

Adaptation and Evaluation of Integrated Rice and Duck Farming in the Hongdong Community of South Korea and the Poolmoo Schools

— Knowledge Sharing and Learning in Sustainable Rice Cultivation Networks



Master Thesis

Department of Geography, University of Zurich

Dominik Rutz

May, 2008

It is a profound irony that we should be confronted with so many problems at the same time in history when humanity is at a peak of its knowledge and power (Botkin, Elmandjra & Malitza, authors of “No Limits to Learning” by the Club of Rome 1979: 7).

**Adaptation and Evaluation of Integrated Rice and Duck Farming in
the Hongdong Community of South Korea and the Poolmoo Schools**

–

**Knowledge Sharing and Learning in
Sustainable Rice Cultivation Networks**

Tutored by
Dr. Claudia Zingerli
Department of Geography
University of Zurich

Submitted to
Prof. Dr. Ulrike Müller-Böker
Department of Geography
University of Zurich

Dominik Rutz, Uhlandstrasse 10, CH-8037 Zurich
Email: drutz@access.unizh.ch

May, 2008

Front page picture: Duck releasing event in Hongdong
(source: <http://mundang.invil.org/>)

Contents

Figures, Tables and Pictures	iii
Abbreviations, Units and Currency	iv
Abstract	v
Acknowledgement	vi
Preface	vii
1 Introduction	1
1.1 Starting Point.....	3
1.1.1 Knowledge Sharing in Sustainable Natural Resource Use	3
1.1.2 Integrated Rice and Duck Farming	4
1.2 Framework of Analytical Categories	5
1.3 Research Questions and Operationalization.....	8
1.4 Structure of the Thesis.....	9
2 Methodology	10
2.1 Phases of Data Collection	10
2.2 Data Collection Through Qualitative (Expert) Interviews.....	12
2.2.1 Sampling.....	13
2.2.2 Interview Guideline.....	14
2.2.3 Interview Accomplishment	15
2.3 Complementary Methods	15
2.3.1 Timelines and Diagrams.....	16
2.3.2 Field Walks and Participatory Observations	16
2.4 Data Analysis	17
2.5 Literature Review and Document Analysis	18
3 Knowledge Sharing and Learning Processes	19
3.1 Basic Definitions	19
3.1.1 Knowledge and Information.....	19
3.1.2 Knowledge Processes and Activities.....	21
3.2 Sharing Knowledge and Problem Perspectives Within and Across Knowledge Boundaries.....	22
3.2.1 Communities of Practice are Part of the Institutional Structure.....	23
3.2.2 Collaborations of Members of Different Communities of Practice	24
3.2.3 Mutual Learning in Multi-Party Collaboration	25
3.2.4 Sharing Problem Perspectives in Sustainable Natural Resource Use	26
3.3 Embedded Social Interaction and Tacit Knowledge Sharing.....	28
3.3.1 Knowledge Chains	29
3.3.2 Socialization	30
3.3.3 Pivotal Social Roles and Institutions.....	32
3.3.4 Institutional and Strategic Knowledge	33
3.4 Securing Livelihoods and Allocating Means Adequately	35
3.4.1 Adaptations and Interventions to Secure Livelihoods.....	35
3.4.2 Resources to Cross Boundaries	36
3.4.3 Supporting Local Capacities for Knowledge Sharing.....	38
3.5 Summary: Analytical Categories	39

4	Case Study Introduction.....	41
4.1	Study Area Introduction: Hongdong Area.....	41
4.1.1	The Geographical Setting of the Community.....	42
4.1.2	From the City to the Countryside: Accompanying a Refarmer.....	43
4.1.3	Farming in Hongdong.....	45
4.1.4	Institutions in Hongdong.....	46
4.2	Case Study Introduction: Integrated Rice and Duck Farming.....	51
4.2.1	Description of the Duck Method.....	52
4.2.2	Problems and Limitations Reports of IRDF.....	54
4.2.3	Combinations of IRDF.....	55
4.2.4	Not the Duck, but the Basic Pattern Goes International.....	56
4.2.5	IRDF Outside Japan and South Korea.....	57
5	Knowledge Sharing and Learning Within and Outside Hongdong.....	60
5.1	Adaptation of IRDF in Hongdong.....	60
5.1.1	The Precondition for IRDF Adaptation in Hongdong.....	60
5.1.2	IRDF under the Market Situation in Recent Years.....	62
5.1.3	How the Principle Was Altered Due to Local (Market) Conditions.....	65
5.2	Knowledge-Related Processes in The Poolmoo Schools.....	67
5.2.1	The Poolmoo High School.....	67
5.2.2	The Poolmoo College.....	70
5.2.3	Socialization in the Poolmoo Schools: Network Transfer.....	71
5.2.4	The Role of Japan and the Japanese Language.....	72
5.2.5	Cultural Differences in Community Life and Marketing.....	73
5.3	Institutions and Embedded Social Interaction in Hongdong.....	75
5.3.1	Interregional Connections of Hongdong Institutions.....	75
5.3.2	Project Outlooks in Hongdong.....	76
5.3.3	Different Networks Have Different Access to Institutions.....	78
5.4	Evaluation of IRDF and Other Organic Methods.....	80
5.4.1	Comparison of IRDF with Other Environmental Sound Rice Farming Methods.....	80
5.4.2	Communicative Aspects of the Different Methods.....	83
5.4.3	How the Methods are Used in Hongdong.....	88
5.4.4	The Future of IRDF in Hongdong.....	89
6	Summary and Discussion.....	91
6.1	Summary.....	91
6.2	Discussion.....	96
6.3	Conclusion.....	103
6.4	Outlook.....	105
	Literature.....	106
	Annex.....	111
	Declaration.....	113

Figures, Tables and Pictures

Figures

Figure 1: Agricultural systems (1995)	2
Figure 2: The interdisciplinary knowledge chain.....	30
Figure 3: Knowledge spiral	31
Figure 4: The Korean peninsula	42
Figure 5: Climate chart of nearby city Taejon	45
Figure 6: Hongdong from space.....	47
Figure 7: The duck effect	53
Figure 8: Material cycles of Azolla, loaches, ducks, and rice plants	56
Figure 9: Organic labels	63
Figure 10: IRDF adaptation in Hongdong.....	65

Tables

Table 1: Research questions and operationalization	8
Table 2: The four basic patterns of the knowledge spiral	31
Table 3: Numbers of organic and environmental friendly farms in Korea in 1996 and 2003	64
Table 4: The ten working principles of the Poolmoo High School.....	68
Table 5: Different organic farming methods taught and/or evaluated in the Poolmoo College and other Hongdong institutions.....	81
Table 6: Organic rice farming methods used by interview partners	88

Pictures

Picture 1: Interview situation	15
Picture 2: Hongdong countryside with the Poolmoo Coop building left of the vinyl house	46
Picture 3: The duck guides to the main building of the Mundangri Infovillage	50
Picture 4: IRDF field in Takahata, northern Japan.....	51
Picture 5: Duck hatchery in rural Bangladesh.....	59
Picture 6: IRDF field in Hongdong on July 17th 2007	61
Picture 7: Mr. Furuno explains details on Integrated Rice and Duck Farming to Poolmoo College teachers and students.....	83
Picture 8: Mr. Inaba's rice transplantation machine with a mechanism that spreads rice-bran pellets evenly.....	84
Picture 9: Biodiversity from WFRF made visible with the help of Korean and Japanese Symposium participants and Mr. Iwabuchi (with the hat) overlooking the result.....	85
Picture 10: Hideaways beside rice-bran fields above (the man on the left with the megaphone is Mr. Inaba) and WFRF below	86
Picture 11: Pictures of the duck releasing event in Mundangri, Hongdong.....	87

Abbreviations, Units and Currency

Abbreviations

ARNOA	Asian Research Network of Organic Agriculture
BDS	Bangladesh Development Society
BRRRI	Bangladesh Rice Research Institute
CDD	Community Driven Development
CoP	Community of Practice
FAO	Food and Agriculture Organization of the United Nations
FIVDB	Friends in Village Development Bangladesh
FTA	Free Trade Agreement
GAS	Golden Apple Snail
GDP	Gross Domestic Product
ICT	Information and Communication Technology
IDS	Informationsverbund Deutschweiz
IMF	International Monetary Fund
IRDF	Integrated Rice and Duck Farming
IRRI	International Rice Research Institute
ISOFAR	International Society of Organic Agriculture Research
JVC	Japan International Volunteer Centre
LETS	Local Exchange Trading Systems
NEBIS	Network of Libraries and Information Centers in Switzerland
NGO	Non Government Organization
NPO	Non Profit Organization
NVM	New Village Movement
OAM	Organic Alliance Malaysia
OECD	Organization for Economic Co-operation and Development
OISCA	Organization for Industrial, Spiritual and Cultural Advancement
OTA	Organic Trade Association
PETRRA	Poverty Elimination Through Rice Research Assistance
RIOA	Research Institute of Organic Agriculture
UN	United Nations
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USDA	United States Department of Agriculture
WEF	World Economic Forum
WFRF	Winter Flooded Rice Fields
WTO	World Trade Organization

Units and Currency

1 hectare (ha)	=	100 ares	=	10'000 square meters
1 Pyong	=	3.3 square meters		
Korean Won 1'000	=	US\$ 1.07	=	CHF 1.29 (August, 2007)

Abstract

This thesis deals with knowledge sharing and learning processes within the international network of Integrated Rice and Duck Farming (IRDF) and within the local institutional structure of Hongdong in South Korea. Within the institutional structures such as regulations and cultural characteristics that influence and are influenced by knowledge sharing and learning processes, a variety of communities of practice share knowledge inside and across knowledge boundaries. Different types of knowledge are developed and shared so that direct resource users can secure their livelihoods while using natural resources sustainably.

