially on greater use of external inputs is not the only kind of intensification available,” (Abraham et al., 2014, p. 1 -2). Yet, the idea of “… ‘more from less’ is counter-intuitive…” in modernist paradigms (Uphoff, 2014, slide 4). Shambu Prasad, a rural policy and science studies professor of the Xavier Institute of Management University in Bhubaneswar, Odisha, India, and a 2014 Fulbright Scholar with SRI-Rice, compares Norman Uphoff to Norman Borlaug to emphasize the contrasting forms of knowledge used in the Green Revolution promotion and SRI’s promotion (Prasad, 2009, p. 3). He refers to the claim by advocates that over fifty countries have taken up SRI in such a short time period as evidence of “substantial rethinking on the way knowledge is conceptualized in agriculture,” with a “potential to push knowledge boundaries” (Prasad, 2009, p. 2). As opposed to input intensive approaches, SRI is presented by its advocates as a knowledge-intensive approach relying on hands-on experience (Thiyagarajan et al, 2013). In this respect, SRI potentially challenges the “the ‘tools’ of development – science, technology, planning, international organizations” (Escobar, 1995, 26). The dominant Western belief that knowledge comes
from experts and acts on nature (Mitchell, 2002) is confronted in SRI, as Fr. Henri de

Laulanie positions rice as the teacher. He states that in rice cultivation:

   rice is the true master of the game, and the rice planter is its
   disciple...the rice...is the supreme judge and master...rice
   itself is the only source for learning about actual efficient rice
   cultivation (Laulanie, 1992, p. 19).

   While SRI is positioned in distinction to modernist approaches to agriculture, it is
not necessarily exclusive of them. Prasad, for example, states that it is “fascinatingly
inclusive and allows both proponents of indigenous knowledge and sensitive modern
scientists to discover, negotiate meaning and engage in a knowledge dialogue” (Prasad,
2009, p.3). This has become more true over the years, as “the reasons for the success of
SRI methods that were developed inductively by Laulanie some 30 years ago after two
decades of observation and experimentation are becoming better understood and
explainable in scientific terms, particularly with knowledge from the realm of
microbiology” (Uphoff et al., 2013, p. 5). SRI promises to be an alternative to top-down,
technocratic approaches to agriculture, as it is based on agro-ecological principles,
promotes organic inputs, and focuses on small-holder farms. But, as Patel says, “No
group is without contradiction, no pure ideology made flesh” (Patel, 2009, p. 17). The
next chapter will take a close look at some of the most prevalent claims that SRI make, as
well as some of the contradictions and academic contentions with these claims. Again,
teasing out these contradictions is not to discard their value, but to ensure that they are
not misrepresented, nor do they exacerbate the pressures and challenges so many
smallholder farmers already face.
Chapter 3

SRI’s claims: Contradictions and contentions

Already in over 50 countries, this unprecedented methodology is eradicating hunger, decreasing poverty, conserving water, diminishing global warming, enhancing the financial livelihood of millions, reducing malaria, reviving the Earth’s soil, enhancing biodiversity and environmental quality, and ultimately benefitting the health of millions and millions of people. (Better U Foundation)

Claims such as those made by the Better U Foundation make SRI out to be a catch all solution for current global agricultural, environmental and social challenges. While advocates for SRI boast such assertions, Uphoff carefully states that SRI “is not considered a panacea” and that “there are some limitations as to where its methods can be productive” (Uphoff et al., 2013, p. 11). Nonetheless, the following benefits are most commonly claimed (as summarized by Berkhout et al, 2014, p.2):

First, grain yields are reported to increase, delivering a direct benefit to both subsistence and (semi-) commercial farming households. Second, SRI methods are widely believed to increase the productivity of two key inputs, namely water and seed. Consequently, the system is thought to be more accessible and affordable to poor and marginal communities and farmers facing water scarcity. A more controversial claim holds that the productivity of the system as a whole increases through positive synergetic interactions among the SRI practices; in other words the positive impacts of individual components of the system are multiplied when they are applied in concert (Stoop et al., 2002; Uphoff, 1999). Third, SRI is said to represent a more ecologically sustainable method of rice cultivation, primarily through water conservation but also (organic) soil husbandry and lower methane emissions (Uphoff, 2007).

This next section will discuss the following claims, their basis, and their contentions in the academic literature: (a) SRI practices lead to increases in rice yields per hectare. This is the most emphasized claim, most likely a reflection of the dominant emphasis on agricultural productivity, and also, is the most contested by skeptics; (b) Any farmer
anywhere will experience benefits when using SRI. Complicating this particular claim was the main focus of my fieldwork, highlighting the diversity of individual farmers’ experiences, especially with respect to access to assets (i.e.: water, labour, income); (c) SRI practices are ‘climate smart’ and environmentally sustainable; (d) SRI relies on farmers for its dissemination, in contrast to top-down extension approaches.

3.1 – SRI practices lead to increases in rice yields per hectare

… [SRI] increases rice yields, 50-100% and often times even more…. (www.betterufoundation.org)

The primary benefit argued by SRI proponents is that the diligent application of SRI methods results in significant yield gains, making the land more productive per acre. This is a controversial point in the literature, with proponents and sceptics disputing the studies and observations on which these claims are based, including the way they are conducted, interpreted, as well as the specific practices that constitute the ‘conventional’ rice cultivation which SRI is measured against (Sheehy et al., 2005; Dobermann, 2004; Berkhout et al., 2014; Berkhout and Glover, 2011).

Proponents of SRI suggest that there is ample and growing evidence of yield increases in a number of locations around the world (Jayapalreddy and Shenoy 2013; Islam et al, 2014; Katambara et al., 2013; Laulanie, 1992; Stoop et al., 2002; Thakur et al., 2010; Thakur et al, 2011; Takahashi et al., 2013; Uphoff, 2007b; Zheng et al., 2011). These increases are attributed to the rice plants’ physiological changes, such as the development of deeper roots with greater activity, larger leaves with a spreading canopy for greater light interception, and an elevated rate of photosynthesis (Thakur et al, 2010, p. 95). SRI plants have been found to have higher leaf area index, higher specific leaf
weight, an open-type canopy, and therefore, an ability to intercept more light (Uphoff, 2014, slide 13-14). The greater light interception at panicle initiation gave SRI plants’ canopies an advantage in light capture ability (Uphoff, 2014, slide 14). SRI plants are also found to have “greater amounts of exudates per hill, per area, and at greater rates” (Uphoff, 2014, slide 15). This is argued to explain the yield increases.

Studies conducted in India (Orissa, Meghalaya and Andhra Pradesh), Afghanistan and Indonesia have all shown increases in rice yield per hectare ranging from 5% - 100% (Thakur, 2011; Islam, 2014;, Uphoff, 2007; Jayapalreddy and Shenoy, 2013; Ramzi and Kabir, 2013; Senthilkumar et al., 2008).

Berkhout et al. complicate the claims of yield increases in SRI by pointing out that “often, SRI is selectively practiced on more fertile plots. As a result, no firm evidence on changes in total factor productivity can be discerned, while partial productivities of land and labour show mixed results” (Berkhout et al., 2014, p. 1). For example, he cites a Madagascar study which found that SRI fields were more fertile and closer to the homestead, experiencing a greater application of manure (Serpantie and Raktondramana, 2013 as cited in Berkhout et al., 2014, p. 4). In summary, based on their SRI performance articles reviewed, Berkhout et al. conclude that “SRI methods appear
slightly more productive on fertile and less drought-prone plots with higher organic and inorganic inputs. Under less favourable conditions, alternative methods outperformed SRI”, although again they state that it is important to keep in mind that many of the reviewed studies had very small sample sizes (Berkhout et al., 2014, p. 4). Overall, Berkhout et al. found in their review that

the nature and exact cause of increases in land productivity remain obscure, although differences in land productivity between SRI plots and non-SRI plots (or farmers) are likely to be a partial cause or an effect of improved results with SRI methods. Various studies suggest that a considerable part of higher yields under SRI management may be attributed to a preferential allocation of SRI to more fertile plots, and/or to a preferential allocation of fertilizer and labour to SRI plots (Berkhout et al., 2014, p. 8).

It is still not clear whether the substantial increases in yield are attributed to “increased fertilizer or labour inputs, more skilful farmers, better soil fertility on plots chosen for SRI management, or synergetic interactions among the SRI practices” (Berkhout and Glover, 2013, p. 5).

In short, SRI is believed to provide a means of risk reduction for smallholder farmers facing the inherent uncertainties of agricultural livelihoods. A study conducted in Sri Lanka found that “the probability that a household would end the season, wet or dry with a net economic loss was nine times greater using conventional practices than with SRI methods” (Namara et al., 2004 as cited in Uphoff, 2007a, p. 93). Uphoff states that SRI farmers in general find that their “resulting rice phenotypes are better able to cope with most hazards encountered” (Uphoff, 2007a, p. 93).

It has been widely accepted that using SRI techniques “promotes visible changes in the growth patterns and morphology of individual rice plants, specifically a vigorous
production of numerous tillers” (Berkhout, et al., 2014, p. 2). Since the relationship between tillering and grain production is not linear, it is not certain that these morphological changes do in fact lead to greater grain production (Latif et al., 2005, 2009 as cited in Berkhout et al., 2014, p. 2). There are also questions about whether reports of increasing yields are sustainable in the long term, as excessive nutrient mining may decrease the fertility of the soil over time. This argument is countered by the claim that SRI plants tend to produce greater root biomass, which enables a greater return of organic matter to the soil following harvest, thereby replenishing the soil’s nutrients (Uprety, pers. comm., 2014).

3.1a - Claim contestation

Despite claims of impressive increases in yield, it took time for SRI to gain global prominence, as “many of the early reports about SRI were informal, anecdotal, or derived from grey literature” (Berkhout et al., 2014, p. 2). IRRI was approached by Norman Uphoff for input and reactions before he published his first journal article on SRI. They responded that they had already experimented with SRI’s practices, with the exception of planting single seedlings. Uphoff was “disappointed that the IRRI response did not take up the question of synergies” between the practices (Uphoff 1999 as cited in Berkhout and Glover, 2011).

Stoop states that in general, mainstream approaches to water-saving irrigation experiments are ‘reductionist’ in design which “prevent researchers from appreciating the interaction among different cultivation practices or the complexity of local conditions” (Stoop, 2009 as cited in Berkhout and Glover, 2011, p. 55).
Whether or not these claimed increases in yield translate into household benefits is contested in the literature. In his study on Indonesia, Kazushi Takahashi and Christopher Barret show that although average yields on farmers’ fields increased by 64% with SRI, “presumably due to the increased use of family farm labour, which has to be shifted from some other productive use, there is no statistically significant difference in total household income between SRI users and non-users” (Takahashi and Barrett, 2013, p. 270). The shifting is not equitably distributed in the family, as his data suggests that “the primary mechanism behind the income neutrality of yield-increasing SRI is a sharp reallocation of family labour away from women’s self-employed non-farm activities into rice cultivation” (Takahashi and Barrett, 2013, p. 272). This suggests SRI has strong implications for gender relations.

The “Achilles heel” of SRI, Berkhout and Glover argue, has been the lack of empirical peer reviewed articles proving its benefits. The first articles written were taken up by students at the Faculty of Agriculture at the University of Antananarivo, which therefore, did not carry much weight. A 2002 conference in Sanya, China produced papers from 14 different countries on SRI trials, and also initiated a global network. (Uphoff et al., 2002, as cited in Berkhout and Glover, 2011). Sebastian Rafaralahy’s (2002) controversial paper was among them, claiming that yields of more than 20 t/ha were obtained with SRI. Berkhout and Glover have found “very few reports of extremely high rice yields, and none of the magnitude reported by Rafaralahy (2002)” (Berkhout and Glover, 2011, p. 47).

Since its inception, SRI has faced criticism from the agro-science community. This community tends to argue that claimed yield results are the product of false
measurements and/or faulty reporting. John Sheehy, an IRRI researcher, is unconvinced by SRI’s yield claims, as he believes “the energy required to achieve such a yield is well beyond the thermodynamic capabilities of plant photosynthesis and crop use of solar energy” (Sheehy et al., 2005, p. 355). Achim Dobermann, a fellow IRRI researcher, states that “uncertainties persist about SRI’s performance in different environments, long-term effects on productivity, soil quality and the environment, and its overall adoption potential” (Dobermann, 2004, p. 276).

Sheehy continues to be disillusioned by the findings, and states that:

No doubt the admirers of SRI will continue in their advocacy and some funding agencies will waste money by diverting it from hypotheses developed with logical consideration of the relevant theory and substantive preliminary experiments (Sheehy et al., 2005, p. 356).

It is difficult to determine whether Sheehy’s hesitations are based on his own disbelief in SRI as a method, or in his loyalty to IRRI’s philosophical alignments. He predicted in 2005 that “eventually, SRI will go the way of other non-science and disappear into obscurity” (Sheehy et al., 2005, p. 356), yet it appears to have only grown in popularity.

W. A. Stoop and Amir Kassam argue that Sheehy’s research “is flawed and far from conclusive”, and that IRRI does not need to be protective of their research interests, as “SRI does not necessarily require huge amounts of funds that would ‘financially compete’ with other research or with development efforts” (Stoop and Kassman, 2005, p. 360).

3.2 – Any farmer anywhere will experience benefits with SRI

SRI is an unprecedented sustainable methodology any farmer can learn and adapt to achieve remarkable results (www.betterufoundation.org).
One of the most compelling claims of SRI, especially for donor agencies such as the Better U Foundation, is that farmers of any agro-ecological, socio-economic and political context will reap SRI’s rewards. This is positioned in contrast with Green Revolution technologies which often limited poorer, small-holder farmers, as they required the purchase of expensive HYVs and chemical fertilizers. In contrast, SRI is posited to be developed particularly for small-holder farmers and effective with any variety, depending only on organic compost while requiring a lower seed rate. In the eyes of SRI advocates, adopting this methodology is a simple win-win. Complicating the simplicity of this claim occupied the bulk of my fieldwork and is the focus of Chapter 5.

Uphoff claims that five million farmers around the world use SRI and to him, this shows that the controversy around SRI’s legitimacy has been “ebbing” (Uphoff et al. et al., 2013, p. 1). As of January 2014, Styger estimates that 8-10 million farmers around the world are applying and benefiting from the SRI methodology (Styger et al., 2014, p.4). However, Berkhout points out that since there is a scarcity of studies assessing diffusion and adoption of SRI, “it is impossible to answer the question exactly how widely SRI or its components have been adopted worldwide” (Berkhout et al., 2014, p. 2).

The yield results of SRI vary considerably amongst farmers, which is attributed by advocates to “whether the methods are used more or less completely and more or less skillfully” as well as that “of the soil biota that are stimulated by the addition of organic matter to the soil, by root exudation, and by soil aeration” (Uphoff, 2007, p. 89). Although “practically all genotypes of rice respond positively to SRI practices” results may differ depending on the genotype of that particular variety (Uphoff, 2007, p. 45). Yet, since SRI requires a lower density of plants, it is assumed that even if yields remain
the same, farmers will have saved money as their input costs would be less. For example, Jayapalreddy and Shenoy showed that SRI fields required 2 kg of rice, whereas traditional cultivation needed 30 kg of seed per acre (2013, p. 2).

Generally, the assumption that SRI is able to work with any farmers is not critiqued amongst SRI advocates. Aspects such as education level, risk aversion, socio-economic status, social networks, caste, gender and access to resources such as water, seed varieties, fertilizers, labour and credit are not considered when determining who can adopt SRI. Although farmer yields are often higher when using SRI, their “risk also seems to increase, which initially favours adoption by better-endowed farmers and on better soils” (Berkhout et al., 2014, p. 1). Not all farmers are able to adopt SRI. For some households, the time and labour required to learn the method is too expensive (Moser and Barrett, 2003; as cited in Uphoff 2007a, p. 93). Jayapalreddy found that farmers who practiced SRI tended to be younger, more educated, and with more landholdings than traditional farmers (Jayapalreddy and Shenoy, 2013, p. 1). There are very few studies aimed at understanding patterns of adoption, partial adoption, and disadoption of SRI. Dobermann states that while “approaches such as SRI may serve the important needs of resource-poor farmers in areas with poor soils, [they] are likely to have little potential for improving rice production in intensive irrigated systems on more favourable soils, where high yields can be achieved through implementation of more cost-efficient management practices” (Dobermann, 2004, p. 261). This claim therefore runs counter to the notion that SRI promises benefits across scale and types of farmers.