After IRDF was invented in the late 1980s by a Japanese farmer and scholar, Mr. Takao Furuno, the idea to systematically integrate ducks in rice paddy fields to control weed, pests and fertilization was shared and applied in South Korea and in many other areas of East, South East and South Asia. The basic principle of the method, putting ducklings into a rice paddy ten days after transplantation for one to two months, allows farmers to get rid of expensive agrochemicals that can be harmful to both nature and humans. IRDF not only enables more sustainable farming, but also catalyzes knowledge sharing and learning processes between people and groups from different parts of society: The prospect of ducks that help to produce organic rice without tiresome weeding work motivated many farmers to stay on their farm and motivated city people to establish their own organic farm, and it also attracts consumers from city areas who come to visit organic farms thus increasing the likelihood of dialogue between urban and rural folks. This way, a variety of communities of practice can be maintained or even extended that are co-present and form a heterogeneous cluster within the rural area where farming practice takes place.

The adaptation of IRDF in Hongdong clearly demonstrated that institutional structures on different geographical levels and their particular characteristics influence knowledge sharing and learning processes. Collaborations within the local network of overlaying communities of practice emphasize sound embedded social interaction, the sharing of different knowledge types, as well as the support of multimembers and knowledge brokers who interlink different parts of society as key persons. Despite those efforts that are crucial to knowledge sharing and learning processes, constraints persist to the sustainable long-term application of IRDF or other organic rice paddy farming methods. In this respect, cultural characteristics in Korea as well as the market situation for organic rice and for duck meat might cause limitations on the national level. The institutional setting at the bilateral Japanese-Korean level needs a deliberate negotiation between involved actors considering the troublesome past of the two nations' relation.

Acknowledgement

I am very grateful for everything I experienced while working on this thesis, and I would like to thank many who supported this process: I thank the people that are dear and near to me: Jeannette for sharing not only knowledge but love every day, my parents for supporting me with the needed material and human means, and my sisters for being curious about my deeds. I thank Song Kap-Keun¹ (송갑근) for the idea of studying Hongdong and the ducks and for inspiring me with regards to knowledge sharing theory. I thank him, Philipp Berger and Yves Bruggmann for their feedback. I thank Kim Herry (김혜리) for translations of Korean Web pages, and for introducing me to spoken and written Hanguk (한국어, the Korean language). For doing a great job editing my English text, I thank Naomi Steinberg. For supervision, support, feedback, and a cheering smile in difficult situations, I thank my mentor Claudia Zingerli. She and Prof. Dr. Ulrike Müller-Böker, I thank for critical feedback and for the opportunity to write this thesis in order to achieve a Master's Degree in the Department of Geography of the University of Zurich.

I thank the people in Hongdong for their time and interest. Most of all, I thank Mr. Hong Soon-Myeong (홍순명) and Mr. Chung Min-Jul (정민철) for organising my stay, and their devotion to organic agriculture and community development. I thank Mr. Kim Shi-Yong (김시용) for sharing horticulture knowledge and I thank him and Mr. Lee Donggeun (이동근) for sharing friendship and translation and organization of interviews. I thank “teacher Chang” for motivating busy interview partners to spend time with me. I thank Mr. Pack Wan (박완) for translations in Japanese, Korean and English and for his generosity. I thank all the teachers and students of the Poolmoo College² for their hospitality.

I thank Mr. Takao Furuno for his devotion to organic rice paddy farming, for giving me his book as a great and important gift, and for interviews. I thank all the people in Japan and in South Korea who were willing to share their time with a geography student.

¹ Korean names are usually written and spoken with the family name first, which is always one syllable, and the given name second, which is usually two syllables or sometimes one syllable.

² 풀무원 환경농업전문과정 in Korean. See the home page <http://www.poolmoo.net/>.

Preface

The seeds of this thesis were sown when I first heard stories about Hongdong and the ducks who helped so many farmers switching to organic rice paddy production. I heard these stories from my former Taekwondo (Korean martial art) teacher, who was born in Korea and is now living and voting in Switzerland with his family.

About twenty years ago, Mr. Song Kap-Keun looked after children in Hongdong's Kindergarten, which is related to the now famous Poolmoo Agricultural Technical High School³, located in the same village. He has maintained close personal ties with Mr. Hong Soon-Myeong, the former head of the High School and the mastermind behind the village's and schools' development. It was this relationship that made this study possible, bringing me together with Mr. Furuno, the duck method's engineer, and allowing me to rely on translators and interview partners.

In 1999, I completed a three year apprenticeship in biodynamic horticulture, specialising in mixed vegetable crops for small scale farming. It is possible that without my background in organic horticulture practice I would have ignored the duck method's success story or perhaps I would never even have been told the story. The research I did for this thesis allowed me to build on this practical background and merge it with what I learned while taking bachelor and master courses in human and economic geography at the Department of Geography of the University of Zurich.

In 1979, the authors of The Club of Rome's book "No Limits to Learning" stated that innovative learning, which anticipates potential catastrophes and allows the participation of those involved is a way of dealing with and creating knowledge that has the potential not only to avert unwanted and potentially catastrophic events, but even to create new alternatives or complements. If we learn by anticipating desirable events and work towards them, "... the future may enter our lives as a friend, not as a burglar" (Botkin, Elmandjra & Malitza 1979: 13). More than thirty years later, the same advocacy group state that efforts must go beyond the first Millennium Development Goal set by the United Nations, which is to reduce hunger and extreme poverty on a long-term basis. Such extended goals highlight the need for accessible knowledge and education services in addition to the development of networked research infrastructure. However, there is also a need for "simple to use" technologies that are understandable and accessible by those without a lot of "formal" education (The Club of Rome 2002: 8).

³ 풀무농업고등기술학교 in Korean. See the home page <http://www.poolmoo.or.kr/>.

In East Asia, an increasing number of people critically assess the developments occurring around them and anticipate desirable events such as sustainable natural resource use. The results of such considerations are simple to use technologies like Integrated Rice and Duck Farming, which have the potential to allocate natural *and* human resources more sustainably in the vast areas of the world where rice paddy is grown.

Dominik Rutz, Zurich, May 2008

1 Introduction

Knowledge empowers individuals with the choice to either use natural resources sustainably or to deplete them. This thesis uses the example of Integrated Rice and Duck Farming (IRDF) to shed light on how knowledge sharing and learning processes cross boundaries in order to enable sustainable natural resource use. These boundaries vary depending on the social and natural environment in which the knowledge is developed, shared and applied. Members of different groups or institutions engage in various forms of collaboration in order to share knowledge across boundaries, so that more sustainable usage of natural resources can be developed and applied.

It can be seen in many, if not most parts of the world, that collaborations that follow blue print planning-implementation approaches did not lead to viable and sustainable outcomes (Bouwen & Taillieu 2004: 137). The aim of this thesis is to contribute to the discussion about knowledge sharing and learning by describing emergent processes of adaptation and evaluation of Integrated Rice and Duck Farming (IRDF) and other organic rice paddy farming methods and analysing them based on theory and findings from other research. The processes that will be most closely examined are those which describe how the Poolmoo Schools and the community of Hongdong in South Korea evaluate and adapt environmentally sound rice paddy farming systems. The institutional structure in this region has been studied in depth using qualitative methods. In order to examine the potential of IRDF and other organic rice farming methods for other rice paddy farming areas, literature from the Food and Agriculture Organization of the United Nations (FAO) and other sources has been considered, especially reports on trials with this method in Bangladesh and the Philippines.

The reason to study how IRDF was shared across different nations in East, South East, and South Asia is its inherent potential for sustainable natural resource use: Farmers using IRDF can systematically use ducks to control weed, pests and fertilization by simultaneously grow rice and raise ducks on the same rice paddy. This way of rice paddy farming enables farmers to secure their livelihood through a better allocation of human resources than time and energy consuming weeding work, while at the same time rid them from expensive and environmental damaging herbicides, pesticides and chemical fertilizers. Furthermore, the method can provide additional income to people who raise and train ducklings for IRDF fields or for farmers who can sell duck meat.

The projected outcome of applying this method in different rice paddy farming areas of Asia, is a significant reduction not only of agrochemical usage but also a reduction in poverty. As can be seen on the map in figure 1, the areas in Asia (and other parts of the world) where rice paddy is grown (light violet = rice paddy dominant, violet = rice paddy not dominant) are the same areas where huge numbers of poor people live and where vast parts of the rural population depends on agriculture.

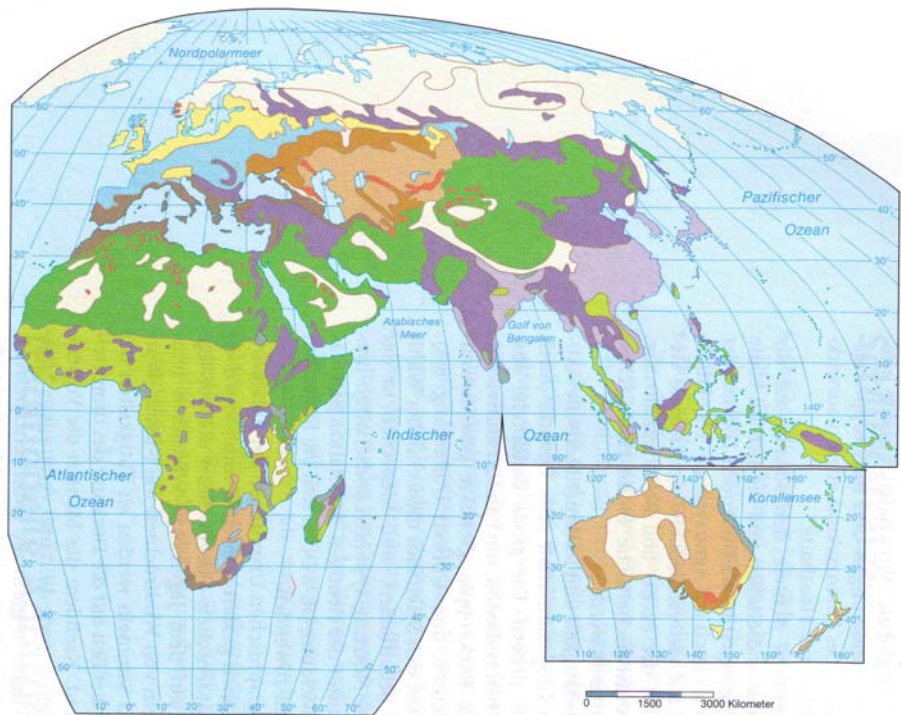


Figure 1: Agricultural systems (1995) (source: Knox & Marston 2001: 394)

In many of those areas, ducks have been raised for generations, and have often been herded either near or on paddy fields. According to the presently available English texts and statements of interview partners in South Korea and Japan, the first systematic integration of ducks for weed and pest control and for fertilization of rice paddy fields was invented in 1987 by Mr. Takao Furuno.

This innovation alone does not necessarily lead to the desired outcome of more sustainable natural resource use. The system's ecological impact has to be thoroughly scrutinized, and in this respect, examining how it is used by farmers in Hongdong in contrast to other organic rice farming methods, leads to valuable insights. As the sharing of this knowledge encourages more and more farmers to adapt it to the particular social and natural conditions of their region, IRDF empowers a growing number of practitioners to get rid of agrochemicals that are harmful to both nature and humanity. This has already happened in many regions through not only individuals but also larger groups of farmers, and for the first time on a large scale in the Hongdong community in South Korea. Examining the way knowledge sharing and learning processes are mutually influenced by institutional structures Hongdong is part of, allows insights into how we can further improve those processes in the field of sustainable natural resource use.

1.1 Starting Point

This thesis looks at how networks that connect members of various actor groups and institutions share knowledge and learn from each other. As these networks are part of the institutional structure, this thesis sheds particular light on how knowledge sharing and learning processes influence and are influenced by these structures. This view is applied to the network of organic farmers and other farming experts in Japan and South Korea, with a focus on the adaptation process of IRDF in Hongdong. Furthermore, this view is used to compare and evaluate the potential of IRDF and other organic farming methods which are used in Hongdong, as well as in other parts of South Korea and in Japan. Although the study area is limited to some regions within South Korea and Japan, insights of how those methods are applied there allows, to some extent, a projection to other rice paddy farming areas.

In order to examine these issues, I have derived analytical categories that are based on knowledge-related theories from the business and the farming world as well as on research findings in the realm of sustainable natural resource use.

1.1.1 Knowledge Sharing in Sustainable Natural Resource Use

In order to cope with uncertainty and change, individuals as well as groups need to accumulate experiences and change attitudes and behaviours (Pahl-Wostl et al. 2007: 3f). Through social learning processes such as interaction and deliberation, individual and group knowledge can be transformed into organizational or social knowledge, which is valuable for the organization or society as a whole. Knowledge is considered important in both the business environment (Drucker 1998: 5; Nonaka 1998: 22; Ravn 2004: 161) and the realm of development cooperation that engages with sustainable natural resource use (Geiser 2002: 158).

But the discussion goes further than just the notion that knowledge is important. In order to bring about sustainability in natural resource use, collaborations are required on and between multiple levels such as: public authorities, private business, scientific experts, groups of users and social interest groups, non-governmental organizations (NGOs) and representatives of stakeholders in the particular ecological domain (Bouwen & Taillieu 2004: 137). Various research disciplines contribute to the discussion on how players in multi-party collaborations can communicate fluently with each other. When it comes to the desired application of new (more sustainable) farming practices, the discussion involves relevant aspects such as: the distinction between modern/scientific knowledge and local/practical/indigenous knowledge (see, for example:

Agrawal 1995; Chambers 1983; Geiser 2002; Müller-Böker 1991), sharing of knowledge within and between farming settlements and how this sharing can be supported (Kistler & Messerli 2002: 247-252; Künzi, Wiesmann & Maina 2002: 226-234), the focus on livelihood (Künzi, Wiesmann & Maina 2002: 234; Hiremath & Raju 2002: 203-218), and finally what types of knowledge (Geiser 2002: 166f, 178) or gear (North, Bajracharya & Gupta 2002: 213-223) should be provided or supported. If such aspects are considered, collaborations in and between different groups of involved actors can share problem perspectives in order to co-construct a social learning process (Bouwen & Taillieu 2004: 137).

Today, development agents accept that efforts to share knowledge are important and contemporary research analyzes the extent to which those efforts really influence farmers' and other farming experts' activities. Those contributions call for a more basic understanding of knowledge-related processes and practices at the local level (Geiser 2002: 160) and this thesis answers that call.

1.1.2 Integrated Rice and Duck Farming

In a paper on integrated crop-animal systems issued by the International Rice Research Institute (IRRI), Sotheary (2005: 44) writes that farming systems allow sustainable natural resource use if they involve ecologically, biologically, and socioeconomically sound crops and animals, and that this can be achieved especially well through the integration of farm practices. Sotheary (2005: 44) concludes that "... with integrated rice-duck farming, ducks could serve as a biological control for rice pests, including weeds and snails. This would reduce if not eliminate the use of chemical pesticides, which harm both the environment and humans."

IRDF, as it is used in Hongdong, has its origin in Japan. Hongdong and the surrounding communities is the first region to prove that the method is adaptable to other areas by a large number of farmers. In Hongdong, where many different institutions and critical thinkers are co-present, it was useful to study IRDF's adaptation process as well as contrasting and evaluating it with respect to other organic rice paddy farming methods. The point is not to generalize the specific situation in Hongdong, but rather to use this adaptation and evaluation process to reflect on theories of knowledge. This then allows an assessment of the developments in this heterogeneous place, in order to improve not only organic farming techniques but much more the methods for sharing related knowledge.

IRDF begins to be particularly interesting when one's initial enthusiasm is met by more critical thinking. Despite the method's many benefits, it has some inherent limitations and problems, and when compared to other organic rice paddy farming systems, the method might be considered less organic, meaning that not all involved material cycles are closed. Nevertheless, IRDF has great potential to rid farmers of their dependency on expensive and harmful agrochemicals and chemical fertilizers, while at the same time allowing a secure means of gaining their livelihood. A further potential of this method is the one this thesis touches upon: As the sharing of the method transcends knowledge boundaries between various actor groups, IRDF represents an interesting and illuminative example of knowledge sharing in the realm of environmentally sound farming.

Luckily, Mr. Furuno travelled beyond his neighbouring country, South Korea. His idea that the IRDF method would enhance the livelihood of rice paddy farmers in South and Southeast Asia was eventually proven in northern, central and southern Vietnam, the Philippines, Malaysia, different areas in China, Malaysia, Bangladesh, India and others. There is not a single voice that denies that the method reduces human and financial resource inputs due to less weeding work and the elimination of expensive agrochemicals and chemical fertilizers. At the same time, it enhances farmers' income through the selling of duck meat or eggs, which allows farmers to intensify their production with only very little additional input. But there is even more to the method than just the material/financial part: In the Asian tiger state South Korea, with booming cities and relatively poor countryside, the ducks are one of many events that draw city people to rural areas like Hongdong. In this respect, the IRDF method not only enhances farmers' livelihoods, it also connects human actors of different groups; regionally between farmers in and around Hongdong, interregionally between country and city people, and also internationally, as farmers and other farming experts from Japan, Korea, Vietnam and many other countries come together and share their experiences, thus fostering peaceful relations between humans as well as between humanity and the earth.

1.2 Framework of Analytical Categories

In order to scrutinize knowledge processes in Hongdong as well as in national and international networks of IRDF and other organic rice paddy farming methods, I will use the following analytical categories as an operationalization based on theory and findings from other research. Those findings derive from both the business environment and the realm of knowledge sharing in sustainable natural resource use. The reason for merging findings from both realms is that

knowledge sharing and learning processes in a bigger firm or in a farming village are both influenced and influence the complex institutional structure they are part of. The categories are introduced below, and elaborated more thoroughly in the third chapter. I relate the categories differently to each of the three research questions in the next section.

Category 1) Adaptation in Knowledge Sharing and Participation in Knowledge Development:

Networks of organic farmers and other farming experts, as well as a village where knowledge sharing processes are studied, are part of an institutional structure. Within that structure, various groups of actors overlap, interact and carry out knowledge sharing and learning processes that are influenced and influence the structure (Pahl-Wostl et al. 2007: 7). Those groups have knowledge boundaries around them that both facilitate knowledge sharing within the group, but at the same time hinder knowledge sharing across the boundaries in multi-party collaborations. Those groups can be called communities of practice (CoPs). Membership in CoPs consists of mutuality of engagement, accountability to the enterprise and the negotiability of the repertoire (Wenger 1998: 57, 137), three characteristics that are not given in multi-party collaborations. If the knowledge boundary or gap between the collaborating actors is neither too wide nor too close, such collaborations can lead to sharing or developing new knowledge through creative friction, in other words to social learning. But this only happens if collaborating actors have a culture of mutual learning and thus not only focus on adoption but accepting adaptation as a strategy too (Geiser 2002: 178f). For actors who engage in multi-party collaborations that share and develop new, more sustainable knowledge, this means:

- a) The process of sharing and applying sustainable farming technique should not only consist of mere adoption but of adaptation to the natural and social environment where farming practice happens.
- b) In the process of developing and sharing sustainable technique, not only external actors but direct resource users too have to be able to participate in implementation and research.
- c) Sharing knowledge about the natural environment with farmers could motivate them to develop, share and apply more sustainable know-how or could promote a better understanding and acceptance of development intentions and legal regulations.

Category 2) Embedded Social Interaction and Socialization:

For knowledge sharing and social learning processes that cross knowledge boundaries, both problem solving and relational activities are to be carried out in order to share both tacit and explicit knowledge (Bouwen & Taillieu 2004: 142). Knowledge development and sharing processes that consider sound embedded social interaction enable involved actors to awake to

routines, skills and inside information that for years were taken for granted. Those aspects of tacit knowledge are important to share problem perspectives to develop adaptable and sustainable methods to use natural resources. Embedded social interaction consists of institutional regulations and authorities, power dynamics, ways of conceiving and relating to others, and of socialization processes (Ravn 2004: 164-169, Nonaka 1998: 28-45). In addition, sharing of institutional and strategic knowledge can enable involved actors to negotiate better within or influence the institutional setting around them, and thus to better sustain their livelihoods (Geiser 2002: 167).

a) Collaborations of members of different CoPs need to consider and establish sound embedded social interaction.

b) To secure livelihoods, knowing about power relations, state laws, market mechanisms, where to get which kind of support (institutional knowledge), and knowing how to influence the institutional structures and to access institutions (strategic knowledge) are important too.