Yet, Rajendra Uprety, a District Agricultural Officer (DAO) in Morang District in Nepal, and a long-time SRI advocate, does discuss these limitations. As a seasoned
practitioner would be, Uprety is reflexive about the challenges he has faced in disseminating SRI. He found that soil type made a difference – while the recommendation of allowing the soil to dry 3-4 times throughout the growth process had a positive impact on loose soils with high organic matter, it had a negative impact on heavy clay soils, as they became very hard after drying which limited root growth (Uprety, 2006). Labour constraints and varietal preferences necessitated different weeding strategies and spacings respectively (Uprety, 2006, p. 39).

While Uprety demonstrates that soil type and fertility may constrain SRI use, Uphoff believes that “the most pervasive constraint on SRI adoption is mental inhibitions, attachment to conventional practices and apprehensions based more on imaginings than data,” as well as a fear of critique from their neighbours (Uphoff, 2007, p. 95). This assumes that all farmers, if they were not clouded by their own inhibitions or neighbours’ perceptions, would “naturally opt for a new technology merely because it is more productive or considered optimal in agronomic terms” (Glover, 2011, p. 218). This assumption, however, ignores many pressures and perspectives that influence an individual farmer’s decision, and, as Glover states, “is not sound” (Glover, 2011, p. 218).

For example, even though Senthilkumar’s study in Tamil Nadu showed that farmers could save 40-50% of their water without any yield reduction, “farmers’ interest in adoption of the practices was mixed” (Senthilkumar et al., p. 93). Indeed, there are many pressures influencing a farmer’s decision to adopt a new agricultural technology or not. In his many years of working as the DAO in Morang District in Nepal and advocating SRI in the region, Uprety has observed that many farmers who have tried SRI and left it, have actually blended some SRI practices with their conventional and/or
traditional practices (Uprety, 2014, pers. comm.). Glover confirms the observation that “on small farms, new practices are often incorporated gradually, experimentally at first, and the process of incorporation may include mistakes and steps ‘backward’ to tried-and-tested practice as well as ‘forward’ to the new practice” (Netting et al., 1989, as cited in Glover 2011, p. 219). This makes understanding which farmers practice SRI extremely difficult, as exposure to the practice may shift their conventional practice in particular ways - so what they practice is actually a combination, or “hybrid” of the two (Uprety, 2014, pers. comm.).

Dobermann highlights that the difficulty in precisely defining what differentiates an SRI farmer from a non-SRI farmer “has provided fertile ground for critics to attack the system” (Glover, 2011, p. 219). While SRI advocates say that SRI is not a fixed technology and that even applying a few of the practices will derive some benefits, this raises the question of what precisely defines SRI (Glover, 2011, p. 220). Notably, despite their emphasis on flexibility, SRI advocates do refer to SRI as a package with specific recommendations (Glover, 2011, p. 220) (See section 2.2b). As part of this vagueness, Dobermann states that there is “a general lack of detailed field research following high scientific standards” (2004, p. 262). While this could be a case of a difference in knowledge values, where IRRI researchers do not consider farmers’ experiments as embodying ‘high scientific standards’, a lack of these standards does indeed make it increasingly difficult to understand precisely what SRI is, and which farmers practice it. Also, “adopters often do not practice the SRI techniques on all of their rice plots,” (Berkhout and Glover, 2013, p. 5), indicating that not only is there diversity in rice cultivation practices between individual SRI farmers, but also between an SRI farmer’s
individual rice fields. In Berkhout and Glover’s review, they found that “qualitative indicators show that the SRI phenomenon is real and substantial, but it is difficult to evaluate the spread of SRI knowledge and practice in quantitative terms” (Berkhout and Glover, 2011, p. 57). They suggest further research into patterns of adoption and partial adoption, the impact on labourers, the impact it has on household income, food security and health of household members (Berkhout et al., 2014, p. 9).

Takahashi’s study was unique in addressing risk aversion and its relations to SRI adoption (Berkhout et al., 2014, p. 8). He completed a study in Indonesia which shed light on the types of farmers that tend to adopt SRI. He suggests that “SRI users are slightly less risk-averse than non-users” (Takahashi, 2013, p. 277), with “female-headed households…less likely to apply SRI” (Takahashi, 2013, p. 279). He concludes that “the most important covariates correlated with SRI use include water availability, family labour endowment, learning opportunities and risk preferences” (Takahashi, 2013, p. 279). This raises questions about which farmers are able to adopt SRI, and whether there is an implicit bias in extension towards more affluent farmers that have already demonstrated more independence and success and that, potentially, are less constrained in their choice of techniques. The question of control over water and access to labour and other forms of income is a focus of my fieldwork research.

3.2a - Limitations due to resource constraints

Berkhout et al. state that “while SRI may potentially offer advantages, several socioeconomic issues remain unresolved and deserve further research” (Berkhout et al., 2014, p. 9). Berkhout and Glover note that “it is clear that the adoption of SRI methods is
associated with quite substantial changes in allocations of inputs, especially labour, water and fertilizer. These include changes to the temporal distribution of labour demand and the gendered division of labour” (Berkhout and Glover, 2013, p. 5). Several authors have noted that a series of major constraints can be found in the availability of key inputs.

First, reliable irrigation appears in many accounts as a prerequisite for successful SRI practices. As Laulanie states, “SRI in rain-fed rice cultivation [is] difficult, mainly because of a lack of reliable meteorological forecasts” (Laulanie, 1992, p. 17).

Senthilkumar et al.’s study in Tamil Nadu revealed some limitations of SRI for farmers without full control over their water source. Farmers in his study claimed that the uncertainty with water release made it difficult to maintain the nursery. Water delays which pushed back transplantation to when the seedlings were older than 20 days “led to intertwining of the roots, making the seedlings unfit for planting. By contrast, in conventional nurseries, farmers can maintain the seedlings until they receive water from the canal as no seedling damage occurs” (Senthilkumar et al., 2008, p. 92). Also, water-saving techniques were not possible during the monsoons, or if neighbouring fields were flooded (as they would naturally drain into their own fields) (Senthilkumar et al., 2008, p. 92). In cases where there is a lack of water at an imperative time, only those farmers who are able to afford water pumps will be able to supplement their fields. In conversations during my fieldwork in Nepal, it was expressed that this access is often associated with connections in the Ministry of Agriculture. As I draw out in Chapter 5, this further complicates the claim that SRI can be practiced by all farmers in all situations, especially those without the assets or social networks that tend to enable water control. Yet, Mushtaq et al. (2009) found that access to reliable irrigation was not the only factor
encouraging some Chinese farmers to adopt AWD or other water-saving techniques. In their conclusions, they state that “AWD adoption was more likely to be influenced by institutional arrangements and farmer training, and a desire to mitigate risk in the face of water scarcity” (Mustaq et al., 2009 as cited in Berkhout and Glover, 2011, p. 52). This indicates that there are combinations of factors – water control and access to irrigation alone does not explain patterns of SRI adoption. Access to extension and agricultural services is another important focus of my fieldwork.

Second, applying organic compost is a constraint, determined by “the availability of organic materials and high labour cost for producing, transporting and applying them” (Dobermann, 2004, p. 275), which indicates that SRI itself might be dependent on farmers’ socio-economic statuses, topographical locations, and agro-ecological practices.

A third constraint that farmers may also face social constraints, as “village community members think that they have the right to laugh at innovators among them” and that a “crop that is too successful” is “dangerous; [as] villagers are afraid of the ancestors’ and spirits’ jealousy” (Laulanie, 1992, p. 22). Laulanie commented on the tendency of Malagasy farmers to revert back to their traditional methods. He states that this occurs not because of the “shortcomings of SRI itself, but the good harvest that SRI provided. The farmers’ apprehension made them switch back to the traditional method, which is safe for them as this precludes any revenge from the ancestors or bad spirits” (Laulanie, 1992, p. 22). Laulanie talks about this as a problem, but Glover states that this is common, and that “Farmers’ evaluations of new technological options will include not only their technical and economic performance but also the opportunity costs and trade-offs involved as well as any social payoffs, which may qualify the outcome of a purely
technical calculation” (Glover, 2011, p. 218). Glover reminds us and stresses that “small-scale farming is partly a social process, which may limit an individual farmer’s freedom to follow an independent path. There may also be tangible benefits of farming in the same manner as one’s neighbours, especially if key resources such as labour or irrigation are collectively managed” (Glover, 2011, p. 218). This raises questions about which farmers are able to adopt SRI, and whether or not there an implicit bias towards more affluent farmers that have already demonstrated more independence and success and that, potentially, are less constrained in their choice of techniques.

A fourth limitation for adoption and a driving force of disadoption is the fact that SRI requires “additional knowledge and labour input at times of labour shortage” (Dobermann, 2004, p. 275). Berkhout et al. also allude to an increased risk for SRI farmers in their 2014 review. Although land productivities tend to be higher under SRI, the variation in land productivity is wider. This, he states “implies that adopting SRI practices could create a source of increased risk for farmers, and many smallholder farmers are justifiably risk averse” (Berkhout et al, 2014, p. 8). Critics have argued that due to the increased labour intensity needed in SRI, it is only possible for smallholder farmers (Professor R2, 2014). Yet, Abraham et al. argues that “agro-ecological innovations [like SRI] need not be limited to small-holder farming” (2014).

i) Labour constraints

One of the most difficult aspects of wide scale SRI adoption is that it is believed to be more labour intensive (Uphoff, 2007b, p. 46), and this has been a ‘barrier to adoption’(Uphoff 2007a, p. 93). As SRI practices are viewed to be “counter-intuitive” to
most farmers, they take more labour time initially, especially when they are “first getting accustomed to handling tiny seedlings” (Uphoff, 2007b, p. 46). The transplanting will require more attention at first, Laulanie admits, and:

at first, transplanters who are not yet used to the method will work with some hesitation and spend more time, which makes one believe initially that more labourers are needed. But [according to their calculations] once they get acquainted with the method of handling small seedlings, it saves time (Laulanie, 1992, p. 20).

Laulanie states that since the seedling nursery will generally be smaller, only a quarter of the size of traditional nurseries, less labour time will be needed, “even if…managed with more care, it will require less total work” (Laulanie, 1992, p. 20). Uphoff claims that, however, “once farmers become more skilled and confident, the process goes more quickly, [and] can become labour saving” (Uphoff, 2007b, p. 46). Jayapalreddy and Shenoy state that per acre, transplanting in SRI actually only needs 5-8 labourers, while traditional transplanting needs 10-15 labourers. This translates to a gain of Rs. 1150 per acre (Jayapalreddy and Shenoy, 2013, p. 2). Barret et al.’s study in Madagascar showed that by the fourth year of practicing SRI, farmers noticed a 4% reduction in labour inputs, and a 10% reduction by the tenth year (2004) (as cited in Uphoff, 2007a, p. 93), although other studies have shown contradictory findings in relation to labour (Uphoff 2007a, p. 93). Also, Berkhout points out that state that the observation that SRI labour decreases “could also result from attrition bias, caused by farmers with the lowest rates of labour productivity disadopting SRI and dropping out of the sample” (Berkhout et al., 2014, p. 7).

Senthilkumar et al.’s surveys of Tamil Nadu farmers using modified rice cultivation practices (similar to SRI) revealed no labour differences in terms of irrigation,
fertilizer application, harvesting and processing (Senthilkumar et al., 2008, p. 90). Land preparation and line transplanting were found to require more labour, which restricted the land size that could be used, especially because farmers were often elderly or engaged in other occupations. Their study found that many labourers complained about SRI practices as they found it difficult to handle very young seedlings and maintain the proper spacing between rows and plants simultaneously – this led labourers to object to following these practices (Senthilkumar et al., 2008). Dobermann, an agriculture research scientist and leader of IRRI’s program on sustaining productivity in intensive rice-based systems, is not convinced by the claimed utility of SRI due to these labour requirements. He states:

[IRRI] has strong reservations scientifically about the claims that are being made, but what is probably more important is that we have strong reservations about the claims that are being made about the general applicability of SRI, because it is a very labour intensive practice, it is very knowledge intensive, it is, in my opinion, in many ways going against the socio-economic trends that we see in rice farming, where labour is becoming less available or more expensive (Dobermann in “Viewpoints.” World Bank, 2008).

The patterns of SRI adoption are strongly influenced by changes in labour productivity and broader socio-political structures. For example, Berkhout states “taking into account relative local input prices, it could make perfect sense for farmers in Madagascar to increase labour use, while farmers in India substitute relatively cheaper fertilisers for labour” (Berkhout et al., 2014, p.7). This was also the case in Nepal, where some farmers who did not have access to labourers for the weeding process used a higher concentration of herbicides.

While labour is a contentious issue with SRI, advocates claim that labour is reduced after farmers gain experience with the practices. For example, those who use
mechanical weeders do not need to seek labourers to do the weeding, which are often expensive and scarce (Jayapalreddy and Shenoy, 2013, p. 2). While many studies demonstrated SRI required more labour, “there is no firm consensus on whether overall labour productivity increases or decreases” (Berkhout et al., 2014, p. 8, emphasis in original). However, “it is clear that the adoption of SRI transplanting and weeding methods leads to significant changes in the organization of tasks, gender division of labour, and temporal distribution of labour demand, including the possibility of an increased labour requirement at harvest time” (Berkhout et al., 2014, p. 8). Traditionally, women are responsible for weeding and transplanting in the rice paddy. However, when SRI methods are adopted, using a mechanical weeder often “triggers a change in these task allocations between men and women” (Berkhout et al., 2014, p. 7). However, little evidence on how SRI impacts gender relations has been documented (Berkhout et al., 2014, p. 7)

3.2b - Different results in different locations

R. Mahender Kumar et al.’s study in India showed that “the performance of SRI varied from location to location indicating that the response of SRI is location specific” (Mahender Kumar et al., 2013). This raises notable questions about the generality of SRI between different agro-ecological zones, and between farmer types. Dobermann is not surprised that the performance of SRI differs between locations, and he specifically urges practitioners to be more attentive to the locations in which specific practices, such as flooding or intermittent irrigation, are most appropriate.

it is necessary to differentiate between environments in which growing rice under flooded conditions is most sustainable and
those where periodical aeration or oxygenation can be the single-
most important management factor for increasing yields. The
former appears to apply to more fertile lowland rice
environments, whereas the latter is mainly the case on marginal
soils with need for aeration to improve oxygen supply to roots,
and to avoid accumulation of toxic concentrations of reduced
substances as ferrous iron (Fe$^{2+}$) or hydrogen sulfide (H$_2$S)
(Dobermann, 2004, p. 266).

He states that “a floodwater layer has unique benefits…estimates vary, but
biological activity in the floodwater is a major component of the long term sustainability
of rice systems, mainly due to large [carbon] and [nitrogen] inputs associated with it”
rapidly developing shallow root system is more suitable to achieve the yield potential,
and where a deeper, more aerated root system may be of greater advantage” (Dobermann,
2004, p. 272). The deeper root system is most desirable in the conditions he outlines here:

(1) soils with no permanent floodwater layer and potential for
water stress; (2) systems with low external inputs of rapidly
released nutrients, and (3) systems with longer growth duration
that allows enough time for root system development (single

Dobermann does not deny that SRI has the potential to raise yields and deliver
other benefits, but claims that it performs best in specific “ niches such as the
management of previously poor systems on mostly marginal land, provided that sufficient
cheap labour is available” (Dobermann, 2004, p. 275), and:

in environments with acid, Fe-rich soils, high labour availability,
and a generally low level of crop intensification. Under such
conditions, conventional management practices such as
permanent submergence may fail to increase rice yield because
rice growth and the response to mineral fertilizer applications is
limited by toxicities caused by anoxic conditions (Dobermann,
In such cases, SRI might help improve the yield performance of farmers operating in sub-optimal conditions with what would be considered poor practices for the specific agro-ecological setting.

Although, Stoop and Kassam cite the number of locations and farmers using SRI as proof that it is not only suitable to certain locations (Stoop and Kassam, 2005). Stoop and Kassam respond to Dobermann and Sheehy by saying that their papers “have bypassed what is already known to have happened in farmers’ fields and are trapped in conventional and narrow theoretical thinking in an effort to discredit and thus discard the possible usefulness of SRI” (2005, p. 359). They accuse critics of not understanding the situation of many smallholder farmers around the world, that “maximizing the productivity of available (family) labour is the goal rather than minimizing total labour input, which is the driving force for mechanized farms” (Stoop and Kassam, 2005, p. 359). Yet, as Berkhout et al. state, there is no evidence whether SRI increases labour productivity or not (2014).

3.2c - Research validity

Another contention Dobermann has raised has been around the “uncertainties associated with [SRI] studies…[which] do not include sufficient descriptions of site characteristics (e.g., soil, climate), experimental protocols, field management, sampling methods, and statistical data analysis to properly assess the validity of the results reported” (Dobermann, 2004, p. 265). Also, he states that “little information was given on how the ‘conventional’ plots were managed in comparison with SRI, and also with regard to known best practices for water, nutrient and pest management” (Dobermann, 2004, p. 265). Glover explains:
The polarizing dynamic of the controversy itself further reinforces the idea that SRI and Best Management Practices (BMPs) are two discrete, mutually exclusive and competing systems of rice cultivation (alongside a third, implicit category of unimproved ‘traditional’ or ‘conventional’ farmer practices) (Glover, 2011, p. 220)

He also states concerns about long term soil fertility, as:

management techniques that stimulate soil organic matter mineralization and crop nutrient extraction from the soil with insufficient external replenishment may lead to a decrease in soil fertility…[and] no research has been conducted to understand the long-term consequences of such soil exploitation for the sustainability of SRI production systems (Dobermann, 2004, p. 267).

When the question of soil nutrient exhaustion with SRI was raised to Laulanie, he stated that “this question is certainly important, but nobody yet knows the answer. Only the future can tell us” (Laulanie, 1992, p. 15). However, he states, “It should not be forgotten that rice is one of the least demanding crops in terms of nutrients” (Laulanie, 1992, p. 15).

3.3 – SRI is ‘climate smart’

[SRI] is more resistant to drought, storm damage, climate changes, and pests... it requires 90% less seed, 30 – 70% less water than typical methods, needs no chemical pesticides, herbicides or chemical fertilizers. (www.betterufoundation.org)

SRI is believed to have a number of environmental benefits, such as reducing chemical inputs and undercutting the incidence of malaria. This section, and this research focused on SRI’s claimed ability to adapt to and mitigate climatic changes, with respect to a reduction in water use and greenhouse gas emissions. Predominately, this study focuses on the claimed reduction of water usage.
Uphoff suggests that it is possible to “climate-proof” cropping systems through the following: “(a) by promoting the growth and health of plants’ root systems, and also (b) by nurturing the robustness and fertility of the soil systems in which plants grow” (Uphoff et al., 2006 as cited in Uphoff, 2007, p. 86). The argument behind this is largely that since the soil is healthier and more productive, along with the fact the SRI plants have a stronger root system, these plants are better able to withstand dramatic climatic pressures (Uphoff, 2007, p. 86). Uphoff claims that SRI plants have shown drought resistance in “Cambodia, China, India, Indonesia, Madagascar, Myanmar, Nepal, Philippines and Sri Lanka” (2007, p. 90). Beyond drought, “SRI crops are less liable to lodging as well as more resistant to heat waves or cold snaps” (Uphoff, 2007, p. 92). While young seedlings are initially more vulnerable to flooding as they are so small, if the crop is lost, a new crop can be regrown in only two weeks, “at little cost” (Uphoff, 2007, p. 92). Along with being more resistant to extreme climates, SRI is considered “climate-smart” because it has been claimed to reduce greenhouse gas emissions (GHG). In a presentation by Norman Uphoff in New Delhi on June 19, 2014, he cited studies from India, Vietnam and Korea, which found a 25% reduction in GHG emissions (Uphoff, 2014, slide 23-25). Yet, he does state that this is complex, and that more research is required (Uphoff et al., 2013, p. 6).

Amod K. Thakur claims that SRI produces an “increased yield per drop of water” (Thakur et al., 2011, p. 223), or, “more crop per drop” (Uphoff et al., 2013, p. 4), believed to be an important part of building climate resilience in water scarce nations (Thiyagarajan et al, 2013;Thakur et al, 2011). Rice is considered the “‘thirstiest’ of our crops” (Uphoff et al., 2013, p. 3), consuming more than 50% of total irrigation water in
agriculture (Mahender et al., 2013, p. 1). As currently produced, irrigated rice requires more water than any other major crop, commonly 3,000 to 5,000 liters of water per kilogram of rice produced” (Uphoff et al., 2013, p. 3). Globally, water usage “has been growing more than twice the rate of increase in population during the last century” (Jagannath, 2013).

SRI practices were found to reduce water usage by 17-50% in Sichuan, China, India, Afghanistan, and Kenya, without any adverse effect on grain yield (Zheng et al., 2011; Uphoff, 2007; Mahender et al., 2013; Uphoff et al., 2013, Thiyagarajan et al., 2005; Jagannath, 2013). Uphoff claims that “as many as 5 million farmers, most of them in China, India, Indonesia, Cambodia and Vietnam, where two thirds of the world’s rice is grown (and consumed), have begun producing more rice with less water (emphasis in original)” (Uphoff et al., 2013, p. 4). Yet, Dobermann believes that the focus on water saving irrigation is complex. Indeed, SRI might also increase the risk for farmers:

The socioeconomic and agronomic issues involved in water saving irrigation are complex. Such techniques are relatively difficult to implement, because they require excellent land preparation, timely availability of irrigation water during critical periods of growth, good irrigation infrastructure, and efficient methods of weed control, particularly in areas with larger field size. If land levelling and water management are poor, the risk for yield reduction due to temporary drought stress, weeds or nutrient losses increases (Dobermann, 2004, p. 267).

This implies that there are a multitude of factors influencing whether water reductions through alternate wetting and drying are beneficial or not. This suggests that not all farmers are equally positioned to carry out SRI, as labour, capital and climatic events all impact the risk-benefit analysis that must be made. Much of this is outside of the direct control of the farmer.
3.4 – Farmer-to-farmer dissemination

As opposed to input intensive approaches to increasing agricultural productivity as in the Green Revolution, SRI is seen as a knowledge-intensive approach relying on hands-on experience (Thiyagarajan et al, 2013). Advocates are hopeful that SRI’s uptake by farmers and (increasingly) by international and government agencies, represents a “substantial rethinking on the way knowledge is conceptualized in agriculture,” with a “potential to push knowledge boundaries” (Prasad, 2009, p. 2) from the belief that the most valuable knowledge is held by experts and researchers, to the acceptance of the value in indigenous and local knowledges. Uphoff presents SRI in opposition to top-down approaches, emphasizing that it is not presented as a final product, thereby allowing and encouraging farmers to innovate practices in nursery management, field markings, and transplantation methods (2007b). It is also situated to potentially challenge the dominant Western view that knowledge acts on nature by positioning rice as the teacher. “In rice cultivation”, Laulanie states, “rice is the true master of the game, and the rice planter is its…disciple…the rice…is the supreme judge and master…Rice itself is the only source for learning about actual efficient rice cultivation” (Laulanie, 1992, p. 19). In this case, Laulanie mirrors Mitchell’s idea in his ‘Rule of Experts’, that “nature form[s] the expertise” (Mitchell, 2002, p. 42). This, however, differs from the ways that the CGIAR and other international organizations influencing agricultural policy view the relationship between research and dissemination, as Brooks notes, their program models “rely on a widely accepted binary that separates ‘upstream’ activities such as basic research from ‘downstream’ adaptation, dissemination and adoption” (Brooks, 2010, p.
SRI’s claimed knowledge values challenge this binary categorization, as the experience and experimentation of farmers and extension officers are posited as leading innovation and developing new knowledge.

Uphoff does highlight the number of ways farmers’ own creativity and innovation have shaped SRI to meet their own needs, interests and locations. For example, the medium used in SRI seedling nurseries has varied widely across locations. In Sri Lanka, farmers use a mixture of soil compost and chicken manure, which they have found to be a better combination in order to easily separate very young seedlings. In the Philippines, some farmers use sand for these same reasons (Uphoff, 2007b, p. 47). Other farmers have changed the location of their nursery, as it can be much smaller with SRI (due to planting a smaller number of seedlings), therefore, can be grown “anywhere that is convenient,” for example, “…on banana leaves…[or] in indented plastic trays” (Uphoff, 2007b, p. 48).

Farmers have also developed strategies and innovations for saving labour at the field marking stage, just prior to transplantation. Laulanie’s original strategy for marking the fields for transplantation was to tie a string to sticks or pegs spaced 25 cm apart along the paddy fields. In Tripura state in India, farmers have used a bamboo rod, and in Iraq, they have developed a board with nails which they drag across the muddy surface. In Madagascar and India, other farmers have “constructed wooden ‘rake-makers’ with its ‘teeth’ spaced 25 cm apart or wider” (Uphoff, 2007b, p. 49). This strategy has also doubled as an indicator for soil moisture level – if the rake is pulled across the land and the paddy is still too wet for the lines to remain, this indicates to the farmer that it is still too wet to transplant the seedlings (Uphoff, 2007b, p. 48). These innovations are “driven mostly by farmer interests and initiatives, supported by professionals from non-
governmental organizations, government agencies and research institutions, universities and the private sector…” (Abraham et al., 2014, p.3).

To Prasad, this support of farmer innovation and experimentation demonstrates a way forward in innovation, a “recognition that science’s new contract with society should substitute paternalism towards people (farmers) and instead make them active participants” (Prasad, 2009, p. 7). While it is claimed that “farmer-to-farmer spread of SRI has been the most important extension methodology, being feasible because the practices are simple and there is no need for purchases or loans” (Uphoff, 2007a, p.95), it is important not to overlook the support from governments, NGOs and major international donor agencies. Uphoff himself states that this has facilitated the spread, as “uptake of SRI [which was] initially very slow…has since been accelerating with government support” (Uphoff, 2007a, p. 89).

Uphoff and SRI advocates claim that SRI is different in that it is transferred from farmer to farmer, in opposition to what Glover calls ‘technology transfer’, which he characterizes as “a hoary model for a kind of top-down agricultural development [which] implies that existing farmers’ practices, which are often characterized as changeless traditions take the form of standardized, mobile packages that can be introduced from outside (or ‘upstream’), which farmers may adopt or not” (Glover, 2011, p. 218). Uphoff claims that SRI is not ‘technology-transfer,’ and that it differs from top-down agricultural policies as it encourages farmers to innovate and experiment with the technologies, as opposed to being handed to the farmers ready to go. Yet, in the farmer surveys that followed Senthilkumar et al.’s on-farm portion of their Tamil Nadu study found that while farmers generally felt positively about the higher yields, increased income and
reductions in water use from the SRI methods, they did not feel confident that they could implement them without the guidance of researchers (Senthilkumar et al., 2008, p. 88-89). Perhaps, this demonstrates that SRI is not immune to the power relations embedded in knowledge practices and institutions that promote them.

Contradictorily, SRI claims to value farmers’ knowledge while at the same time, aiming to “overturn the conventional norms of rice cultivation” (Glover, 2011, p. 219). Although rice has been grown for up to six millennia by millions of farming households throughout the world, “SRI shows that some of our intuitions and inferences [about how rice is grown] may be wrong” (Uphoff et al., 2013, p. 3). There is tension in SRI’s claims specifically about valued knowledge. On the one hand, proponents advocate farmer creativity and innovation, while on the other hand, thousands of years of rice farming in specific locations is challenged with one universal technical way of cultivating paddy, ‘developed’ by a French missionary in Madagascar.

The claim of solely being disseminated ‘by farmers for farmers’ is also not always the case. For example, The World Bank has been involved in promoting SRI as well in India’s state of Tamil Nadu, where they have funded a multi-million dollar, multi-year agricultural development and irrigation management programme, including SRI promotion as a major component which has the potential to affect “the cultivation practices of many thousands of rice farmers” (Berkhout and Glover, 2013, p. 13). The World Bank is also involved in SRI promotion activities in Cambodia.

The way that SRI is presented to farmers is also contradictory. On the one hand, SRI represents “the exact combination of methods that would inevitably be adopted by any discerning farmer if she were to be guided solely by the demands of rice itself”
(Glover, 2011, p. 219). On the other hand, it is commonly claimed that SRI is not presented as a package of practices that must be strictly followed, instead, it is “focused on getting farmers to try the methods for themselves, making adaptations to local conditions and then making their own assessment, continuing only if they are satisfied” (Uphoff, 2007, p. 95). As larger donors become involved, however, SRI is increasingly defining and streamlining itself. For example, the SRI Workshop in Bangkok in 2014 specified that the SRI initiatives under the West African Agricultural Productivity Program (WAAPP) will require “concrete practices under different climatic conditions, with different soil systems, different varieties, different market conditions, different labour constraints, etc.” (SRI Workshop, 2014, p. 2). This necessity to clarify the particular changes needed for different environments shows an acceptance that SRI practices are not universal, while at the same time, attempting to universalize them. SRI practices are also increasingly being practiced with other systems. For example, at a recent workshop in Bangkok, SRI researchers and practitioners discussed ways in which SRI can be used with greater mechanization (SRI workshop, 2014). This complicates whether or not SRI is considered an agro-ecological set of practices.

3.5 - Summary

As Berkhout et al. indicated in their 2014 review article, “deriving firm conclusions from the studies reviewed is seriously hampered by methodological limitations, great diversity in SRI practices and extension and incompletely documented changes in relevant inputs” (Berkhout et al., 2014, p. 3). The debate about whether or not SRI increases yields, is applicable to every farmer, is environmentally sustainable and
values farmer knowledge continues. This chapter did not attempt to prove or disprove the claims SRI proponents and critics state, but rather to complicate and understand them. Berkhout et al. state in their 2014 review paper that “although claims on the adoption of SRI-practices, reduced water use, and increasing water productivity are frequent, there is a paucity of studies quantifying the magnitude of these changes under farmer conditions,” further complicated by “the observed diversity in SRI adoption and practice, small and non-random samples, and a lack of control for various unobserved farm characteristics” (Berkhout et al., 2014, p. 8). Still, the “reported levels of SRI activity in some locations nevertheless appear to be substantial” (Berkhout and Glover, 2011, p. 13). The ways in which SRI becomes deemed “successful” or “unsuccessful” by certain farmers, researchers, institutions or donor agencies are filled with “important and intriguing questions, not only about the rice and the techniques of rice cultivation, but also about agricultural research and development, communication, the mobilization of social and professional networks, the exploitation of scientific knowledge, learning processes, and other topics” (Berkhout & Glover, 2011, p. 137-138). Chapter 5 aims to explore these questions, with a specific focus on the five areas of SRI claims: (1) SRI will lead to increased yields; (2) SRI is universally applicable; (3) SRI practices are adaptable; (4) SRI plants are “climate-proof” and; (5) SRI research and extension privileges farmers’ knowledge.
Chapter 4

SRI in Nepal: Fieldwork Context

The previous chapter examined the claimed benefits of SRI. In a landlocked and largely agrarian country like Nepal, with 88% of the population living in rural regions and 78% employed in agriculture (Joshi et al., 2012), the proposed benefits of SRI would seem major and immediate. Nepal has a population of 27 million people in a landlocked area of 147,000 km² (Joshi et al., 2012), with the agriculture sector accounting for one-third of the total GDP. The four main climatic seasons in Nepal are Spring (from March to May), Summer (from June to August), Autumn (September to November) and Winter (December to January), each of which offers different opportunities and constraints for agricultural production (ICIMOD, 2015). Generally, rice paddy is grown in the Summer season, although, some farmers grow a crop in the spring as well, as long as they have access to groundwater irrigation. Farmers rely heavily on the monsoon, which commonly lasts from the end of June to the middle of September. In this period, 80% of the rain falls, so the rest of the year is generally dry. In addition to seasonal change, agriculture in Nepal is greatly shaped by geographic factors. In this respect, there are three major agro-ecological zones in Nepal - the High Himalayas, the Mid Hills and the Terai (ICIMOD, 2015). I conducted my research solely in the Terai. It is the most agriculturally productive region in the country, and also, is where the greatest advocacy and dissemination of SRI has been conducted.
4.1 – Making SRI in Nepal

SRI’s first appearance in Nepal occurred in 1998, when a government agronomist, in collaboration with the United States Agency for International Development (USAID), conducted field studies showing little promise. It was attempted again in 2001 by the International Maize and Wheat Improvement Centre (CIMMYT) and Appropriate Technology Asia (ATA) at trial sites near Kathmandu. These trials, like the first ones, were deemed unsuccessful. SRI’s significance changed in 2002, when SRI trials in Sunsari-Morang district produced 8 tons/ha, where the national average is 2.7 tons/ha. This spurred the formation of a national SRI network in 2002, and a national workshop in 2003. It was held in Chitwan at the International Centre for International Mountain Development (ICIMOD), facilitated by Chris Evans, an employee of International NGO, Himalayan Permaculture (SRI-Rice, 2015). It is clear that international organizations were heavily involved in the introduction of SRI to Nepal, yet, its continued presence has relied predominantly on local advocates such as Rajendra Uprety.