Category 3) Livelihood Security and Adequate Allocation of Means:

Livelihood security is the crucial prerequisite to enable farmers to experiment with more sustainable farming technique. Therefore, sustainability in management of natural resources can only be brought about if knowledge sharing activities or other development interventions and institutional regulations focus on the livelihood of direct resource users (Hiremath & Raju 2002: 208, 212; North, Bajracharya & Gupta 2002: 223), or other involved actors. Collaborations in implementation and research need membership in multiple CoPs or knowledge brokering activities. Together with experiments with new farming methods, such deeds are time-consuming and expensive, and both need additional resources to be allocated for. For instance, supporting local capacities for knowledge sharing can be encouraged by supporting and assisting the installation and maintenance of communal social organizations such as self-help groups, co-operatives, and locally involved NGOs (Künzi, Wiesmann & Maina 2002: 233). Hence, allocating means adequately for knowledge sharing and learning processes can mean:

a) Supporting either technical improvements or state interventions that can provide livelihood security while ensuring sustainable usage of natural resources.

b) Supporting multimembership and knowledge brokering activities, or regular co-presence in knowledge platforms such as communal organisations.

1.3 Research Questions and Operationalization

With the study case of IRDF adaptation in Hongdong, three research questions will be discussed. Based on the aforementioned analytical categories, I operationalize the three questions as outlined in table 1. The first question deals with knowledge sharing and learning processes within the institutional structure on the local and regional level, of which various actors and institutions of Hongdong are part of. The second question deals with the bigger geographical scale of how knowledge is shared between Japan and South Korea, and differently within the two nations. The third question is another widening of the scale. It deals with the potential of IRDF and other organic rice paddy farming methods for knowledge sharing and learning processes and thus for the implementation and development of sustainable natural resource use. Although this question can only be answered with the help of the experiences in areas in South Korea and Japan, some basic characteristics of the different method can also be projected to other rice paddy farming areas too.

Table 1: Research questions and operationalization

Research Questions	Operationalization
<p>Question one: How is knowledge shared and developed within institutional structures in Hongdong?</p>	<p>Knowledge sharing and learning processes on local networks that aim for sustainable natural resource use consist of:</p> <ul style="list-style-type: none"> • A focus on adaptation rather than on adoption based on a culture of mutual learning. • Participation of Farmers in Implementation <i>and</i> Research. • A consideration of embedded social interactions and socialization. • Livelihood security enabled by a consideration of different knowledge types (sound technical knowledge, institutional/strategic knowledge, and knowledge about the environment) • An adequate allocation of means for knowledge sharing processes.
<p>Question two: How is knowledge shared and developed in organic rice cultivation networks in Japan and South Korea?</p>	<p>Knowledge sharing and learning processes in international and national networks that aim for sustainable natural resource use consist of:</p> <ul style="list-style-type: none"> • Embedded social interaction like cultural characteristics and interactions. • Livelihood security of involved actors • The way means are allocated
<p>Question three: What are the potentials for sustainable natural resource use within IRDF and other organic rice paddy farming methods?</p>	<p>The potential of a rice paddy farming method in terms of sustainable natural resource use depends on how it enables knowledge sharing and learning processes. This involves:</p> <ul style="list-style-type: none"> • The ease with which individuals can alter and adapt the method to local conditions. • Securing farmers' livelihoods through a sound allocation of human, financial, and natural resources.

1.4 Structure of the Thesis

Chapter 2 describes the methodology that was used to collect the empirical material. Chapter 3 provides insights based on theory and empirical findings from other scholars that define the above mentioned categories more precisely. In chapter 4, the study area of Hongdong and the study case of IRDF are introduced. The adaptation process of IRDF in Hongdong and South Korea and other related knowledge sharing and learning processes within and outside Hongdong are elaborated in chapter 5. This chapter will focus on the institutional structure that influences and is influenced by those processes, and closes with an evaluation of the different organic rice paddy farming methods that are shared within and outside Hongdong. The last, sixth chapter contains the summary, the discussion of the research questions, the conclusion and an outlook.

2 Methodology

This chapter describes the scientific approach of this thesis. First, a description about the phases of data collection is given. In order to show the possibilities and limitations of the data, sections 2.2 to 2.5 discuss the different empirical methods that were used to collect data, what topics were selected during the qualitative interviews, what interviewees were chosen, and how interviews were managed. The research I had done was basically explorative in a circulatory way: Before I set out to the field research, I screened theories on knowledge sharing that could be applied to the realm of sustainability natural resource use. The ones I used are based on empirical findings in different situations, and had some analogies that I kept in mind during the process of collecting my own data. After doing so, I had more ideas about what theories and what other research might be of use for my thesis. I integrated more theory that helped me to analyze my data, to discuss the important aspects of it, and to make visible the important aspects of my research concerning knowledge sharing and learning.

All the cited theories base on empirical findings and therefore are constructed by induction. The thorough comparison of these theories to my own findings shall allow a comprehension of what is going on in the study area and within the IRDF network, and an extension and evaluation of the theories.

2.1 Phases of Data Collection

The field research in South Korea and Japan was carried out between July and October 2007, and it is structured in three phases: Introduction, core phase and finishing phase. During these months, I was accommodated in the dormitory of the Poolmoo Ecological Agriculture Course (the Poolmoo College). This institution plays an important role in the community's development since it combines research activities on organic farming with education and village related work such as organising events with different institutions. Living there allowed insights into the students and teachers lives and schedules, and I became aware of college activities other than teaching and some of the many connections that the college fosters with people from all over South Korea and elsewhere.

In the first phase I became familiar with Hongdong, the various institutions, and the people that make the heterogeneity of this place. I not only met locals, but also Mr. Takao Furuno and a delegation of Japanese farmers and scholars who are interested in IRDF and community

development. They visited Hongdong for four days in order to attend the annual Japanese-Korean Symposium on Integrated Duck and Rice Farming in which I could participate. In this first phase, some broad information could be gathered in unstructured or spontaneous interviews and on observations during field walks and the symposium. No interview guideline was used, but some interviews were recorded and transcribed or field notes were made. Many statements as well as observations could be used for analysis as they were relevant to the discussion.

The insights I gained from these experiences allowed me to choose the focus and the sampling for the second, core phase. Qualitative interviews with farmers and other farming experts allowed in depth analysis of the core issues of this study. The sampling is described below, and the interview guideline can be found in the annex. Furthermore, I visited some selected areas in Japan on a study trip with teachers and students of the Poolmoo College. During those ten days, I gathered data by participative observations, field visits and spontaneous interviews. The stations were: a sister school which teaches organic rice farming (Ainou⁴ School, near Kyoto), an area which is famous for organic rice farming (Takahata, approx. 300 km north of Tokyo), a East Asian symposium on organic rice farming and marshland preservation (held between the 3rd and 6th of August 2007 in Utsunomia, approx. 100 km north of Tokyo, here always referred to as the Utsunomia Symposium) and finally Mr. Takao Furuno's farm near Fukuoka, on Kyushu Island in the South of Japan.

The final phase consisted of three interviews with the heads of the two Poolmoo Schools and with a farmer often referred to as a community leader who was the first to farm with the IRDF method in Hongdong. Since the schools were repeatedly said to play a central role in the development of the village and the adaptation of IRDF and other environmentally sound rice farming methods, these interviews relativize the findings in the second phase with the background of the schools activities and histories.

Here is an overview of the empirical methods used:

- ◆ Field research in South Korea (especially Hongdong) and Japan
 - Qualitative interviews
 - 14 semi-structured interviews with farmers and other farming experts (e.g. teachers, a professor, a government official)
 - 10 spontaneous interviews
 - Study trip to Japan with Poolmoo College students and teachers

⁴ Ainou means: "Loving Agriculture" and has nothing to do with and anthropological term.

- Participatory observations
- Field walks
- ◆ Literature review and document analysis

2.2 Data Collection Through Qualitative (Expert) Interviews

The findings in this thesis are built on qualitative research methods. Open and semi-structured interviews are the core of these methods. They are mostly committed to hermeneutic-comprehending processes of analysis (Reuber & Pfaffenbach 2005: 67). Decisions about which questions to ask, the sampling, procedures for administering the interview guideline, and tactics for dealing with respondents shape the process of data collection (Cloke et al. 2005: 38).

The data base for this research was acquired mostly through qualitative interviews with farmers and other farming experts in Hongdong and, to a smaller extent, in other regions in South Korea and Japan. There is no pre-existing scientific data in English on knowledge related characteristics, activities and worldviews in the field of IRDF and other organic rice paddy farming methods or how they are evaluated in Hongdong. However, some experiences with the adaptation of the duck method in other regions are used to describe (and to some extent evaluate) the spreading of the method in contexts other than that of Hongdong. In addition, some brief translations of Korean texts are loosely integrated into the analysis.

Qualitative interviews play an important role in research projects that are based on ethnography and participative observation. In these kinds of projects, interviews are used to collect experts' knowledge about the field of research, to collect and analyse the subjective perspective of observations or to ascertain the experts' biographies (Hopf 2000: 350). I will argue that for knowledge transfer, cultural aspects are crucial and that subjective perspectives and experts biographies are therefore meaningful and relevant to the discussion. Since these issues are highly individual, the interviews were only loosely structured. This allowed a flexible reaction while maintaining the focus on the issues that are relevant for this thesis. Therefore, this thesis does not claim to state objective findings. Rather, its description of an example should contribute to the comprehension of knowledge related issues that are intertwined with communications between various stakeholders and actors in the fields of organic rice cultivation and community development in East Asia.

2.2.1 Sampling

In the first phase of the research, the sampling was rather spontaneous. Apart from many field notes and short and spontaneous interviews with Japanese symposium participants (including Mr. Furuno), I could also conduct some longer interviews, namely with an agronomic professor in a South Korean university, with a government official at the county level, and with teachers of the Poolmoo college.