4.2a - Individual interest

Rajendra Uprety, also in attendance at that first SRI meeting in 2003, is widely known as Nepal’s biggest advocate of SRI. He is the DAO in Morang District, and his introduction to SRI was through a 2001 article Uphoff had written (Uphoff, 2001) in LEISA magazine (Low External Input and Sustainable Agriculture). The article’s photo of a “very handsome looking rice plant” inspired him to conduct his own trial on a small plot, which produced 7 tons/ha. A farmer who had observed this tried SRI independently in his own field, and called Uprety to see the positive results. This convinced Uprety of the utility of SRI in Nepal. “That,” Uprety recalled, “was a very memorable day.” Since
that day, Uprety has been dedicated to spreading SRI throughout the country. In 2005, the World Bank Awarded him with the Nepal Development Marketplace Award, at a value of $20,000, for his efforts in teaching farmers how to use SRI in 2004. The award was to be used to disseminate SRI in Morang and Panchthar districts (Uprety, 2006). Uprety’s District Agricultural Development Office (DADO) in Morang continues to work at disseminating SRI, and making it easier for farmers to adopt it. For example, Morang’s DADO provides SRI farmers with a free mechanical weeder when they practice on 3 kattha or more. Uprety has also just completed his PhD Dissertation analyzing the best way to increase SRI adoption in Nepal.

Ram Bahadur Khadka was another individual researcher interested in promoting SRI. He had learnt of SRI while completing his Master’s at Rampur University. When he graduated in 2009, he joined an NGO called FAYA (Forum for Awareness and Youth Activity) Nepal while they were working on a joint short term emergency relief project funded by the European Commission and carried out by FAO’s Emergency Agricultural Coordination Unit (EACU) in the western region of Nepal. Khadka believed SRI could play an important role in the project, and connected with Uprety to demonstrate the technique. They proposed this method to the FAO’s French project manager, who was “very excited,” Khadka recalls, to include it in the project. That year, 9 Farmer Field Schools were set up with 25 ‘leader farmers’ at each location, and the following year, this grew to four times the size, with 36 Farmer Field Schools. Khadka co-wrote a study on SRI from data during this time as well (Dahal and Khadka, 2012). It was mandatory for all farmers attending the field school to attempt SRI in their own fields as well, and Khadka personally guaranteed compensation for any losses they may incur in the process.
All farmers, he said, had successful harvests. Despite its apparent successes, the project folded after the second year due to a seed dissemination problem that the EACU was involved in – seeds designed for high production in low land areas were taken to the mountains, where many farmers experienced colossal losses in yield. Because of this incident, the MoA forced the FAO to fold the EACU, eliminating funding for the SRI project. Today, Khadka is not sure how many farmers still continue to practice SRI.

The examples of Uprety and Khadka demonstrate the importance of individual interest, as well as institutional support in the success or failure of SRI in Nepal. Potentially, without the World Bank’s grant, Uprety would not have the resources to disseminate SRI. Also, had the French manager of the FAO project not been impressed with the SRI results, it would not have been part of the project. As well, if the project was not connected with the FAO, the seed controversy would not have affected the SRI project and its dissemination.

4.2b - Institutional interest

It is important to note that while SRI in Nepal has been supported at various stages by Uprety, the World Bank, Cornell University, Oxfam, FAO and Rampur University, overall, it is not officially supported by Nepal Agriculture Research Council (NARC), and thus, by the MoAD. The Ministry can only promote what is guaranteed by NARC. Professor John Duxberry of Cornell University initiated SRI field trials at NARC research stations in Nepal in 1998 and 1999. These were unsuccessful. Again, at the Bhairahawa research station under the National Wheat Research Program, SRI was attempted in 2001. This study was also unsuccessful as conventional practices gave greater yield. After this failed attempt, a common belief was that SRI was not suited for
Nepal (Uphoff, 2007). When I asked an official at NARC about NARC’s position on SRI’s promotion, he said “we are not pushing this as a technology…our researchers tried and found that it has some advantage but it requires some meticulous activities. So if [farmers] can do all the activities as per the requirements, then, it’s okay.” Yet, Uprety notes that no one from NARC has ever visited his plots, and that even parliamentarians who feel positively about SRI do not promote it in the MoA. He feels that the transitional period of Nepal’s government and the priority of writing the new constitution has taken precedence over development objectives. He believes that with political stability, development initiatives such as SRI will receive more attention.

Yet, NARC’s resistance may stem from other influences. NARC separated from the government and became autonomous twenty years ago. Its main responsibilities are to design agricultural research programs and develop improved technologies to address national agricultural production problems. Its national and international connections allow for knowledge and germplasm exchanges. While NARC’s core funding is granted by the Government of Nepal, IRRI and the International Maize and Wheat Improvement Centre (CYMMIT) coordinate and distribute funding to NARC from many different international donors. Some of the donors include the Government of Australia and the BMGF. Currently, NARC is working on a pilot project called “Sustainable Resilient Farming System Intensification.” Along with a focus on mechanization in this project, they are collaborating with IRRI to develop varieties that are both drought and submergence tolerant. Based on my interview with a NARC official, it is clear that mechanization and biotechnology are prioritized as solutions to agricultural productivity problems in Nepal. There is also the potential that SRI promotion is politically
unfavourable to IRRI. Researchers at IRRI such as Dobermann and Sheehy do not promote SRI, and focus more rigorously on biotechnology. Perhaps NARC’s dependence on IRRI for funding, trainings and workshops also tempers their enthusiasm for SRI’s potential in Nepal. Since the MoAD, who is responsible for the dissemination of new technologies through various DADOs, takes its directives from NARC, and cannot promote a new agricultural technology or method unless it is NARC guaranteed, NARC’s resistance has limited SRI’s trajectory in Nepal. While individuals in powerful positions such as Uprety are effective at impacting which technologies are disseminated in their own district, they are limited by the MoAD and NARC when it comes to national level promotion.

The officials at NARC and the MoAD, as well as Khadka and Uprety, all studied agronomy at Rampur Agricultural University in Chitwan. This institution may indirectly influence the developments and programs NARC and MoAD pursue. Rampur University has conducted past research on SRI, although the results were not always positive. Professor R1 recalled that his students’ results were not encouraging, as due to “heavy rain, there was standing water [which continued] for more than seven days, [so] many [seedlings] died.” To be successful, he feels SRI needs “government efforts, technician support, agriculture department support, agriculture university support, [and] extension support.” In general, the professors and students feel the necessity to control water is a major limitation.
There has been NGO and INGO involvement in SRI promotion in the country, including Oxfam and Himalayan Permaculture. Of these INGOs, Student R4 is wary, as he is unsure of “whether they are trying to help Nepal become food secure, or if they are thinking of their own personal benefit.” He is specifically referring to a collaboration with Oxfam and Samahati, which involves a large group of women practicing SRI on a communal piece of land in their village. He does not believe this is an effective demonstration, as most farmers do not have a large continuous plot of land, and most farmers do not use the co-operative labour strategy as the demonstration does. He feels this is not representative of Nepal’s farming situation.

4.2c - Dissemination

Although Uprety is able to influence the dissemination priorities in his district, it is still challenging to reach all farmers due to limited staff. Extension is conducted through organized workshops, or through farmers themselves visiting DADO or Agricultural technician offices, of which there are few. Between Morang and Jhapa Districts, there are two DADOs and four technician offices. Extension workers are often overstretched, and feel like there “there is much work” to do but not enough people to do it. Not all farmers are able to access their services, for example, an agricultural technician
shared that the farmers who end up coming in to the offices to ask advice “are [the] progressive …[or] leader farmers.” He says that those who come are able to read notices, whereas those that are poor and illiterate are not able to access this information. To reach illiterate farmers, he says, extension officers need to go out in the village themselves. When I asked if he thinks his office is doing a good job at reaching illiterate farmers he said “I don’t think so. We are trying, but it is not enough…all people cannot get our service.” For that to happen, he says “We need more manpower, more technicians…and we need enough budget, and programs…” He said that these problems are at a policy level, and that those changes need to be made by the central government. This demonstrates how socio-economic and political conditions impact access to new technologies. While SRI may be best suited for poor small-holders, many farmers who are unable to read Nepali would be left out. The families who can not afford to send their children to school could probably be most benefited by a low-input intensification system, yet, these are the farmers least likely to be reached by through extension based on existing dissemination and socio-economic structures. This indicates there is also an element of chance as to whether a farmer is exposed to this technique. One way to increase those chances is to happen to live in the same village as an agricultural technician - one who is generous with his time, knowledge and experience, such as my host, Govinda Acharya.

Govinda Acharya runs a workshop once a year or every two years in Karjuna, and about 25-30 people come to him informally each year asking for his advice. His position is important in the village, as he is accessible and trustworthy. Govinda’s combination of training, experimentation, government networks and relationships in the village were
important aspects of spreading SRI in Karjuna, one of my two fieldwork locations. The next section that follows will give a brief overview of the agro-ecological and social context of these locations.

4.2 – Fieldwork Location

4.1a – The Terai

Considered the “granary” of Nepal (Parilyar, 2008, p. 14), the Terai is a flat extension of the southern Indo-Gangetic plain, occupying 2,142,200 ha, and accounting for 14.4% of the country (Parilyar, 2008, p. 14). The Terai lies at the altitudes of 66m - 300 m, and its warm subtropical climate and fertile, alluvial soils make this region the most agriculturally productive of Nepal. Due to its climate, farmers in the Terai are able to grow three crops a year, and intensive farming occurs anywhere that irrigation is available (Parilyar, 2008, p. 14). In total, 47% of Nepal’s agricultural GDP is produced by the Terai, the largest proportion of the three major agro-ecological zones (Parilyar, 2008, p. 27). Much of Nepal’s limited industrial development also lies in the Terai (Sugden, 2013, p. 7), and it is the most...
densely populated area in the country, home to 48.4% of the population and covering 56% of the total cultivated land (Joshi et al., 2012).

It is important to note that although the length of the Terai shares a common geomorphology, land use is not uniform. For example, the eastern Terai is known for an increased amount of rice cultivation owing to a greater proportion of higher alluvial soils and a greater availability of water and rainfall compared to the west (Parilyar, 2008, p. 15). From east to west, the climate is variable, and access to water drastically changes depending on local topography and general access to irrigation (Joshi et al., 2012). The main crops in the Terai include rice, maize, wheat, Cotton, Tea, Jute, sugar cane, mustard and Tobacco (Parilyar, 2008, p. 15). In 2013, the eastern Terai produced the largest amount of paddy in Nepal, accounting for 1.06 million mt of the 5.04 million mt, which represents 21% of the total production of the country. Jhapa was the largest producing district, followed by Morang (MoAD, 2013). Horticultural products grown include mango, litchi, pineapple, jackfruit, imli, potato and tomato (Parilyar, 2008, p. 15).

Livestock are important aspects of farming and food security in the Terai. Most households in the Terai keep cattle, 50% keep goats, and 1/3 keep buffalo (Parilyar, 2008, p. 27-8). Cattle and buffalo provide milk, manure and draught, with oxen used for cultivation and transport. Goats, buffalo and cattle are the main grazing livestock, which are generally raised sedentary and fed crop residues and some supplementary concentrates, unless daily grazing is possible. The responsibility of livestock rearing generally falls on the women in the family (Parilyar, 2008, p. 18). While the extensive encouragement of chemical fertilizers has become important to farming since the Green Revolution (Hazell, 2009), manure remains the main source of nutrient replenishment,
soil fertility maintenance and sometimes fuel in areas with massive deforestation (Parilyar, 2008, p. 18).

The Terai is characterized by predominantly Hindu multi-ethnic groups including the Brahmins, Chhetris and Tharus (Parilyar, 2008, p. 15). In general, the Brahmins and Chhetris have migrated to the Terai from the Hills, whereas the Tharu peoples are indigenous to the region. Nepali and Tharu are the Brahmin/Chhetri and Tharu mother tongues respectively. Agricultural landholdings are generally subsistence based, fragmented and scattered, where 75% of the holdings are less than 1 hectare in size (Joshi et al., 2013). Small land owners in the Terai on average own 0.41 hectares, and medium holders on average own 1.11 ha (NPCCBS, 2013, p. 67).

4.1b – Fieldwork sites

Within the Terai, my research was focused on two rural locations in two different districts of Nepal – Phulbari, Chitwan and Karjuna, Morang. Phulbari is a Village Development Committee (VDC) in Chitwan Nepal. It is about 3.5 km from Rampur Agricultural University, and 12 km from Narayanghar, a transportation centre and busy market city. It is about 25 km from Sauraha, a popular tourist destination in Chitwan National Park, and 160 km from Kathmandu. Given my short time frame in this particular area, I was able to interview 12 farmers, generally those socially or professionally connected with my host. My particular host in this setting was well connected with NGOs and the University, and often had foreign visitors through Worldwide Opportunities on Organic Farms (WWOOF), as well as agricultural students visiting from Rampur.
Karjuna is a village about 30 km from Birathnaghar, the capital of Morang. It is 21 km from the nearest town, Birahcthowk, where transportation to various other places in Nepal is available. Many of its characteristics reflect that of the eastern Terai in general. While the eastern Terai is well known for its rice productivity, it was common for farmers in Karjuna to have at least one family member working outside of agriculture, and paddy sales were rarely the main source of income. The jobs that individuals took on in addition to farming were very diverse, and included working as a tailor, bank security officer, furniture builder, milk collector and salesperson, police officer, teacher, metal worker, vermin-compost salesperson, construction worker, agricultural technician, labourer, and making extra money through selling their animals.

Beyond these more local jobs, fifty percent of all farmers I spoke to in Morang, had at least one family member living overseas sending money to help them. Their family
members were in countries such as Qatar, Bahrain, Kuwait, Singapore, Saudi Arabia, the United Arab Emirates, Malaysia, and America, working jobs that included labour, cooking, security, and retail sales. However, I found that most families had no idea what job their family member had overseas. Only one farmer had a female family member overseas, her daughter, working as a nurse in America with her husband while he completed his PhD.

The village itself is a multi-ethnic community, made up of Brahmins, Chhetris, Tamang, Tharu and Dalit people living together. Many of the non-Tharu people I interviewed had their ancestry rooted in the hills of Nepal, either from Dhankuta, Sankhuwasabha, Khotan or Therathum. Generally, their families had migrated to Morang because of the difficulty in farming on steep slopes, the lack of infrastructure, property and facilities (such as adequate schooling, health care, and transportation). In general, it seems that the promise of greater yields, access to facilities and income, and the ability to grow rice were the major pull factors encouraging people of the Hills to migrate to the Terai.

4.3 - Summary

There exists a complex collaboration between government officials, international organizations and individual interest and connections at play in making SRI successful or unsuccessful in Nepal. While Uprety is a strong advocate with backing from CIIFAD, the World Bank, and his own DADO, institutions such as the MoAD and the FAO, who also receive their directive from the MoAD, are blocked due to NARC’s hesitation. Whether or not IRRI’s general lack of support for SRI has influenced NARC’s position is inconclusive – probable, but speculative at this point.
SRI’s introduction and continual presence in Nepal has been coordinated, maintained, and challenged through complex institutional and individual relationships. The actions and opinions of these powerful actors have a significant impact on the lives of farmers in Nepal, particularly regarding which agricultural technologies are deemed relevant or useful, and which farmers are able to access this information.

While reading the following section, which outlines the ways in which farmers’ lived realities converge or diverge from SRI’s global narrative, it is important to keep these key actors in mind. The most powerful decision-makers in the country cannot agree on whether or not SRI is effective to begin with. Even still, it is promulgated by believers and attempted by farmers. While the decisions made at the top have a significant impact on the lives of farmers, and the extent to which SRI practices are widely disseminated and made available, arguably, the most powerful actors in spreading SRI to a certain extent are the farmer themselves, as they ultimately decide what to do in their own fields. Hence, the next chapter analyzes the experiences of farmers in the Terai in order to complicate the simplistic narrative of how SRI impacts their lives. Particularly, we will be analyzing the claims discussed in Chapter 3, as follows (1) SRI will increase yields; (2) SRI practices are adaptable to various contexts; (3) Any farmer anywhere will reap benefits from practicing SRI; (4) SRI knowledge is disseminated largely from farmer to farmer; and (5) SRI practices are environmentally sound.
Chapter 5
Lived realities of SRI claims

This chapter provides an analysis of my fieldwork in Nepal, with a focus on the complex array of factors that influence an individual farmer’s choice of whether to adopt SRI or not. My aim is to uncover some of the tensions in the process of translating SRI as a global standardized practice into complex local practices, which tend to be hidden within the global discourse. The chapter therefore follows Glover in asking what happens when SRI as a system of knowledge flows into rice farming as a system of practice (Glover, 2011, p. 222).

I have approached this question in an exploratory nature, giving weight to individual farmers’, researchers’, and government officials’ experiences with SRI. The structure of this chapter mirrors Chapter 3 by addressing the claims regarding SRI’s (1) yield; (2) adaptability; (3) universality; (4) dissemination; and (5) sustainability in that particular order, with the following broad guiding questions: (1) Do farmers’ experiences converge with the claim that SRI increases rice yields? How much is productivity valued by farmers, researchers and officials? ; (2) Is there room for SRI farmers to adapt their methods to fit their particular situation, and in what ways do they do this? How much adaptation is permitted until SRI is no longer SRI?; (3) Do all farmers feel they are able to use SRI? How do unique socio-economic and agro-ecological conditions (such as land ownership, water control, access to information, credit and labour) impact a farmer’s ability to reap rewards from this practice?; (4) How did farmers, researchers and officials learn about SRI? How is it spread from farmer to farmer? and; (5) What are the differences in terms of ‘environmentally sound’ practices between
‘conventional/traditional’ paddy cultivation and SRI? In addressing these key contentions, the chapter seeks to understand SRI’s global claims by introducing the diversity of lived experiences that unevenly converge or diverge from the projections.

5.1 - Claim 1: “SRI practices result in yield increases”

As was stated earlier, this thesis is not in a position to confirm or reject the claim that SRI practices result in yield increases compared to conventional methods. In contrast to the strategies agronomists use to valuate these claims, my research was designed to be exploratory, observatory and qualitative in nature. That said, my qualitative research did reveal some interesting insights into the yield question.

Some researchers and officials do dispute the claims of increased yields. Professor R6 did not feel that SRI’s claimed productivity increases were necessarily widely replicable in field conditions. He says that although NGOs and INGOs have created “a noise in the society that SRI gives more yield,” and although he has seen biological experiments in which SRI sometimes increases yield by 20%-50%, in general, he has “seen no difference between SRI and transplanted rice.” He said that a few years ago, the DADO in Chitwan started a campaign to promote SRI in the region. Now, he says, “if you go into the fields, no one is using SRI.” He does not indicate whether this is because the trials did not increase productivity, or whether the increased productivity was not enough to keep the farmers interested in practicing.

Across Phulbari, Karjuna, and a few various villages in Morang district, I interviewed 62 farmers (12 in Chitwan, 50 in Morang). Of these 62 farmers, 27 had used or are currently using SRI (4 in Chitwan, 23 in Morang). Of those that had used SRI, 5 of
them were in their first trial year, so had not yet experienced the results. Of the remaining 22, 21 had found increases in their fields, ranging from 10% to 100%. Roughly 40% experienced an increase at 50% or greater, 40% experienced an increase less than 50%, and 20% experienced productivity increases of 100%. Of these 22 engaged SRI farmers, 14 had left SRI (63%) for various reasons, predominantly due to the increased labour requirements. This complicates the assumption that crop productivity is the driving force behind a farmer’s decision to adopt a new technology or not.

Yet, Uprety emphasizes the importance of increasing rice yields in Nepal, and sees SRI as an important option for farmers. He says “if rice production increases, the people who benefit from this are farmers.” He continues:

I found [that] the production costs of SRI farmers and conventional farmers, [whether] high yielders or low yielder is more or less the same. There are no significant differences. But if your yield increases, that benefit goes to farmers. Three tons of rice per hectare more or less covers the production cost. Whatever amount you increase your yield [beyond] three tons [per hectare], that is your benefit. So if farmers produce one ton [more], it means 15-20,000 NPR per hectare more to the farmers per season. It is big money.

To Uprety, if a new system of management is able to increase yield even slightly, it offers enormous benefit to farmers.

Yet, for Farmer K18, all of the hard work in the field was not worth this minimal increase in yield. He also said that there was a problem with the panicles because, in his own words, “when the plant gave birth, the mother died.” He explained that the panicles were mostly empty of grains. Even though the plant was “fatter” in SRI (50 tillers in SRI compared to 22 tillers in conventional), each panicle was less productive. He affirmed that this occurred even though he gave water to the rice plants at all the correct times. He
stopped using SRI after this experience, as he did not feel the increased labour was worth the minimal increased yield. This was common even with farmers that experienced 75-100% increases in yield. The productivity increase was not worth the increase in labour requirements. This suggests that they felt their *labour* productivity decreased. Farmer K36 was the only farmer I interviewed who actually experienced a decrease in yields in her SRI field – her productivity reduced by 65%, and so she abandoned the method. It is not clear whether Farmer K18 and K36 just happened to be practicing in particularly bad years. For example, Farmer K4 has been alternating between SRI and conventional rice practices for 8 years. She notes that the productivity increases of SRI changed year after year largely based on the rain volume and timing. Also, Farmer O7, a permaculture farmer in a village just outside of Kathmandu, learnt about SRI through Chris Evans, an employee at an NGO called “Himalayan Permaculture.” Although Farmer O7 has been practicing SRI for 6-7 years, he is unhappy with his yield this year. He says most of the hills only have 3-4 tillers, and his production is very low compared to other years. He attributes the loss to the excessive volume of rain this year. While it seems obvious that any rice paddy will perform differently under differently environmental conditions, it is not clear whether SRI techniques produce more or less resilient rice plants in variable and unpredictable climatic events.

Farmer K32 said that she started SRI this year because she wanted to increase her production. Many farmers I spoke to who were not using SRI were generally satisfied with their current yields. This could be an impediment to their adoption, as the lack of necessity for yield increases may reduce interest in altering their practices. Many farmers would accept a lower yield with less labour, as opposed to increasing labour for a greater
yield. This suggests that the farmers I interviewed were more concerned with increasing labour productivity as opposed to yield productivity. This indicates that while SRI may increase yield per acre, it may potentially be at a lower yield per hour laboured. Incidentally, farmers with different labour compositions (i.e.: whether it is familial labour, the parma system, hired labour) may make different decisions about whether or not SRI fits in their fields. This may also change according to the intended use of the yield. If the paddy crop is used to feed the family, and there is enough grown to do this, farmers may be less interested than someone who financially benefits from excess crop, such as Farmer C9, who uses his crop as foundation seeds that he sells in his Agro Vet shop. Although increasing productivity is a goal of NARC, IRRI, the FAO, CIIFAD, the MoAD and various NGOs and INGOs, this does not necessarily resonate with individual farmers. Uprety agrees:

The Government always wants more food within the country, so they need less money to import outsider food, but the farmer’s priority is different. They want to improve their livelihood. Where they can get money, they go there – if they get more money selling their land, they will sell and go into another profession. So that is the difference of priority of the individual and the nation.

This potentially suggests that when SRI advocacy focuses on yield productivity, it effectively meets national, international and donor interests, but focusing on labour productivity may more adequately address the needs and interests of farmers.

5.2 - Claim 2: SRI Practices are malleable to fit different locations

As was outlined in Chapter 2, the global SRI narrative emphasizes the supposed synergistic relationship between all six practices. Yet, after working on the frontlines, Uprety explains, “We don’t encourage that all components [must] be there, [just]
…whatever [is] suitable for their agro-climatic condition and socioeconomic situation…the farmers can decide.” He said he does not encourage “perfect” SRI, but instead, encourages “partial SRI.” He stresses that farmers have the best knowledge of what is most appropriate for their particular landholding. For example, he explains, if a farmer cannot weed enough, they can use herbicides. If they live in a flood prone area, they can use submergence tolerant varieties. In this way, Uprety proposes that SRI can work in tandem with many different cultivation methods, which is a shift in perspective from early SRI advocacy. Today, there are several SRI iterations, including organic SRI, high-input SRI (which seems contradictory), direct-seeded SRI, and chemical SRI. He said that now several farmers have come up with their own methods, and that “their rice system is neither conventional nor SRI, it’s a hybrid, or in between.” This begs the question – what counts as SRI in practice?

A pragmatic application of SRI theories, an approach characteristic of Rajendra Uprety, makes practical sense. Of course, farmers should choose what works best for them. Yet – if SRI is so malleable, what exactly is it? Does SRI become an educational movement, providing farmers with a palate of options to improve rice cultivation methods? If so, why promote “SRI” globally as a package of practices, when in fact on the front lines, it is not promoted or implemented like that? Does allowing so many variations immunize SRI from failure, as it can always be argued that a particular farmer did not practice it properly? As I interviewed more farmers, it became clear how flexible and different practical implementation of “SRI” was.

Farmer C9 has been using SRI for 7 years, and although he follows most of the recommendations, his fields always have stagnant water because his land does not have
effective drainage. Because of this topographical characteristic, he is not able to employ the alternate wetting and drying method that is promulgated under SRI. Similarly, the women growing rice as a co-operative through the NGO Samahati followed all of the practices precisely, however, due to their clay soils which were unable to drain completely, they could not follow the wetting and drying precisely. These are two examples of environmental constraints on practicing pure SRI. The reasons why farmers may choose to change practices are based on an interaction between environmental and social constraints and limitations, or personal preferences. Many farmers adjusted the practices they followed in their SRI trial to mitigate any challenges they faced in terms of their particular agro-ecological and socio-economic situation. For example, Farmer K1 said that in his initial SRI trial, he transplanted seedlings that were 10-12 days old, and planted one single seedling per hill. He changed this method, because he found there were too many weeds. Now, he uses seedlings that are 15-20 days old, and puts 2-3 in one spot, while leaving a little bit of water in the fields to minimize weed growth, removing the water once the tillering begins (around 20-22 days after transplanting). He has found with these slight modifications, weeds in his field have been reduced, which has also reduced his labour.

It is not clear why other farmers have adjusted their SRI practices. Farmer K18 used chemical fertilizers, pesticides and herbicides with SRI. Farmer M4’s SRI fields followed most of the recommendations, although, he used 22 day old seedlings instead of 14 day old seedlings, and planted 2-3 per hill instead of 1. Farmer K32 said the only difference in management between their SRI and non-SRI fields is that in SRI, the seedlings are transplanted in a line with wider spacing 1 hatt (elbow to fist), where
usually it’s one *bita* (finger to thumb). In his SRI fields, Farmer K31 plants 1 month old seedlings at 1 *hatt* spacing with 3-4 seedlings per hill, with applications of chemical fertilizers, herbicides, pesticides, compost maul and constant water in the field. Farmer K28 planted the seedlings when they were 20-30 days old, with 5-6 per hill. They used chemical pesticides, herbicides and fertilizers, and did not plant in straight lines. All of these examples point to the fact that it is unclear what being an SRI farmer actually means. While in practice it is expected that farmers will adjust whatever techniques they have been taught to fit their particular situation, perhaps SRI’s flexibility has rendered it meaningless.

This made me question exactly how many of the six principles a farmer needed to employ to be considered “SRI.” Many farmers in Karjuna who have left SRI maintain that they practice a “hybrid” SRI – where they keep many of their conventional practices, but have blended them with SRI philosophies. For example, they often transplant younger seedlings with fewer number per hill, but go back to their ‘regular’ application of fertilizers and water. Again, this begs the question of who – from a formal perspective – is considered to be practicing SRI? Are those hybridizing their farming considered SRI farmers, as clearly, their practice has been impacted by their exposure to an alternative method? Or is it unfair to call these farmers ‘SRI’, if they have developed their own method a part from the strict practices?

Another phenomenon that seems to be occurring is a melding of SRI practices into conventional practices, without being considered an “SRI” farmer within the local community. Of the 14 farmers who left SRI after practicing it for 1-3 years, 42%, had changed their own farming habits, adopting what some would call “hybrid” SRI, and
what others would call “conventional” rice practice. While their ‘hybrid’ practices varied, it generally involved reducing number and age of seedlings planted while maintaining flooded fields. For example, Farmer M6 said that now in their conventional farming they use younger plants and plant fewer seedlings per hill, which has increased their yield and reduced their seed cost. Farmer M7 also said that although she stopped practicing SRI 8 or 9 years ago, her conventional rice farming has changed, as she now plants younger seedlings with wider spacing.

These kinds of practices complicate claims about the number of farmers using SRI both locally and globally. Although SRI advocates suggest that 5 million farmers are practicing SRI, it is not immediately clear exactly which practices they are using. The very idea of SRI appears eminently flexible as it seems it can be as wide as following all six principles to following one, such as increasing spacing or weeding on time. Uprety’s pragmatic opinion is that what it’s called does not matter, as long as it benefits the farmers. Govinda Acharya agreed with this, as he said that even when they do not use SRI exactly, their conventional farming changes for the better. However, the imprecision and permeability of the line between SRI and conventional practices raises important questions about what SRI actually is.

5.3 - Claim 3: Any farmer anywhere can use SRI

The researchers and officials I interviewed in Nepal immediately recognize that there is no possible way for one agricultural technology to work for everyone. Ram Bahadur Khadka, a researcher who promoted SRI with the FAO in 2009, said “there is no technology which is suitable for all farmers…SRI is not possible in the lowland area…the field is flooded over the whole crop period. No, no – SRI will not work.” An
official from NARC agreed with this view by discussing the importance of providing a variety of technologies to farmers:

> we should not rely on only one technology, we should accommodate…whatever suitable technology there is…so that they can work in our complex farming system in the farming communities…[which] are diverse in many ways in terms of socio-economics, in terms of land availability, in terms of other resource availability, and in terms of climate.

Professor R1 adds, “SRI alone cannot be a solution of food problems… it can be a significant technique to solve the food problem [but] it alone cannot solve it.” Professor R3 attributes SRI’s suitability in Nepal to the farmers’ own preference, the timing of rainfall, their skill in handling young seedlings, and labour accessibility in a time of labour scarcity and low agricultural wages. Professor R2 agrees when he says:

> SRI is good. But, like a god, [it] is not available to everyone. Norman Uphoff, you know him? I have been to his seminar. Oh! He speaks like SRI is everything! Like you can do whatever you want from SRI. [In our religious books, there] is one cow known as Karma Denu. That cow gives [you whatever you want]. SRI is exactly like this (he laughs loudly)! You can’t take SRI like that. In Norman Uphoff’s report, sometimes, he says he gets the yield of 21 tons/hectare. Nepalese generally average hardly 3 tons/hectare. If we can increase 7 times, all of our farmers would have a mountain of grains… But this is not the case.

He explains why further:

[SRI] basically has four thematic principles. Younger seedlings, wider spacing, controlled water and organic content of the soil. Now the question is whether these conditions are available in all places? That is a big question…. if all these conditions are suitable, probably, the rice crop will give a good yield. I made two of my students make a thesis on SRI. The results of one was not so good, but the second produced fantastic results, of 7 tons per hectare in this location! It was just last year. It was financed by Uphoff.

To summarize, Professor R2 is basically saying that in suitable locations, SRI is very productive, but in unsuitable locations, it will not work. This contradicts the basic
tenant of SRI farming, that it can work for everyone everywhere. Later in the interview he said that the type of farmers most likely to adopt SRI are “Small holder farmers with labour availability and with controlled water systems.” A Master’s student at Rampur went further to say that even in this context, while “[SRI] is best in principle….practically it may be difficult because [the farmers do not have the skill] of handling single seedlings that are only 14 days old. I do not know any farmer that has adopted SRI.”

Uprety is reflexive about the challenges he has faced in disseminating SRI. He writes in a reflection of his 2005 trials that in some cases, SRI practices proved weaker than conventional methods. He says that this “demonstrated the risks of SRI adoption, especially for those farmers who want to increase their rice production but are resource poor (due to unreliable water supplies, less fertile land, less investment)” (Uprety, 2006, p. 37). Uprety notes that the land diversity in Nepal makes it difficult to disseminate effectively, as land type varies greatly according to their “fertility status, water availability for irrigation, varieties of rice, socio-economic status of farmers, labour availability and many other aspects” (Uprety, 2006, p. 38).