The interviewees were sampled with more focus during the second, core phase of the research. In order to get in-depth information on the adaptation of the duck farming technique, I asked the Poolmoo teachers to recommend six farmers to interview. One of the suggested persons was already on my list for interviews for the final phase, so I replaced him with one other farmer that I knew of. Those six farmers from the Hongdong municipality consisted of two women and four men. One woman farmer was a college graduate and sustained her livelihood alone. The others were all members of families whose livelihoods mostly depended on farming. Two of them were teaching and/or writing about their experiences in farming journals or their own publications. The other three were engaged in leading positions in one of two big farming cooperatives in Hongdong. These persons could be called farming experts because they could speak as representatives of larger groups. When asking experts, the interest of analysis is not their whole persons but [also] on what they explicitly utter about the group they are representing with their expertise (Flick 2005: 139). As all interview partners could not only refer to their individual situation, but also to the groups they represent, I call all the interviews that I structured with guidelines expert interviews.

Although this sampling was mostly not compiled by myself, it did meet my criteria as to what was adequate for the research topic. I wanted to interview people who had experienced the adaptation of IRDF to their own fields and the fields of other people in their neighbourhood or local groups such as cooperatives. However, as turned out later during the analysis of the data, all interview partners were members of one network. Although this part of the local society has many in- and outside connections, and is also responsible for most of the knowledge related activities, it is more or less separated from another part of the local society, for reasons to be discussed further down.

Since I could stay at the Poolmoo College during my research, I could readily access teachers, and conducted several interviews with them. The Poolmoo College fosters good connections to

other institutions and people of Hongdong, which allowed me to count on those relations for my sampling. Teachers helped me to arrange interviews with busy people who, were it not for the tremendous respect and gratitude afforded to these teachers, would otherwise never have come.

With two of the interview partners, a second interview was carried out in the final phase of data collection. One of them is Mr. Hong, who led the Poolmoo Highschool for more than twenty years. During that time, the first tests with IRDF were carried out on fields of this school. With his help, the story of how IRDF was adapted in Hongdong could be traced back to the very beginning. The other interview in the final phase was with Mr. Chong, the head of the research and organization of the Poolmoo College. Together with data from observations and interviews in both South Korea and Japan, insights from this interview allowed a thorough comparison of the organic rice paddy farming methods that are used and experimented with in Hongdong.

2.2.2 Interview Guideline

For the semi-structured interviews with the six farmers the central phase of the research, I developed an interview guideline (it is attached in the annex). For all the other interviews, individual guidelines were prepared. The guideline is fundamental since it focuses on the expertise of the interviewee, as well as on the desired topics for the research (Flick 2005: 139f).

The operationalization during interviews proved to be difficult. For questions about how a farmer usually connects to knowledge sources or how she or he is improving their own techniques, I would usually not receive much in the way of usable answers. However, that did not force me to change the interview guideline, but rather I changed the weighing of the questions.

The guideline consists of three parts: The first part of the interview is related to the livelihood of the interviewee, about their and other family members' income and the farm size. In the second part, I would ask for the technique history. For this I used a timeline (compare complementary methods in chapter 2.3), on which the interviewee could pin the start of farming work and the introduction of new techniques. With the help of this overview I then asked where and how interview partners learned new knowledge and how they value these knowledge sources.

The interviews with experts in the last third of my study consisted of questions about the duck method, but also about other environmentally sound methods and how these experts evaluate them. I would also ask why those methods are that successful in Hongdong and talk about

possible reasons why they are not in other areas. In this respect, the roles of the schools, of other institutions, and of key persons were discussed.

2.2.3 Interview Accomplishment

I was flexible in my ordering of the questions. Sometimes, questions were added to gain a deeper insight in the subjective worldview of the interviewee, sometimes questions were eliminated because they had already been answered. However, the interview guideline was followed for the six farm experts interviewed, which allowed for a comparison⁵ (Flick 2005: 144).

For six of the twelve interviews, a Korean-English translator was needed. Since the College fosters good relationships to other institutions and village people, I could easily find two translators who were not involved with institutional politics and thus would not alter the content in their favour. All the translated interviews progressed well and I could use the time that was needed for translations to impart between the guideline and the interview process.



Since I myself could learn a lot about organic farming

Picture 1: Interview situation (Dominik Rutz, 2007)

practice, I asked detailed questions about technical and institutional issues. Questions could even be formulated as a yes or no question, but provoked extended reactions that were very close to the issue at hand that relativized and evaluated what I had asked.

2.3 Complementary Methods

Complementary to the interview guideline, other methods were used for a triangulation. “Triangulation refers to the diversification of perspectives in order to offset the biases that may result from looking at an issue from a limited viewpoint” (Freudenberger 1999: 20). Timelines

⁵ I compare the statements of those six interviewees in table 6 in chapter 5.4.3.

and diagrams, both tools of Participatory Rural Appraisal (PRA) (Ruggeri Laderchi 2001: 7), helped to validate topics discussed in interviews. In addition to interviews that were conducted inside, far away from the plants and fields as well as being far away from the meetings and teachings we were discussing, I could carry out some observations in “the field”. Field walks and participatory observations could be used to triangulate the research methods. To transcend impressions from field visits and participatory observations to textual data, I followed the approach outlined by Bernard (1994: 136-164, 180-207): I reviewed jottings and diagrams that were taken hastily during these occasions on the same evenings. Either, they jogged my memory so that I was capable of tracing back my impressions or what people said during the day, or they served as basis for more questions that I could ask on another occasion.

2.3.1 Timelines and Diagrams

As I already mentioned, questions about how and to whom the experts would communicate about farming techniques often did not lead to useful answers. But as I asked for their technique histories first, I could pin such questions on what interviewees had just told me about their practice. Therefore, I followed the approach that interviewees would tell me their farm’s “technique histories” that was pinpointed to exact years with the help of a simple timeline (a sample is attached in the annex). In addition, the space beside the timelines could be used to draw easy diagrams in order to quantify relevant aspects. In contrast to a questionnaire where information is only appropriated by an outsider, timelines and diagrams as visual sharing allows all participants to actively crosscheck, verify, and amend information that is discussed (Chambers 1994: 1256). This way, everyday knowledge that interview partners may conceive as banal and not worth of mentioning can become relevant (Freudenberger 1999: 21).

2.3.2 Field Walks and Participatory Observations

To gain deeper insight into the farming techniques that are used in Hongdong, I accompanied the head of research of the Poolmoo College on field walks. We visited both the fields of the College and those of farmers who are members of a joint research team. In Japan, the farmers we met and the symposium staff organized many field visits for us, during which all participants, including me as well as students and teachers from the Poolmoo College, could ask many questions, and take pictures and notes. Furthermore, we were able to feel with our own hands the soft soil that is a result of either the constant paddling of the ducks feet, or of activities of many different species that live on a paddy field with rich biodiversity. During many such occasions, knowledge was shared, and participants, including me, became more familiar with relevant topics as well as with

the people. That process of becoming an insider is inherent in participatory observations, and enables being welcomed or at least being granted doing bizarre things like conducting interviews, taking photos or notes and the like during all different sorts of events and meetings (Bernard 1994: 137, 141).

In addition to these visits with the plants and animals such as ducks and snails, I could participate in many meetings during the two symposia I attended, and gained insights through spontaneous interviews and participatory observations and took many field notes. During some events, it was difficult to find a translator. However, as participant fieldwork can be used to talk to people about sensitive topics and also to become aware of what topics are sensitive (Bernard 1994: 137, 141) these topics proved viable insights into cultural aspects of knowledge sharing and learning. Such spontaneous interviews were not formalized and often resulted in vivid discussions between participators in either Korean or Japanese out of which only excerpts were translated to me. On one other occasion, a pop music video on TV on a jet ferry trip from Japan to South Korea was the starting point for a thorough discussion about cultural differences between the two nations. I could experience in many situations of participative observation that such insights helped me to understand the meaning of what is being observed or discussed. This allows a researcher to speak with confidence about the meaning of the data and to make strong statements about cultural characteristics (Bernard 1994: 141).

2.4 Data Analysis

Through transcription, interviews become texts that can be interpreted (Flick 2005: 54). During the transcription process, I shortened the statements slightly and underlined some core statements with additional information. Of course this is a serious reduction of the infinite primary and secondary data, but as Kowall & O'Connell (2004: 440, cited in: Reuber & Pfaffenbach 2005: 153) state, transcriptions are always selective constructions. I used the software ATLAS.ti to supply every relevant quotation with codes. For a theory driven analysis, I based these on the theory and research findings I will outline below. After I arranged the coded quotations in a matrix, it was obvious that I could not use the whole diversity of data. As I wrote this thesis, I considered relevant passages in the matrix whenever it was needed to exemplify and explain the issues. The aim of this procedure was to better understand what was uttered as subjective mentioned meaning (dependent on Weber 1980: 1, cited in: Reuber & Pfaffenbach 2005: 175). This way, conclusions could be made that emanate from the individual perspectives and experiences of interviewees.

The texts that are derived from interviews represent a multi-faceted reality as they are interpretations of the different realities of interview partners. Those realities consist of subjective perception and evaluation of chosen facts. Therefore, facts carry an interpretative horizon (Schütz 1971: 5, cited in: Flick 2005: 57). As they are validated by how interviews selected them, those facts are viable starting points to understand knowledge sharing and learning processes. Furthermore, through their valuation and comparison, facts that were uttered by interviewees gain relevance for this research, and they allow us to comprehend the scrutinized situations and stories.

2.5 Literature Review and Document Analysis

Literature review includes the selection of available documents (both published and unpublished) and the effective evaluation of these documents in relation to the research topic. This selection is written from a particular standpoint to fulfil certain aims or express views on the nature of the topic and how it is to be investigated (Hart 1998: 13). Apart from literature concerning the meta-level of knowledge sharing in sustainable natural resource use, I reviewed and analysed literature and documents from scientists and development agents who studied IRDF and its dissemination.