My interviews in Nepal converge with these particular observations, and complicate the notion that any farmer anywhere can adopt SRI. The most common limitations were land ownership and land characteristics, water control, access to information and credit, and access to adequate and timely labour. In what follows I address these issues in turn.

5.3a - Land ownership and type
Land tenure is a complex issue, and this section does not propose to address it fully. My fieldwork experiences, however, do indicate that whether or not a farmer owns his own land may impact whether or not SRI is a viable technology in their fields. In turn, whether or not a farmer owns land – and how much they own – is a product of their socio-economic status, gender, and caste. This complicates the promise that SRI can be practiced by any farmer – it seems, it is most likely profitable to those who are landowners, and this requires a specific socio-political-economic status.

It is useful to give a very brief history of landownership in the Terai here. There are not many early accounts of the Terai before the 1700s, except for Hamilton’s colonial reports, ([1818]2007) as summarized by Sugden, that indigenous peoples of the region east of the Koshi [of which Morang is a part of] carried out a form of slash and burn agriculture with an emphasis on land as a common property (Sugden, 2013, p. 9). From the 1700s to the 1850s, the far eastern Terai was conquered and incorporated into the Kingdom of Nepal, obligating all indigenous cultivators to surrender significant portions of their crops and labour service to the state. The state, ultimately, was the landowner, holding greater power than the local indigenous nobility. Families from the Hills began to settle in the Terai for many reasons, including overpopulation (Joshi et al., 2013) and exploitative land tenure systems in the Hills, as well as government policies encouraging re-settlement in the Terai. This “may well have represented a mechanism through which the state could increase its control over the [area] by expanding settlement [while] at the same time, offsetting demographic pressure in the hills and limit dissent” (Sugden, 2013, p. 15). In general, the Nepali government considered the Terai to be an untapped resource, with limitless forests of fertile land. The dense forest and endemic malaria
prevented settlement for many decades – the indigenous Tharu people were immune to malaria, but visiting settlers often died within weeks of arrival. By eradicating malaria and encouraging deforestation programmes, land was cleared and resettlement opportunities were established (Joshi et al., 2013). This led to land settlement problems, as migrants would claim ownership over land belonging to local Tharu people. The regime continued to expand the cultivable area in the Terai, and encourage settlement, which further subordinated the indigenous class. Control was ultimately retained by the state, with the largest landlords and most powerful members of the bureaucracy belonging to the Brahmin and Chhetri castes of the Hills (Sugden, 2013, p. 11). Before 1950, the crown was the supreme owner of all land in Nepal (Acharya, 2008, p. 3).

When the Rana regime fell, there were many reforms designed to improve the problems with inequitable land distribution. While many significant acts were involved, the Lands Act in 1964 is considered to have had a particularly important impact on land distribution and management in the Terai (Adhikari, 2008). This Act “abolished dual ownership of land, effectively ending the tenancy rights” (Adhikari, 2008, p. 59). This tended to favour Brahmin and Chhetri landlords, as it was recalled by indigenous Tharu elders that “that the indigenous Tharu nobility did not have the same links to the bureaucracy as their high caste counterparts, and were therefore the primary losers from the reforms” (Sugden, 2013, p. 14). The higher castes such as Brahmin maintain “a firm hold on land” in the Terai (Adhikari, 2008, p. 44), whereas the majority of the landless populations are disadvantaged indigenous groups (Adhikari, 2008). This population is considered “the most insecure segment of population in Nepal” (Adhikari, 2008, p. 44). To buy land was not a possibility for many landless tenants, who were often indebted, as
well, citizenship laws “biased against non-Nepali speaking Terai communities also
deprived many households from the citizenship papers necessary to make purchases”
(Sugden, 2013, p. 14). The legacy of that historical subordination exists today, and is
evident in terms of opportunity, landownership, and assets (Sugden, 2013), although, this
is not generalizable as a rule.

As a result of these historical processes, there are many different forms of
landlord-tenant relationships present in the Terai. One such system is the adhiya
sharecropping system, in which the landlord pays 50% of the input (referring to chemical
pesticides, herbicides and fertilizers), and the tenant pays the landlord 50% of the
production, or yield. Another sharecropping system is called the thekka system, in which
the renter gives a set amount of paddy every year to the landowner, (potentially 20-30
maund per bigha) and can keep 100% of the yield on everything else. In this relationship,
the landowner is not required to provide any money for inputs.

The adhiya system “absorbs much of the product of ‘surplus’ labour time and, for
many, a portion of the product of ‘necessary’ labour time” (Sugden, 2013, p. 18).
Essentially, the cultivator is giving away 50% of their labour input. This demonstrates an
imbalance in who experiences benefits from SRI – potentially, for sharecroppers, the
focus on labour and knowledge-intensification in SRI further drains their resources while
saving the landowner’s, especially when it is common for the landlord to skirt their
required input payments. In SRI, with a focus on the increased input of organic manure
and decreased input of chemical fertilizers, the sharecropper again bears the cost of
caring for and feeding the cows, while the landowner saves money. Also, the emphasis
on the use of traditional varieties also excuses the landlord from having to front 50% of
the seed cost, while the sharecropper is responsible for selecting and saving any traditional varieties for the following year. These class dynamics greatly shape the division of risks and rewards between rural agents, and therefore impact upon decisions about agricultural techniques. Upadhyay agrees that sharecroppers are generally not very interested in SRI “because they need to divide whatever they produce, so their share will not increase with their hard work. Their benefit is reduced by 50%.” In this way, SRI is potentially a less attractive cultivation method for sharecroppers than the conventional method as it is the landowner who accumulates an inequitable benefit while the sharecropper bears the burden of increased labour.

Of the total farmers interviewed, five were purely sharecroppers, with three under the adhiya method, one under the thekka system, and one whose land was split between the two. Thirteen of the farmers I interviewed rented land as well as owning their own. In general, the land they owned was smaller holding than the land they rented. Three farmers I interviewed were landless. The remaining forty-four farmers interviewed were landowners, however, their land titles ranged from 1 to 60 kattha (See Appendix A). Eight of the eighteen sharecroppers or sharecropper/owners had practiced SRI in the past, or were in their first year of practice at the time of interview. One pure sharecropper, Farmer M3, has been using SRI for ten years, however, he accrued other benefits through his participation in SRI, including greater support from DADO and opportunities for workshops and trainings in other parts of Nepal and India. One partial sharecropper has been using SRI on and off for 8 years while one full sharecropper and two partial sharecroppers are attempting SRI for the first time. Three have attempted SRI and left it.
This information does not suggest that sharecroppers never experience benefits from SRI – the benefits, as was used in the example of Farmer M3, may come in different forms. This probably depends on the particular form of SRI they are using, the particular relationship between the sharecropper and landlord, and the other benefits they may receive by practicing SRI. There are also differences in the ways that landowners control the land they own and the people who rent it out. For example, Farmer K12 has a landlord that gives inputs of fertilizer and seed, but not for herbicides or pesticides, because he believes these are bad for the land. However, the increase in weeding labour is not covered, so the landlord again benefits. Farmer 28, who found SRI to be very productive, rented out his land when he decided to go overseas to make money. He does not control how the fields are planted at all, but has noticed that while the yield was 70 maund/bigha when he was working it, now it is 35 maund/bigha, which they receive half of. Their total production is half of what it used to be. He says it is because the people renting do not “struggle” hard in the land, which may be because labour costs are not shared between tenant and landowner. Farmer K37, however, found no difference in production between owning and renting out the land.

There are caste and gendered dimensions to this as well. Land is passed down through men traditionally in Hindu culture, and this is common throughout Nepal. While the men are the ultimate landowners, in many cases, the women I interviewed were the head of the households in the absence their husbands who were working overseas and did not know much about the farm operations. Yet, when the men came back home, they stood in the head position. This, however, is complicated, and each individual household had a unique balance of power and decision-making between husband and wife. Some
men dominated decisions, and in some cases, the women did. Although there are many spaces for resistance, in Nepal it is common for the power in a community to be held by men. However, with the increasing labour migration abroad, who holds this power could become more complicated.

While landownership is important in determining whether SRI is beneficial or not, the specific type of land owned is also crucial. As was outlined in Chapter 2, Dobermann has his own beliefs about the types of soil that SRI works best on, which this study cannot comment on. The only time soil quality was brought up was by Professor R2, who felt that soils in Nepal, after years of chemical application, had become acidic. He felt this was a limitation to SRI adoption. Professor R1 stresses the importance for farmers to select a site that is level and allows them to maintain and drain the water if they want to try SRI. Without these conditions, he believes the SRI results will be poor. In general, most comments about appropriate land type for SRI were focused on the ability to control water.

5.3b - Water control:

While priorities and perspectives differed between researchers, practitioners and farmers in several diverse ways, a common point of contention with SRI focused on the control over water sources. Uprety stresses that those owners or operators who have controlled irrigation systems and are interested in increasing their yield are the most interested in SRI. He emphasizes the need for alternatives for other farmers. This is echoed by an official at the FAO, who says although SRI is not one of their main strategies in promoting food security, it is a good strategy to increase rice production as long as it is on irrigated land. Professor R1 agreed, saying that “some rich farmers, those
who are very dedicated to farming, they have their own irrigation facility. If those farmers are properly educated about SRI, with some incentive, then up to 3-4 years later, they will get more yield under SRI.” Professor R2 says that in the promotion of SRI in Nepal, “the greatest bottleneck is water…our whole rice system is based on the monsoon and [few pieces of land] are irrigated.”

He says that in Chitwan, it is common for rainfall to saturate the fields so fully that it floods over the bunds. They call this golhutni. “Now you can see it,” he says, and points to water spilling over the paddy bunds and onto the road. “Now, the question is,” he says, “can we control the water at this time? In no way.” Professor R5 agrees:

We don’t have control over water. You can verify it by travelling to visit our farm, about 5 minutes from here. A few days ago, the whole rice field was submerged due to flooding. So ‘control over water’ means that we should drain excess water, or provide it through irrigation. Such system is not available or well developed in our country. It is not possible because we grow rice in the rainy season, during the monsoons. We don’t know how much precipitation we will have, and the interval between the rainfall events and the amount of precipitation is not constant, which does not allow the growth of SRI in our farms.

Professor R5 continues to say that “the main thing is the farmer must have drainage and irrigation systems.” Farmer C1 explains that planting multiple seedlings at a time is a practice done in the Terai as a precaution because of the likelihood of flooding and risk of seedling submersion.

Farmer M3 agrees, stating that while he believes all farmers should use SRI, those who cannot control water cannot use it. Farmer C8 believes SRI is not possible without proper drainage, and Farmer C9 thinks that those in the upland areas without access to irrigation would not be able to practice it. He also stipulates that it is important for this...
water to be cool, as warm water hurts the seedlings. In this case, not only is access to water important, but so is the temperature of that water.

Erratic, unpredictably occurring rainfall is a major limitation, believes Professor R2. He thinks that the alternate wetting and drying technique is difficult to maintain because “our agriculture…is totally dependent on natural rains.” Professor R6 points out that one of the most important reasons for doing SRI is water scarcity, yet, “because of climate change, which is occurring so fast in Nepal, the monsoon is almost one month late. Because the monsoon is late, there is not much water available, especially at the time of transplanting. And that creates a big problem.” The monsoon timing is also changing, Farmer C4 says, but she does not find this to be a big problem, as it is only “10-15 days early or late.” Farmer C7, however, does see it as a problem for farmers, as late rainfall means that there is a high water table at harvest time, which increases the chances of the crop becoming wet which destroys it. Farmer K19 said that last year, she could not put water in her field, as no water fell from the sky – without this heavy rainfall, there was no water in the canal. They had to create a system amongst people in other villages – in her area, she was
allowed to put water in her fields at night. The other side of the canal was able to put water in their fields during the day. Sometimes, she said it was difficult to stay awake because she was working all day and would sometimes fall asleep and miss her turn. She said if she was even a few minutes late, the others would take the water. This year, during transplanting time, the canal was dry, so her husband walked upstream to unblock the canal. By the time the water got to their house, it had all “moved into the soil.”

Most importantly, this dependence on timely flows of water highlights the point that a farmer having “access” to irrigation is variable and differentiated based on the pattern of rainfall, and where their fields are in relation to the canal’s source. A farmer upstream may have had greater accessibility to the canal’s water at that time than Farmer K19 had. Farmer K29 confirmed this, by saying that sometimes on the way to the lower area, people living in the middle areas take all the water. To counter that, the community will send one man to guard the middle areas of the canal to ensure enough will flow lower. This example again complicates the idea that all farmers can use SRI. Agro-ecological situations such as low or uncertain rainfall interact with more social and political issues, such as the practices around sharing scarce resources, as Farmer K19 indicated, which impact different farmers differently.

Groundwater bore pumps alleviate the need for farmers to depend on monsoon rains or shared resources, however, they are not equitably accessible. Farmer C10 has requested a bore pump from DADO, but that they always tell him they do not have deep boring resources available. He told me that these resources in fact do exist, but DADO tends to give these resources to farmers who have larger landholdings. “The rich,” he says, “have more contact with those in…power.” I asked him what he can do about this,
and he leans back, smiles, and says “We pray to God!” Farmer K42’s land does not have access to the Karjuna canal, but she fears if she purchased a pump, it would be stolen. Instead, she ‘rents’ water from others during times of scarcity. Farmer K42 says it takes three hours to flood her land. Mostly, she said, she depends on rain from the sky. Farmer K30 also ‘rents’ water, when it is not accessible from the canal, and his rate is 100 NRP/hour, indicating that pay scale is differentiated. Boring wells are expensive, indicating that socio-economic status is also a determinant of water access. This means that potentially, the more financially endowed families are more likely to have control over water, and more likely to use SRI. Again, this complicates the notion that any farmer anywhere can use SRI – it seems that farmers with better access to water resources are more likely to find SRI successful, especially since SRI requires watering at particular times. Yet, even those with access to boring wells are dependent on access to electricity. Farmer K32 said that she feels a potential challenge to SRI is excessive load-shedding, as it prevents her from using her pump. Farmer K26 agrees that boring is difficult because sometimes electricity “doesn’t come.” Farmer C2 says that water is accessible “as long as there is electricity and no government problems.” Variable supply of electricity is a
common experience in Nepal, so even farmers that can afford bore wells are still dependent on electricity supply, which is out of their immediate control.

Differentiated access to irrigation is a product not simply of class position, canal access, erratic rainfall and electricity supply, but also socio-political situations beyond the farmer’s control. Farmer M1’s experience is an example of this. Previously, he had practiced SRI, but this year he could not because government officials bulldozed illegal shops from the roadside, and debris filled the community’s irrigation canal. Farmer K35 believes her water scarcity problems stem from population pressures, as “now there are more houses here than in the past, and in the past, we could put water [in our fields] whenever we wanted.” Farmer K36 attributes the difficulty farmers have with water access to the weeds that tend to grow in the canals, requiring a person from each household to clear it twice a year.

It is on the basis of these kinds of practical experiences that Uprety notes, contrary to the projected universality of SRI for farmers, that access to water is vitally important. He states:

the farmers who have water control [and] reliable water supply systems are more attracted to SRI. Those who don’t have assured irrigation, and those who are most vulnerable [like rain-fed or lowlands, flood prone areas]...[they] are not very willing to apply SRI, because their situation is not suitable to do all work on time. You know, some SRI practices should go on time, isn’t it? So those areas where irrigation is assured are best for SRI. And in other areas, we should try the hybrid, or modified SRI.

5.3c - Access to information and credit:

Although SRI is argued to be able to work for any farmer anywhere, farmers do need to be able to access information on what SRI is before they can use it. Even though
Govinda Acharya is a strong advocate of SRI in the village of Karjuna, there are still many people who did not know what SRI was. Often, the people who were familiar with SRI were those in Govinda and his wife Laxmi’s Farmers’ Group, and their labourers. Those who were not familiar tended to be from the Tharu community. This suggests the importance of considering differential access to networks for distributing knowledge about agricultural technologies and practices.

Being involved in one or more co-op and/or farmer’s groups is common in Karjuna. Farmers join because it gives access to credit without requiring their land certificate, it provides safe place to save money, and delivers annual bonuses from NRP 2000 – 5000. Different co-ops have different interest rates, generally spanning around 12-14%. If the co-op is agriculturally based, they may deliver workshops about new farming techniques. Co-ops are distinct from Farmers’ Groups.

Not every farmer in Karjuna is able to be a part of a co-op, owing to their perceived assets and personal networks, such as caste. Farmer K22 says she cannot join co-ops, because they require large sums of money for entry. Some co-ops, for example, Joy Laxmi, requires 48,000 NRP in order to enter. She had to join the bank instead, and to take out a loan, they require need a land certificate. If you do not pay the specified interest in the first month, the bank warns you. By the second month, they will come to your house and take whatever is worth the amount of money you owe them. “Except our lives,” Farmer K22 laughs, “they’ll take everything.” This demonstrates the unequal risk in obtaining credit for those farmers that cannot join co-ops.

Chandra Prasad Adhikari, my host in Chitwan, was one of the chairs of an Organic Co-op. Many farmers I interviewed in the village were a part of this co-op, but
Farmer C3 and other sharecroppers were not – only those who owned land were able to join. It is difficult and expensive to buy land in Nepal, and so those who are already privileged to own land have access to a co-op that lends money and provides agricultural support. In some ways, the co-op further entrenches these inequalities. Some farmers, however, are uninterested in joining co-ops. For example, Farmer K19 does not trust them. She recalls an experience where she put money into a co-op in which the leader “escaped”, or, ran off with all of the money. Due to this experience, she decided to form her own group for people who share her family name. This would be more closely akin to a Farmer’s Group.

Farmer’s Groups are slightly different from co-ops as they take on fewer members – 25 is the minimum and usually the maximum, whereas co-ops take thousands of members. Laxmi and Govinda’s group, Swayputri, for example, is a women’s Farmer’s Group, made up of their family and friends. Being a part of a Farmers’ Group is important to access agricultural information and techniques. Due to limited extension resources, DADO does not run workshops for individual farmers – they will only make a trip if it is for an entire Farmer’s Group. Swayputri and other Farmer’s Groups generally meet once a month, discuss agricultural techniques and individual farmers request loans. Swayputri is particularly privileged, as Govinda Acharya is the ‘teacher’ of the group, and as an Agricultural Technician, is able to provide pertinent knowledge and access to resources such as quality seeds. Farmers’ Groups can also be exclusive – for example, Farmer K45 and K6 are not a part of any Farmers’ Group as they do not have enough money to join. Farmer K23 would like to join, but he thinks people don’t ask him to because he is weak and old, and Farmer K24 believes people do not ask her to join these
groups because the people in the village know that her husband does not make any money.

Most of the people who attempted SRI in Karjuna were a part of Swayputri. This is not to suggest that there was an intentional exclusion of others, but does show how personal social connections can ease access of information and encourage trials. Farmer C2 says that in Nepal, there is a political situation where “people in power only give things to those they favour”. Farmer C7 is another example of this – at the end of our conversation, he showed me the motor he has for water, which he said he obtained through his brother who is a government worker. Also, those farmers who have access to education, or have relationships with those who are educated, may be at an advantage. For example, Farmer C9 learnt of SRI when he was educated at Rampur, and his position as an Agro Vet as well as his connections with Rampur professors, provide him access to workshops whenever they are available. In contrast, Farmer C10 was a farmer whose land was used by agricultural students conducting an experiment on SRI. After the students left, Farmer C10 did not continue, as he felt he did not have the knowledge to keep using SRI. This may complicate the notion that SRI is best suited to the poorest small holders, as access to education, which is generally associated with a higher socio-economic condition, may be an important determinant of long term SRI use.

It is difficult to say whether using SRI promotes connections between farmers and DADO, or whether those connected with DADO to begin with tend to be targeted to try and ultimately are more successful with SRI. For example, Farmer K27’s husband is friends with Uprety and other officers at DADO, so when she started using SRI, they came into her fields to teach her and her husband. Before he started using SRI, Farmer
M3 received support from an NGO called *Adadin*, and not from DADO. This has shifted since he has started using SRI – now, he does not receive any help from *Adadin*, and he only receives it from DADO. It was common for those practicing SRI to say that DADO came to look at their fields, while those not practicing SRI said they received help from their neighbours. This reveals that there may be benefits beyond physiological changes that assist the success of SRI fields, and may represent a strategy farmers may employ when deciding whether or not to use new agricultural technology.

Many people in Karjuna reported that they do not receive agricultural support from government officials – in general, they tend to receive it from family members and neighbours. Very few practitioners of SRI learnt of it from their neighbours organically – they had attended workshops directed by agricultural technicians. More accessible than DADO are Agro Centres. The Agro Centre is a small shop that is usually the seed/fertilizer/herbicide/pesticide hub for a particular Village Development Committee (VDC). The Agro Centre usually has an employee, often called an “Agro Vet”, who gives information about the fertilizers, herbicides, pesticides or seed variety a farmer is interested in buying. Although, for many farmers, the AgroCentre is not easy to access due to distance and inconsistent employee hours.

The impact of support for farmers is well known. For example, an official at NARC said that supporting farmers is key and that “maybe if you provide some facilities or something to the farmers, then they will follow [SRI].” A DAO said that SRI could work if it were driven by a project, otherwise, he does not think the farmers will practice it. He says that “they need support for the risk that they will take by trying a new agricultural innovation.” He clarified that he was talking about financial assistance. He
says they also need management assistance, because often when the support people for the projects leave, or the funding for the projects runs out, the farmers stop using what they had learnt. He feels this is due to the withdrawal of support.

5.3d - Labour:

An important aspect of SRI is the amount of labour needed at specific times during the rice season. Labour is needed to prepare and level the fields (with tractor or ox), to transplant, to weed three times a season and to harvest and thresh. As was discussed in Chapter 4, migration is a common trend across Nepal, leading to a labour scarcity in the country. This was a major limitation for SRI in the opinions of many officials, researchers and farmers that I spoke with. There are different forms of labourers in Nepal, some are periodical labourers, some are bonded labourers who stay in the landlord’s house as domestic servants (Adhikari, 2008), and some are family labourers. There were a few households I interviewed that seemed to have bonded labour, although, they would say that they were taking care of a relative or a friend’s child, and that this child was helping around the house. It was difficult to discern the contours of these relationships. In this section, therefore, I will be talking about the issues surrounding labour with SRI, referring to family labour and periodical, hired labour.

There are many different labour strategies employed by farmers across Nepal. Some perform their own labour, some use immediate or extended family labour, and others hire labourers. Specifically in Morang, hired labour has different agreements. They usually work 7am -5pm a day, with a gap for lunch provided by the employer, and make 250 NRP/day. Other systems are based on piecework, where labourers are paid per
seedling bundle transplanted. There is also a form of labour called the *parma* system, where several friends or family members all take turns working in each other’s fields. I interviewed a few people practicing *parma*, who were all of Tharu decent. Yet, other Chhetri/Brahmin families spoke favourably of this system, and did remember practicing it when they were young, although, I did not meet a family that currently practices *parma* from this caste.

Many people who hire labourers in Karjuna are hiring others from within the village, yet in Phulbari, the labourers are generally from the border areas of Nepal, or from India. Farmer C6 thinks that the “labour from the border areas is not good”, so she tries to do the weeding on her own. Labourers’ wages also vary according to location. In Phulbari, the labourers’ wages were generally 400-450 NPR per day, whereas in Karjuna, the daily wage was generally 250 NRP/day, or 200 NRP/day with 1 kg of *chamal* (dry rice). This probably has to do with different experiences of scarcity in different locations – the labourers in Phulbari generally travelled from the “border” areas, whereas, cultivators in Karjuna tended to hire labourers from the village. Wages for women are generally lower than for men for the same work (Adhikari, 2008). In general, the labourers do not feel they receive an adequate wage, and the farmers do not feel they can afford to pay the labourers any more.

Labour availability goes beyond simple access, as it must also be adequately timed with the monsoon rains. This is a problem in conventional paddy cultivation, but becomes even more significant with time sensitive SRI practices. If transplanting labour is not available when the monsoons arrive, the seedlings will be transplanted late. If weeding labour is not available on time, the weeds could choke out the young seedlings.
If harvesting labour is not available on time, the panicles could become heavy and fall, damaging the yield. Late harvesting labour with uncertain monsoons could also result in the harvest becoming wet and unusable. Last year in Chitwan, Farmer C1 recalls, this occurred when there was a labour scarcity during the harvest, so many farmers had not had the chance to bring the straw in from the fields when the rains came. This rendered the straw unusable for cattle fodder, upon which many farmers depend.

In a context of labour scarcity, the suggestion of increasing labour with SRI, whether real or imagined, is a massive limitation for farmers who already feel stretched. Requiring more labour in a time of labour shortage, an official working for the FAO explains, is a major con for SRI. An official at NARC says that “SRI requires meticulous… attention. [Only then] can [a farmer] practice it.” He goes on to say that “if you look at the farming communities now, it is very difficult to get labourers in the peak period, and it is very expensive. Now the Nepalese farmers are slowly adopting mechanization and using machinery. This is not actually compatible with SRI.” An official at FAO agreed that a big con of SRI is that it requires more labour in a time of labour shortage. Professor R2 agrees that the major block for adopting SRI is that:

it is labour intensive. … since we are experiencing acute labour shortage, and since SRI requires a lot of labour initially, [it is difficult to adopt SRI]. Uphoff says that we have to develop equipment, and with good equipment and if you can continue with SRI for 3-5 years, then labour will be reduced because the weeds will be suppressed and so on…but practically…[I don’t think it will work].

The farmers who have tried SRI echo this difficulty, and the labour issue was a major factor in the disadoption of SRI. Farmer K26 left SRI, because he said it brought him more ‘tension’ in irrigation and weeding, and that he did not receive any support.
while attempting to use SRI. Khadka confirms that “some are leaving because SRI is more labour intensive, [and requires] more care [than] conventional systems.” Farmer M2 stopped using SRI gradually as he said he faced problems with weeding and levelling his land, as well as balancing his time between the shop he owns and working the fields. Despite the doubled yields it produced, Farmer K27 left SRI after using it for three years because her sons left home to pursue further education. Without family labour, she has to hire others, but they refuse to transplant small seedlings. Student R4 confirms the importance of developing new skills with SRI, as different tasks need to be completed in less time. He says “when the seedlings are a small age, they have to be uprooted and must be transplanted within 30 minutes to get established. It is hectic.” Farmer K35 agreed with this, as she found SRI to be more work, especially due to weeding. Farmer K43 said it took too much time to transplant in SRI, and he could not keep doing it because of the labour scarcity in the village. In contrast, Farmer K45’s daughter, a labourer, said she found it took less time to transplant in SRI fields, as she only had to plant one at a time, and following the lines made it easier. Farmer C9 also feels that transplanting takes less
time in the SRI fields, while everything else is the same. It is important to note, however, that Farmer C9 has been using SRI for 7 years, and does not work in his own fields.

In other words, while SRI may fit in certain areas in terms of their water availability and drainage capabilities, without access to labour, it will not be successful. Even farmers who significantly increase their yields with SRI find that it is not enough to keep them engaged. For example, Farmer K28 produced 70 maund/bigha with SRI compared to 40-45 maund/bigha with his ‘conventional’ practices. He used SRI for 6-7 years, and liked it – however, he knew he needed to make more money to send his children to school, so he moved overseas to work. Unless someone owns a lot of land, it is more profitable to work overseas than to practice SRI. The people he rents the land out to now do not use SRI, but he says there’s nothing he can do about it. This is an interesting point, as others, such as Farmer K43, say they left SRI or cannot use SRI at all because they have too much land and therefore, cannot give it the attention it needs.

Excess male migration has impacted others who are using SRI, for example, the women at the Samahati co-op said they cannot find labourers because male members of the family have gone to work in Gulf countries. There are fewer labourers, and the women have a lot of work to do – they need to work in the co-op fields, look after their children, cook and clean their houses, as well as work in their own fields.

Uprety contrasts this, stating that “if people work continuously, then the labourers develop skills like space maintenance, line maintenance, and then that is easy – they don’t need the rope and markers. But generally, people feel it’s difficult if they just try once or twice.” He encourages farmers to adopt the principles slowly so it doesn’t feel so overwhelming. Even putting one of the principles into practice, he says, will yield results.
For example, he says that “they can reduce seedling number and increase the spacing…[and] increasing organic matter is always better.” He also advocates mechanical weeders to limit the workload of weeding. Khadka agrees that the mechanical weeders are a very important tool in promoting and sustaining interest in SRI. He said that “weeding is important, because if they do not weed at the proper time, then they will lose all their crops. The alternate wetting and drying promotes weeds, which is a big issue.” Often, however, women complain that the mechanical weeders are too heavy, so they require men to help them. Weeding is traditionally a woman’s job, so the mechanical weeders also offer an opportunity to disrupt gendered divisions of labour, for better or for worse.

In terms of labour, Uprety believes the parma system is most suited for SRI – although, notably, those who I met who practice the parma system were predominantly in the Tharu community and many in this community had not heard of SRI. This may be revealing of the class and caste aspects of the dissemination of new agricultural technologies, and potentially the conundrum with the way labour relations work with SRI specifically in Nepal. Potentially, those who have access to the information about SRI are those who are well connected to agricultural networks, and are generally landowners.

Figure 9 – An example of a mechanical weeder used in SRI. Photo taken at farmer’s home in Morang, Nepal.
They are more likely to own land because they have someone in the family working overseas who is sending money home. This makes them less likely to have access to family labour, and less likely to practice the *parma* system, which is the most suited labour system for SRI. These questions are exploratory in nature – there may be communities which practice *parma* exclusively that I was not able to visit.

There is a potential positive for labourers with the increased use of SRI. When I asked Govinda Acharya about how practicing SRI would benefit labourers, he said that when people increase their yield, they also increase the wage that they pay their labourers, as the labourers will demand more of you when they know that. The wage for labourers, he points out, has been constantly increasing. He points out that 10 years ago, labourers were paid 60 NPR a day, and now they are paid 250-500 NPR a day. He said this increase in pay is not solely due to inflation or drops in Nepali currency, but due to the scarcity of labour. Yet, whether or not labour wage increases “automatically” is yet to be understood. It seems it needs to be demanded by the labourers themselves. Uprety agrees that SRI could have a positive impact on labourers, as he says, “if rice production increases, the per unit labour production is increased. So, that is, per unit of labour, production is high.” However, based on interviews, it is not certain whether all farmers experience greater labour productivity with SRI. He suggests that farmers will value those workers who have skills in SRI transplanting and weeding, and those labourers may demand more. He continues, “if farmers realize the benefit, then they will pay higher.”
5.4 - Claim 4: SRI knowledge is passed predominantly from farmer to farmer

Receiving support from social networks can arguably be realized in many forms. It is common for farmers to follow those agricultural methods that worked for their neighbours. As was indicated in Chapter 2, SRI claims that its popularity was predominantly spread from farmer to farmer, outside of formal institutions. Yet, from its inception, SRI was claimed to be ‘developed’ and ‘packaged’ by a foreigner, a French Jesuit. The whole dissemination of SRI was catapulted following CIIFAD’s work in Madagascar, and currently, SRI is being disseminated by organizations such as the World Bank in partnership with Cornell’s SRI -Rice in their project in West Africa.

If we recall, the arrival of SRI in Nepal did not come from a farmer either. The individual that brought SRI to Morang is Rajendra Uprety. The transfer of SRI knowledge from Govinda Acharya to his neighbours could potentially be an example of farmer-to-farmer transfer, although, it may be more complex as he is also an Agricultural Technician, and has gained a certain respect and assumed authority over teaching new agricultural methods.

In Nepal specifically, while farmer-to-farmer dissemination of SRI may exist, there is also a reliance on the involvement of institutions and government officials. I did not interview anyone who said they started using SRI by watching another farmer in their field. People cited either DADO, Govinda Acharya, or the Agro Centre. This is not to say that farmers never take the advice of their neighbours. In fact, this is quite common for many different agricultural techniques. Uprety confirms this by saying that, “Farmers believe their neighbours…if their neighbours do better with SRI, then they [will] try it.” I asked further if this is something farmers always do, and he said “Mostly, mostly… they
[try] whatever they [see] in their surroundings.” This indicates that even if farmers do learn and practice SRI through other farmers, this is not a phenomenon unique to SRI. While there may be several farmers that practice SRI unbeknownst to DADO, in my experience, agricultural technicians were involved in the promotion of SRI through formal channels such as workshops. Therefore, my fieldwork experience questions this particular claim.