Since I could not find literature on the particular subject of Integrated Rice and Duck Farming in library networks accessible through my university (NEBIS and IDS), I turned to the internet. First, I learned from many Google search results that either scientific or common texts exist that deal with IRDF. Some of the search results guided to the homepages of the Food and Agriculture Organization of the United Nations (FAO), of the International Rice Research Institute (IRRI) and its associated Poverty Elimination Through Rice Research Assistance (PETRRA) in Bangladesh. I particularly, but thoroughly, searched these homepages for hints or entire works about IRDF. Many of the search results, hints, statements and works on IRDF allowed me to investigate if and how it came to a region and how it was shared there. In addition to what I found through online searches, I learned from Professor Sohn Sang Mok from the Research Institute of Organic Agriculture, Dankook University in Cheonan, South Korea, that he and his colleges published several contributions that critically deal with the method. What can be concluded by only a brief glance at the body of writing about IRDF, the discussion about it is already in progress.

3 Knowledge Sharing and Learning Processes

This chapter elaborates the meta-level of knowledge sharing and learning processes. To develop my arguments, I introduce theories of the business environment and relate them to the context of knowledge sharing in sustainable natural resource use. Section 3.1 contains the basic definitions on which I base my arguments that are outlined in sections 3.2 to 3.4. Out of those arguments I derive analytical categories in section 3.5.

3.1 Basic Definitions

3.1.1 Knowledge and Information

“I know” is an expression we hear many times in day to day conversations. That expression can signify a wide range of things from being slightly familiar to a well-grounded understanding of something or someone. Having knowledge means something much more precise. It means something a person has experienced. Given the many different definitions about knowledge in literature, it is somehow an impossible task to pin down the term. The almost excessive use of the word leads to the conclusion that knowledge is important.

I suggest to always look at the definition of knowledge in contrast with another term: information. With the separation of knowledge from information, other more subtle contrasts and sometimes confusing nuances can be relegated to the background. The following definitions will be used throughout the thesis:

Knowledge, unlike information, is always personal. Merriam-Webster Online dictionary defines knowledge as:

2a (1): the fact or condition of knowing something with familiarity gained through experience or association (2): acquaintance with or understanding of a science, art, or technique **b** (1): the fact or condition of being aware of something (2): the range of one's information or understanding <answered to the best of my knowledge> **c**: the circumstance or condition of apprehending truth or fact through reasoning (Merriam-Webster 2007).

Information (here only referred to as an object and not as performance), on the other hand, is something that can be stored and handled by non-human entities such as computers, books or chromosomes but it has, as the following definition shows, something to do with knowledge:

2a (1): knowledge obtained from investigation, study, or instruction (2): intelligence, news (3): facts, data **b**: the attribute inherent in and communicated by one of two or more alternative sequences or arrangements of something (as nucleotides in DNA or binary digits in a computer program) that produce specific effects **c** (1): a signal or character (as in a communication system or computer) representing data (2): something (as a message, experimental data, or a picture) which justifies change in a construct (as a plan or theory) that represents physical or mental experience or another construct **d**: a quantitative measure of the content of information (Merriam-Webster 2007).

How the two terms, knowledge and information, are related can be seen in the way the two are shared between persons: As individuals or groups interact with each other, gaps or knowledge boundaries between the different actors have to be overcome. Those gaps have to be within a certain enabling distance that allows rectifying them meaningfully (Wenger 1998: 138-140). The definition of information shows that knowledge that is explicitly expressed and leaves the knower as a raw form of data (2c (2)) can be obtained by a learner as information (2a (1)). First, this learner has only a notion of the issue but knows where to get the information if it is needed, for example from a teacher, a co-worker or a book. Later, what has been newly learned will be incorporated into his or her body of knowledge only if it is relevant for the person's practice. Therefore, new information becomes part of one's knowledge-base only when it is understood and brought into context with the already known in a meaningful way.

This is how Ravn's (2004: 163) definition of *knowledge as practice* can be understood. One person will only integrate new information (that can be a representation of one other person's experience) into their personal knowledge, if it has any meaning for her or his practice. Given the above mentioned definition from Merriam-Webster, knowledge always has to do with a person's ongoing practice, i.e. with knowing, understanding, being aware, and apprehending. Hence, I define *knowledge as personal practice*.

Knowledge that we can express through language is called *explicit knowledge* (Wittgenstein 1958: 78, cited in: Ravn 2004: 165) and has always a tacit dimension. *Tacit knowledge* is that part of our knowledge which we are not able to talk about, "we can know more than we can tell" (Polanyi 1983: 4, cited in: Ravn 2004: 165). It is important to keep in mind that explicit knowledge is never freed from the tacit; all knowledge has an explicit as well as a tacit dimension⁶ (Wenger 1998: 67, Ravn 2004: 165). This is why knowledge is always bound to persons; it is personal. Therefore, knowledge is spatial in the sense that humans, as knowledge

⁶ I understand the distinction between tacit and explicit knowledge as analogous to practical and discursive consciousness, respectively, as formulated by Giddens (1995: 91-95, 335f). However, I will not use those terms in my thesis.

bearers, are situated in only one place at any given time.

3.1.2 Knowledge Processes and Activities

Knowledge processes and activities can be referred to with terms such as ‘knowledge transfer’ (Bouwen & Taillieu 2004: 146f; Ravn 2004: 163; Roux et al. 2006), the ‘development and creation of knowledge’ (mostly through cooperation of actors of different disciplines) (Bouwen & Taillieu 2004: 147, Wenger 1998), ‘knowledge management’ (Drucker 1998: 5; Geiser 2002: 169f) or ‘knowledge adoption and adaptation into practice’ (Geiser 2002: 178). Those terms are used in various ways, and thus needed to be clarified before being used throughout this thesis.

Knowledge transfer or knowledge sharing: The concept of knowledge transfer is criticized for it holds on to the knowledge-as-substance metaphor, that “... considers knowledge as some substance or content, a thing that can be transferred from one container or mind to another container or mind” (Bouwen & Taillieu 2004: 146f). Ravn (2004: 163) sees knowledge that is being transferred is always redesigned in order to put it to use in some other sector of society, and rejects the notion that knowledge transfer can be conceived of as a linear one-way process. All involved groups or individuals have to actively involve into this two-way knowledge transfer. Hence, it has a process character of interdependent sharing (Ravn 2004: 163f). Out of similar considerations, Roux et al. (2006: 1) propose to move from unidirectional knowledge transfer to knowledge interfacing and sharing. If knowledge is defined as personal practice, the receiver always has to adjust the transferred knowledge to fit his or her practice. The sender is therefore required to somehow attune their knowledge transfer methodology and content in favour of the receiver’s personal practice, i.e. of the receiver’s knowledge. To summarize, a knowledge-related process can be called ‘knowledge transfer’ or ‘knowledge sharing’ if mutual learning happens during the process. This is why I use the term knowledge sharing synonymously to knowledge transfer throughout this thesis.

Knowledge development and creation: New knowledge is constantly developed or created by knowledge sharing processes, during which actors of different parts of society interact (Bouwen & Taillieu 2004: 147). Usually, the responsibility for developing and creating new knowledge is assigned to research institutes only. But as I will show in the findings of my research, these processes do also occur elsewhere and at best in multi-party collaborations or by activities of members of multiple communities of practice (CoPs, they are defined below).

Knowledge management: As organizations shift from command-and-control to information-based companies that are structured into various fields of professional specialization, more and more specialists that actively manage knowledge between those fields are needed on the management level (Drucker 1998: 5). In farming practice, enterprises are carried out on a lot smaller scale, on the level of individual farming households. Thus, the situation in which a person holds all the relevant strings in one hand in order to actively manage knowledge is usually uncommon. However, farmers often operate in highly complex institutional structures and difficult natural environments and can thus indeed be called to “manage” their knowledge in order to secure their livelihoods. Furthermore, development agents can intervene in knowledge management practices of many different actors like: farmers, other resource users, agricultural extension staff, researchers, and others (Geiser 2002: 169).

Adoption and Adaptation of Knowledge: Earlier research on knowledge and natural resource use often focused on the diffusion of technologies by development agents, technologies that are to be adopted by target groups. Those studies have given way to a more recent perspective that focuses on the “target group”. This perspective understands adaptation of knowledge as an active and purposive process of integrating new elements into peoples’ livelihood concerns (Geiser 2002: 168, quotes in original). Farmers and other farming experts should move their focus from the strategy of adoption, that hinders interaction as it pursues to replace indigenous practices with new ones, to the strategy of adaptation, that respects indigenous practices in which external knowledge systems can be integrated (Geiser 2002: 178; Herweg & Yohannes 2002: 181).

3.2 Sharing Knowledge and Problem Perspectives Within and Across Knowledge Boundaries

The only thing that is certain about the future is that it brings uncertainty and change. To live in a world of change, individuals and groups have to learn new methodologies, new skills, new attitudes, and new values. This includes far more than a simple exchange of mere information but of knowledge sharing and learning processes in which knowledge and the ability to act upon what is newly learned are continuously questioned, applied, and reassessed (Pahl-Wostl et al. 2007: 3). Such processes of sharing problem perspectives are possible in collaborations within and between communities of practice (CoPs) (Bouwen & Taillieu 2004: 137). This section discusses how knowledge sharing and learning processes cause knowledge boundaries between CoPs that are part of the institutional structure and what attitude for sharing problem perspective in collaborations across such boundaries is needed.

3.2.1 Communities of Practice are Part of the Institutional Structure

Wenger (2000, cited in: Pahl-Wostl et al. 2007: 6f) emphasizes learning as participation in groups of people, in a shared domain of human endeavour. Such learning processes influence and are influenced by the institutional setting. In these processes, members of different communities of practice (CoPs) connect in flexible networks and collaborations ranging from formal legal structures and contracts to informal, voluntary agreements (Pahl-Wostl et al. 2007: 1, 3, 6f).

The concept of communities of practice as institutions of participatory learning highlights the social meaning of any individual's practice. This means that typing a scientific paper or thesis alone in a university office is a particularly social event. It is, as if colleagues were there, looking over our shoulder as it were, representing our sense of being accountable to the professional standards of the CoP one is a member of (Wenger 1998: 57). A CoP is defined as a regime of competence. Competence means membership in a community of practice, which includes: a) mutuality of engagement with its members, b) accountability to the enterprise, i.e. to have the same aim as other members, and to take responsibility to achieve it, and c) the negotiability of the repertoire, i.e. the ability to make use of the repertoire of the practice in order to engage with it (Wenger 1998: 137).

Wenger (1998: 118) sees communities of practice as essentially informal for their life is basically produced by its members through their mutual engagement which evolves organically and tends to escape formal descriptions and control. Their boundaries and peripheries are not congruent with the structures of institutional affiliations, divisions, and boundaries. Neither are they independent from those structures, nor are they reducible to them. Networks of communities of practice structure something that Wenger calls a landscape of practice that is defined and constantly redefined by the knowledge sharing and learning processes within and between different CoPs. As such, CoPs influence the institutional structure, but at the same time they are influenced by them and are thus part of the duality of structures outlined by Giddens (1995: 67-81).

The distinction between information and knowledge becomes clear if we look at Wenger's (1998: 136) use of the phrase "competence". Competence is not a mechanical possessing and processing of certain pieces of information, nor is it the performance of certain actions or the mastery of certain skills in the abstract. It means membership in a community of practice. In such a regime of competence, knowing can be recognized as competent participation in the

practice, which includes not only the emergence of the already known, but also the knowing of something entirely new (Wenger 1998: 137). Any experience or competence can become knowledge – or ignorance – by simply varying the regime of competence. For example, to ask someone which way to turn in order to keep balanced on a bicycle is to change the regime of competence – away from practice towards teaching (Wenger 1998: 139f).

Therefore, knowledge as personal practice is negotiated in regimes of competence and is, as such, the actual source of boundaries which maintains outsiders on the outside and insiders on the inside. Close relationships between participants, their detailed and complex understanding of their enterprise, their practice or their repertoire (of words and stories) which outsiders may not share, are relevant in this respect (Wenger 1998: 113). Social as well as spatial distance cause knowledge boundaries, and knowledge boundaries can cause social distance. Since knowledge causes such boundaries, knowledge sharing is a matter of crossing them and of collaborating with and learning from the members of other communities of practice. As to be described in the following section that deals with collaborations of members of different CoPs, those collaborations include tension that either impair or allow knowledge sharing and learning.

3.2.2 Collaborations of Members of Different Communities of Practice

Members of different communities of practice can interact in multi-party collaborations which engage in developing and sharing sustainable farming practices in the context of (inter-)national development cooperation. In such collaborations, actors of different thinking cultures such as practitioners/farmers, NGO field staff, extension workers or scholars share knowledge with each other. In order to understand the knowledge sharing and learning processes in such collaborations, we need to look at two things properly: *First*, we need to understand that the actors involved usually work in different fields of practice, i.e. in private and professional areas which are specialized to negotiate meaning within a specific cultural/natural environment and within a certain scope of practice (local, regional, national, or global). These areas can be public or private institutions that may have certain limitations and mechanisms of governance (Bouwen & Taillieu 2004: 143), i.e. they have knowledge boundaries around them. *Second*, it is important to think about the ways these fields can share knowledge across the boundaries of their particular speciality.

As I defined above, new knowledge can be gained through gathering information and integrate it into one's practice, or in Lorenz' word (2001, cited in: Ibert 2007: 109), through its

recontextualization into local practices. Another way of widening one's knowledge can occur during meetings of two or more persons. Impulses from outside the ongoing stream of routines disrupt given certainties and are, according to Ibert (2007: 111), the only reason for learning. Those tensions between individuals' experiences and competences of altered regimes have to be understood as processes of creative friction that can occur if members of different CoPs interact.

What distinguishes the group as a whole from a sole individual is that the individual, unlike the group, has experience. The group, on the other hand, is a regime of competence. In order to allow creative friction between the individual's experience and the competence of the group, there has to be a gap or a knowledge boundary caused by spatial and cultural distance. Learning is impaired if this distance is either too close or too distant. If the distance is within a certain enabling bandwidth, experience and competence can "pull" each other along, particularly if the gap between them can be meaningfully rectified: Competence can pull experience if a new member aligns her or his experience with the competence of the group (e.g. a new employee). Experience can pull competence if some members make a new experience and try to adjust the group's enterprise so that the competence shifts (Wenger 1998: 138-140).

3.2.3 Mutual Learning in Multi-Party Collaboration

In the realm of sustainable natural resource use, the institutional structure that consists of various groups of actors on different levels causes a variety of knowledge boundaries. For instance, on the community level, clan structures and traditional authorities can prolong knowledge boundaries that impair cooperation between clans and fluid knowledge sharing processes between innovative farmers and the rest of the population. Knowledge boundaries are also caused by poor information flow between local to the regional or national level. Therefore, development interventions often neglect farmers' realities and miss existing opportunities (Kistler & Messerli 2002: 248-252).

However, external views are perceived to be essential for developing knowledge that leads to sustainable practices in natural resource use (Kistler & Messerli 2002: 249, 251). Integrating an external view can either be done by farmers, or by external actors if farmers can participate in processes of knowledge sharing and development (Künzi, Wiesmann & Maina 2002: 227-229, 234). The knowledge boundary between farmers and external actors can cause creative friction, but if the gap is too wide, i.e. the boundary too rigid, learning can be impaired too.

In the context of crossing knowledge boundaries between external actors and locals, it is vital to look at the dichotomy between modern/scientific knowledge and local/practical/indigenous knowledge. Geiser (2002: 164) states, that this dichotomy eventually does not hold sway, because “modern” knowledge that is often influenced by the “North” is not applicable in many local contexts of the “South”. Today, in the discussion of this dichotomy, it is generally accepted that different (groups of) people can have different knowledge regarding natural resources (Geiser 2002: 164, brackets and quotes in original). This statement shows that learning can be impaired if the gap between “specialists” of the “North” and the practice in the “South” is too wide. It demands readiness for **mutual learning** of all involved actors (Geiser 2002: 179, emphasis in original). Farmers’ perspective determines knowledge development and application but also external views are important to achieve long-term sustainability in natural resource use. Therefore, collaborations in which external actors as well as farmers participate should enable the sharing of problem perspectives (Bouwen & Taillieu 2004: 144). Consequently, every member of involved CoPs that engage in multi-party collaborations in the realm of sustainable natural resource use should learn from the others too.

The next section discusses how sharing problem perspectives can either be possible if external actors learn from farmers or vice-versa, if farmers learn from external actors.

3.2.4 Sharing Problem Perspectives in Sustainable Natural Resource Use

External actors have to understand, inter alia, that individual farming practice are complex and diversified crop and livestock combinations that offer possibilities to effectively balance uncertainties and thus secure livelihoods (Chambers 1991, cited in: Künzi, Wiesmann & Maina 2002: 226). In order to sustain livelihoods while using natural resources sustainably, technical knowledge that either existed some decades ago, that are still carried out by direct resource users, or new farming practices and systems can be relevant. Technical knowledge has to be adaptable to the natural environment as well as to the social environment, because practices have to be conform to the institutional structure, i.e. they have to be “politically correct” (Geiser 2002: 166f).

Farmers manage different types of knowledge to secure their livelihoods (Geiser 2002: 169). They are only able or willing to integrate new technical knowledge into the body of knowledge, if it is in line with pre-existing practices and attitudes. In order to make technical knowledge that secures livelihood while enabling sustainable natural resource use adaptable by farmers, two

ways of how problem perspectives can be shared are possible: One is to integrate farmer's views in the knowledge development process. The other is that farmers integrate external views into their knowledge sharing and application activities.

Farmer strategies and perceptions for the development of suitable and applicable knowledge can be integrated in the field of implementation if external actors not only focus on adoption but accept adaptation as a strategy too (Geiser 2002: 178). So far, knowledge development processes that integrate farmers' views have only occurred in the field of implementation but not yet in the field of research, because research agendas are controlled exclusively by scientific institutions (Künzi, Wiesmann & Maina 2002: 234). This means that a close collaboration between farmers and external actors during different stages of developing and sharing knowledge would be needed in order that knowledge allows both secure livelihoods and sustainable natural resource use at the same time.

However, it is not the development and sharing of better adaptable knowledge but much more the farmer's world views that determines the application of more sustainable natural resource use. Künzi, Wiesmann & Maina (2002: 232-234) base the fundamental statement that the generation and diffusion of technologies converge with the respective motivations and intentions of farmers on theories of social actions and psychology. Those theories lead to the conclusion that know-how that does not match personal motivations and intentions is of no interest to practitioners. In other words, knowledge that actually matches personal motivations is prioritized. Only the known social and economic environment is what is perceived as directly connected to the household's social and economic situation. Other knowledge, which would provide insights into the ecological situation, is generally lacking in the authors' study region in Kenya. Therefore, the authors suggest that knowledge about the environmental situation should be provided. This would motivate involved actors to develop more sustainable know-how or promote a better understanding and acceptance of development intentions and legal regulations (Künzi, Wiesmann & Maina 2002: 232-234). External views such as knowledge about the broader environment could enable farmers to have insights into the ecological situation, and would thus motivate them to develop, share and implement more sustainable farming practices.

Collaborations of members of different CoPs cause creative friction in order to develop what it takes to deal with change: new knowledge. In such collaborations, a profound process of mutual learning is only possible if sound embedded social interaction that includes tacit knowledge sharing is assured.

3.3 Embedded Social Interaction and Tacit Knowledge Sharing

Any person's knowledge is questioned through interaction with another person, especially if the vis-à-vis is a member of a different CoP. But the competence of this other CoP should not be too far away from one's own experience. Tacit knowledge such as routines, skills and inside information that for years were taken for granted can be unfamiliar to an apprentice, or a newcomer. As the knowledge changes the person and the practice during the knowledge sharing process, it changes the regime of competence. This boundary encounter is always one of exchanging explicit and tacit knowledge at the same time: Even the most verbal practice will have tacit aspects that are revealed as soon as another person from another setting utters a demand (Wenger 1998: 140).

Bouwen & Taillieu (2004: 144) state that in multi-party collaborations, different actors acknowledge and work with their interdependencies among multiple ways of knowing and forms of expertise. They thus move away from expert top-down planning-implementation strategies to a joint involvement. The authors highlight that relational practices, in other words embedded social interactions, are crucial to social learning as they allow for a sharing of problem perspectives. This section elaborates on the important aspects of embedded social interaction. It builds on theories that were developed for larger organizations and their knowledge gateways to research institutes or to other knowledge sources and relates those theories to the context of sustainable natural resource use.