5.5 - Claim 5: SRI practices are environmentally sound

One of the main claims SRI makes is that it is a sustainable rice growing practice, and that it is better for the environment than “conventional” rice growing practices. When I asked about the potential environmental benefits, Uprety said that “[SRI] is sustainable, because it needs [fewer] chemicals, it increases microbial activity, it preserves water, it reduces greenhouse gases, and it preserves varietal diversity.”

In practice, however, the relationship between SRI practices and sustainability issues may be more complex. The SRI farmers I spoke to often did use chemicals, although there was significant variation between respondents. Farmer C8 said that while he does continue to use pesticides and herbicides, he uses less than he used in traditional cultivation. Farmer C2 says that he needs to use chemical pesticides to fight off insects – if he did not do this, he says he would have to leave farming. Farmer K2 uses chemical fertilizers because he has two cows which do not produce enough organic manure to provide for all of his fields. Professor R2 discussed the practical problems with increasing organic matter. He said

Practically, if we talk about increasing organic matter, we have less and less grazing lands, less and less common resources from where you can get the organic matter, less and less labour which
can bring organic matter to the soil. Those are the conditions. But promoting chemicals in no way is ecological, it’s not ecological. Growing organic matter, for example, growing the plants that produce organic matter in the soil may be one good idea, but it is not always practical. That’s why it is very important to [be] location specific, and try to solve [problems] through the practices based on location specificity.

Access to organic manure and distance from their fields was a limitation for Farmers 37 and 43. They used SRI on the fields that were closer to their house because they were able to carry the compost there. In fields that were further away, they had to use chemical fertilizers.

Another more commonly stated environmental benefit in SRI claims is that it reduces water usage and emission of greenhouse gases. My fieldwork was not in a position to address this, however, it seemed that perhaps those farmers who depended on borewells would be able to reduce water usage. Many who relied on shared canal water sources or directly from the rains did not reduce their water use by a vast amount. This indicates the pressing need for further research on the interaction between water access, SRI practices and sustainability questions.

5.6 - Summary: Narrative vs. practice of SRI

Due to the nature of this research, this analysis does not seek to state whether any of SRI’s claims are ‘true’ or ‘false.’ Indeed, my research suggested that to even clearly identify SRI among the plethora of agricultural techniques actively engaged in Nepal is more difficult than I had originally believed. In contrast, it has sought to juxtapose the coherent vision of SRI as an agricultural practice with defined benefits that circulates at a global level with the diversity of practical, situated experiences in the fields of the Terai.
In so doing, my fieldwork indicates that the lived realities of the sixty-two farmers interviewed, and the experiences of practitioners, officials and researchers in Nepal raise important questions of SRI’s promise of universal benefit. Whether SRI is likely to be attempted, adopted and deemed ‘successful’ depends upon a range of socio-economic and agro-ecological conditions, and the complex ways in which they interact. This indicates that SRI is not context-free at all, and therefore, not a universal practice.

In summary, this section has shown that while all but one farmer did experience an increase in yield with SRI, this came at a labour expense that not all farmers felt was a positive trade-off with production. This suggests that labour productivity may be a more important factor for these particular farmers. Also, not all farmers seemed interested in increasing their yield. This may be a product of obtaining the greatest proportion of household income from overseas remittances, although, this requires further research. In terms of malleability of SRI practices, the lines between pure SRI, hybrid-SRI, partial-SRI and non-SRI were blurred. Farmers did tend to adjust practices that best suited their agro-ecological context and labour availability, which did align with the global claim of its adaptability. Yet, it seems the adaptability is accompanied by inconsistencies in what SRI is. Further, some of these inconsistencies allow SRI farmers to use practices such as flooded paddy and chemical inputs that diverge from its claims of environmental sustainability. Whether or not this is actually a problem is up for debate, as pragmatic practitioners such as Uprety believe that it does not matter what the farmer calls their particular agricultural practice as long as they are benefitted in some way. Determining how to measure SRI’s success and proliferation while maintaining such flexibility in practices requires further research.
The claim of universality was the most focused on claim of this study. In the case of SRI, this fieldwork suggests that in Nepal, SRI seems most suited to small-holder farmers who have access to agricultural support and credit networks, control over irrigation and drainage, and access to family or hired labour. With these stipulations, it seems that those who do not own their own land, do not have control over water or access to extension services are less likely to practice and be successful with SRI. While the fieldwork analysis does show that some farmers do notice SRI by watching their neighbours, supporting the farmer-to-farmer dissemination claim, it is unlikely for these farmers to attempt it without support from DADO, researchers, or other extension support.

Unequal access to resources is not caused by SRI, but like any new agricultural development initiative, it could heighten existing inequities. It is not certain whether better endowed farmers are selected to practice SRI, are less risk averse, have more powerful social networks, or happen to have access to a formal education and are better able to assess benefits and risks. These are all questions for further study that this research is unable to answer. Regardless, it is important to question whether access to various resources for successful SRI practice actually widens the gap between the well-endowed and the most impoverished rice producers in Nepal.
Chapter 6

Conclusion and Future Research

6.1 – Complicating SRI’s claims

SRI-Rice’s network of practitioners, researchers and donors have worked to make SRI a ‘traveling rationality,’ or a practice that can be implemented universally irrespective of local context. This process of producing SRI as a universally applicable technology requires a silencing of the particular and an amplification of the general. It is precisely this ‘silenced particular’ that this project aimed to uncover in the context of Nepal’s Terai. Indeed, my fieldwork has demonstrated that, at least in Nepal’s Terai, specific agro-ecological and socio-political contexts greatly impact whether and how SRI is implemented and whether or not farmers experience ‘benefits’ from it.

By analyzing how the social landscape of the Terai in Nepal plays a role in determining who uses SRI, how it spreads and how benefits are realized across class and gender, this project has complicated several of the claims that underpin SRI as a travelling rationality. Through interview-based fieldwork, it seems that SRI is best suited for land-owning farmers who have access to compost maul, on upland irrigated land close to their house. Also, it is best if the particular farmer has access to male and female labour at the appropriate times, and a mechanical weeder. It is also best if they are part of a Farmer’s Group that is in contact with DADO. This is not to say that farmers that do not meet these conditions cannot practice SRI. Based on the interviews, however, it seems those that meet these conditions are best suited for a successful experience with SRI. Moreover, where these kind of conditions do not exist, farmers are more likely to
either reject SRI or to borrow some elements of SRI practice, creating a hybrid form of conventional-SRI framing.

To be clear, while the fieldwork did highlight that numerous individual farmers in Chitwan and Morang had positive experiences with SRI, this is not true of all farmers. It is therefore important to complicate the notion that any farmer anywhere will benefit from using this technique and to understand what the key constraints on successful adoption are. At the same time, the research also indicated that it is important to expand on what is meant by “benefit”. For many farmers, the increased input of labour time was not worth the increased yield accrued, therefore emphasizing the importance of local labour availability and cost as a key factor in SRI success. Other key limiting factors that the thesis raised included access to land, water and credit, all of which are very unevenly distributed in the Terai.

This research’s exploratory and qualitative methods demonstrate that SRI is not ideal in every location. SRI, like any agricultural technique, is subject to agro-ecological and socio—political pressures. Specifically, the thesis aimed to understand the lived realities silenced in SRI claims regarding its (1) productivity; (2) malleability; (3) universality; (4) dissemination; and its (5) environmentally sound practices. Despite the vast majority of farmers reporting yield increases under SRI, this was not enough to keep all farmers engaged. The more intensive labour that was required was a major drawback for farmers’ involvement, indicating that while yield productivity may be the most important aspect to stress for donor agencies, for farmers, labour productivity may be the most enticing aspect of an agricultural development. Farmers who were satisfied with their yield and economically sound through remittances from family members living
abroad probably had little incentive to increase their labour intensity to increase their yields.

The claim that SRI is adaptable to farmers’ situations seemed to be accurate only if a strong definition of SRI was relaxed. In the fieldwork sites, farmers were able to practice as few as one of SRI’s recommendations yet still be considered SRI farmers by SRI advocates in the region. Although, the lines between SRI, hybrid-SRI, partial-SRI and non-SRI farmers were unclear. In contrast to claims, it seemed not every farmer was in an ideal position to practice SRI, certainly in its full form, as it depends on access to resources such as water, information, land and labour.

Noting the heavy involvement of DADO officials, SRI-Rice, the World Bank and Oxfam in its extension, it is clear that SRI is not solely reliant on farmer networks to be spread. While the phenomenon of farmers sharing their knowledge of SRI does exist, it is not unique to this particular practice, as it is historically embedded social behaviour based on trust – observing an agricultural method or technique work effectively in your neighbour’s field provides reasonable assurance that this will also occur in your own field. SRI’s claims of environmental benefit through reduction in chemical fertilizers seems only relevant to those who are: (a) owners of sufficient number of cows and buffalo; (b) do not rely on such manure for a fuel source; and (c) own land that is close enough to their cattle shed to plausibly carry the manure to their fields. Otherwise, it is not possible for compost maul alone to be used in the SRI fields and farmers must rely on chemical inputs.

In general, this exploratory research indicates that SRI’s global narrative may be silencing important socio-economic and agro-ecological inequities that exist in rural
Nepal that are essential constraints on SRI practices. It is less likely that this silencing is an intentional act to limit political dissent amongst rural populations, and more likely to be a strategy to attract the attention of interested researchers, practitioners, and donor agencies. In short, its simplistic presentation may simply be a marketing tactic. Seasoned practitioners such as Rajendra Uprety, Norman Uphoff and Erika Styger almost certainly recognize these limitations and simplifications. Yet, while it may be believed that simplistic ‘silver bullet’ representations are more effective at capturing donors’ attention, farmers may benefit more by accurately representing the applicability of SRI in specific situations – i.e. by explicitly recognizing that SRI is more labour intensive, and is best suited for landowners who have access to timely labour, a controlled water source, and sufficient compost maul.

6.2 – Future research

This research suggests that in Nepal’s Terai, farmers who are most suited to practice SRI are landowners with small plots who have access to timely labour and a controlled water source. They also tend to have a family member overseas, and are adequately connected with the MoAD or other agricultural technicians. To develop this argument further, more systematic and in-depth research is necessary, with interviewees from more diverse agro-ecological situations, extension access, and more widely representative of various caste and socio-ecological contexts. More work could also be done to investigate whether female or male-headed households are more likely to try SRI and why this is.

Also, due to Nepal’s diverse geographical and cultural make-up, a small study on SRI in the Terai is hardly representative of its potential within the entire country. Further
studies conducted in the Hills would be helpful in outlining the constraints and limitations of this practice in these regions. Of particular interest would be the Western Terai, where Ram Bahadur Khadka and FAYA Nepal ran trials in 2009. Follow up with farmers who had practiced SRI at that time would be helpful in understanding the impact of agricultural support on its proliferation and long-term use. Experiences of farmers in this region may also give some insight to unique pressures and challenges, especially flood and landslide damages, specifically in the summer of 2014.

Other questions to be asked include what exactly SRI is, and how many practices need to be followed to be considered an SRI farmer. This is important if we are to truly understand whether or not there is a synergistic nature to the six practices, and to determine how many farmers practice it and are benefitted. Is high-input SRI still SRI? How much in line does SRI need to be with agro-ecology before it stops becoming SRI? Extending from this, it would be useful to study which principles tend to be hybridized into conventional practices after the farmers leave SRI? For example, this preliminary research suggests that farmers tend to reduce their seedling number and age of transplanted seedling after exposure to SRI, but return to flooded fields. Is this considered hybrid-SRI, or is this conventional agriculture with an introduction of more cost-efficient farming practices?

Finally, my study suggested that access to extension was an important determinant of SRI use, and this tended to exclude the Tharu community. Yet, the Tharu community were more likely to utilize familial labour, and the parma system, which Uprety thought worked best with SRI. It would be interesting to compare the success of SRI in Tharu communities and Brahmin/Chhetri communities to explore whether SRI
works best in specific socially embedded practices. In Karjuna specifically, the labourers on Brahmin/Chhetri fields tended to be Tharu. Some of these labourers learnt about SRI through labouring in the fields of people who wanted to practice it. Some landowners claimed that even though they tried SRI, the labourers refused to use it. A further study could focus specifically on labourers, and their experiences with SRI.

6.3 – Final thoughts

The focus on developing a new agricultural technique relying less on formal networks of extension, fewer expensive inputs like chemical fertilizers and HYV, reducing water use and still producing a greater yield is important and necessary. However, it is just as important for these practices to be upfront about where they are best suited, and some of the major limitations that exist within it. If the reader takes this information and decides to abandon SRI as a potential player in improving rural food security and well-being, then this thesis will have failed. The aim was to complicate SRI’s global narrative not with the intention of discounting its utility and potential, but in order to deliver a more responsible, authentic and critical representation of specifically where it works best, and for whom.
Bibliography


## Appendix A
### Farmer Reference

<p>| C1  | Brahmin | Phulbari | Female | 1 | 1 bigha | 0 | No |  |
| C2  | Brahmin | Phulbari | Male   | 0 | 10 kattha | 10 kattha | 50/50 | No |
| C3  | Brahmin | Phulbari | Female | 1 | 0 | 24 kattha | 50/50 | No |
| C4  | Brahmin | Phulbari | Female | 1 | 10 kattha | 0 | No |  |
| C5  | Sudra   | Phulbari | Female | 0 | 10 kattha | 0 | No |  |
| C6  | Brahmin | Phulbari | Female | 1 | 10 kattha | 0 | No |  |
| C7  | Brahmin | Phulbari | Male   | 0 | 2 bigha | 0 | No |  |
| C8  | Brahmin | Neepani  | Male   | 0 | 15 kattha | 0 | Researchers at Rampur | Yes | 7 |
| C9  | Brahmin | Neepani  | Male   | 0 | 1 ha | 0 | University studies | Yes | 7 |
| C10 | Tamang  | Unknown, Chitwan | Male | 2 | 1 ha | 0 | Students from Rampur conducting on-stie trials | No | 1 |
| C12 | Brahmin | Phulbari | Male   | 0 | 1 ha | 0 | Professor at Rampur | No | 0 |
| M1  | Tharu   | Unknown, Morang | Male | 0 | unknown | unknown | unknown | Yes, Uprety | Yes | 3 |
| M2  | Newar   | Laxmipur | Male   | 0 | 2 bigha | 0 | Yes, Uprety | No | 1 |
| M3  | Brahmin | Laxmipur | Male   | 0 | 0 | 4 bigha | Yes, DADO | Yes | 10 |</p>
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<td>0</td>
<td>Govinda</td>
<td>Yes</td>
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<td>K3</td>
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<td>Karjuna</td>
<td>Female</td>
<td>0</td>
<td>0.5 kattha</td>
<td>0</td>
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<td>Karjuna</td>
<td>Female</td>
<td>1</td>
<td>8 kattha</td>
<td>7 kattha, 50% given with rice only, no input</td>
<td>Yes, Govinda Acharya</td>
<td>Yes</td>
<td>8 (alt.)</td>
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<td>Female</td>
<td>1</td>
<td>7 kattha</td>
<td>1 bigha</td>
<td>50/50</td>
<td>Yes, Govinda Acharya</td>
<td>Yes</td>
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<td>Yes</td>
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<td>No</td>
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<td>1.5 kattha</td>
<td>0</td>
<td>Yes, neighbours</td>
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<td>Female</td>
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<td>50/50</td>
<td>Knows from GL's house, but doesn't use</td>
<td>No</td>
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<td>1/5 bigha and 3 kattha</td>
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<td>Tharu</td>
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<td>2</td>
<td>1 bigha and 3 kattha</td>
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<td>1 bigha</td>
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<td>3</td>
<td>1 kattha</td>
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<td>Karjuna</td>
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<td>1 bigha</td>
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<td>No</td>
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<td>8 kattha</td>
<td>2</td>
<td>Yes, in school</td>
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<td>Karjuna</td>
<td>Male</td>
<td>0</td>
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<td>1 bigha</td>
<td>Yes, from neighbours</td>
<td>No</td>
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<td>0</td>
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<td>Khositla riesta</td>
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<td>8 kattha</td>
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<td>Yes, agricultural officer</td>
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<td>Khositla riesta</td>
<td>Female</td>
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<td>Yes, husband and Uprety</td>
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<td>M/F</td>
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<td>1 bigha</td>
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<td>Yes, National Rice Institute</td>
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<td>Gender</td>
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<td>10 kattha</td>
<td>50/50</td>
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<td>1 bigha</td>
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<td>Yes, Govinda</td>
<td>No</td>
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<td>5.5 kattha</td>
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<td>35 kattha</td>
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