3.3.1 Knowledge Chains

People communicate and collaborate in order to let knowledge cross boundaries between various communities of practice. Ravn (2004: 164) sees communication and collaborations between members of different CoPs in a temporary team as knowledge chains, a concept that is similar to multi-party collaborations. It is a social organization, a social arena and a dynamic process with a diverse group of professionals trying to work together. Processes within the knowledge chain always have to transcend the knowledge boundary between particular disciplines, for instance between researcher and practitioner, or two practitioners of different regions, and so on. These groups represent thinking cultures or knowledge systems (i.e. CoPs) with distinctive traits, which makes knowledge sharing in knowledge chains a complicated but urgent matter.

In figure 2, actors in knowledge chain processes are designated as puzzle jigsaw pieces. The dotted vertical lines represent knowledge boundaries between communities of practice. Those subsystem boundaries enable or facilitate knowledge sharing within a CoP but they restrain cross-system sharing of knowledge (Ravn 2004: 166f). The horizontal line represents an intra-personal boundary which is subdividing every person's knowledge into two parts: the under part as tacit knowledge which we are not able to express, and the upper part as "the top of the iceberg", the part of our knowledge which we are able to express and discuss. Interactions between actors can occur above this line in the form of explicit knowledge sharing, drawn as black arrows. The grey arrows between actors represent embedded social interaction. It consists of many different aspects of interpersonal communication such as culturally defined behaviour, sympathy, underlying interests, power dynamics, and so forth. These aspects are crucial for personal relationships that, according to Ravn (2004: 167), are fundamental for successful knowledge sharing and learning processes.

Ravn (2004: 169) outlines the following three aspects⁷ of crossing knowledge boundaries within knowledge chain processes. I completed figure 2 with equivalent numbers from one to three in ovals.

1. In order to share knowledge, we have to make tacit knowledge explicit. As discussed above, boundary encounters act as creative friction that actually initiate this process.
2. In multi-party collaborations, we have to overcome the disciplinary boundaries between different CoPs through sharing of explicit knowledge.

⁷ He originally had four fields, but I merged the last two, since both are part of embedded social interactions.

3. Embedded in every knowledge sharing and (mutual) learning process is social interaction like:
 - power dynamics inherently built into any organizational process,
 - and ways of conceiving of and relating to the people with whom we are to collaborate (preconceptions, friendly or unfriendly attitude, charisma, etc.).

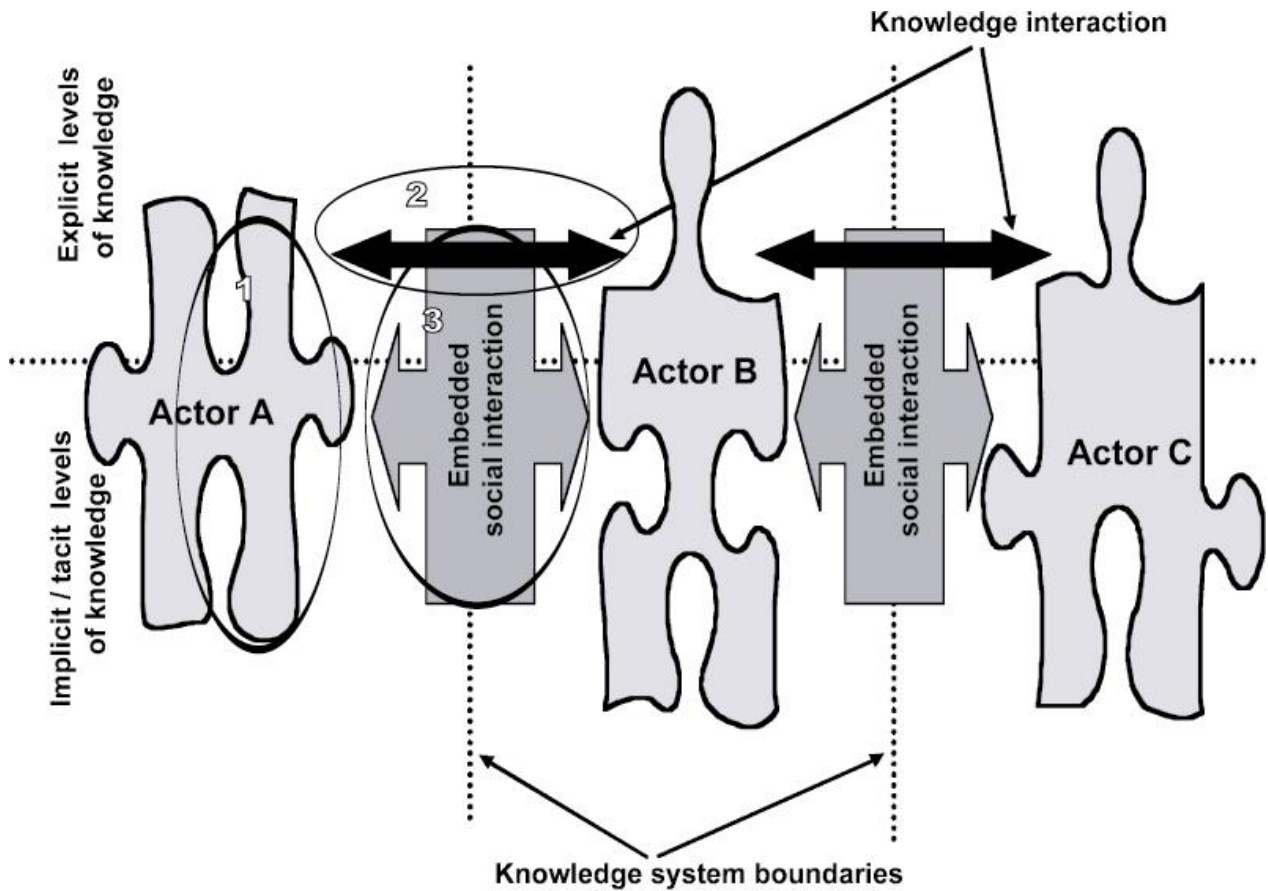


Figure 2: The interdisciplinary knowledge chain (based on Ravn 2004: 168).

(Note that this chain can be extended with more actors and two-way arrows between Actor A and Actor C etc.)

The above mentioned clan structures and traditional authorities (compare section 3.2.3) are an example of power dynamics that decisively influence knowledge sharing and learning processes within a farming village. But embedded social interaction does not only consist of institutional structures, but also of socialization processes. The next section discusses how socialization is not only important to share knowledge better, but much more in processes of knowledge development and creation.

3.3.2 Socialization

Nonaka (1998) highlights four basic patterns how knowledge can be altered between and within the tacit and the explicit dimensions as a motor for knowledge development processes. Brought to a sequence, they form a knowledge spiral as depicted in figure 3. The four patterns are explained in table 2 by using the definitions from above:

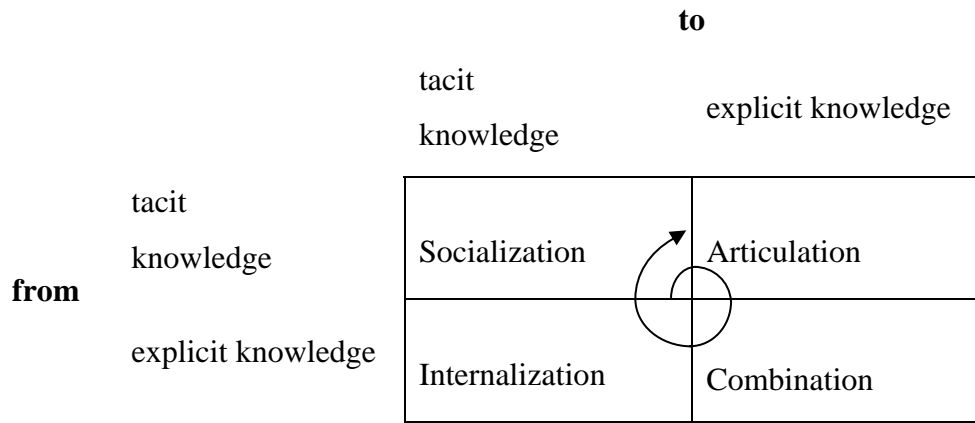


Figure 3: Knowledge spiral (based on Nonaka 1998: 30)

The pivotal piece of Nonaka’s findings is that new knowledge can be gained if members of a CoP apprentice themselves to external experts. He exemplifies this through an example whereby a product manager for baking machines learns for several months how to bake good bread from a renowned baker. The relation between this product manager and the baker is one of apprentice and master, a socialization process that allows the sharing of tacit secret and skills. After these months, the newly learned can be articulated to team members in the ancestral company. The point critical to the high quality of the bread was the way the dough is pulled. The innovation that follows is a baking machine that pulls the dough the right way the master baker showed it to the product manager, a technique that can be shared throughout the organization where it can be embodied in new products (combination). By adopting and combining the new, it can be internalized by other employees. “... [T]hey use it to broaden, extend, and reframe their own tacit knowledge. (...) Other employees use the innovation and eventually come to take it for granted as part of the background of tools and resources necessary to do their jobs” (Nonaka 1998: 29).

Table 2: The four basic patterns of the knowledge spiral (Nonaka 1998: 28-30).

From tacit to tacit knowledge (socialization):	As a starting point for the gaining of new knowledge, a person has to learn tacit secrets from an expert on the desired knowledge or practice. This process of becoming an insider can be called <i>socialization</i> .
From tacit to explicit knowledge (articulation):	This person then translates the tacit knowledge into explicit knowledge in order to explicitly share it with members of the same or a different CoP. This process can be called <i>articulation</i> .
From explicit to explicit knowledge (combination):	The multy-party collaboration or CoP then standardizes this knowledge through <i>combination</i> , i.e. putting it together in a manual or workbook and embodying it in a product of farming technique.
From explicit to tacit knowledge (internalization):	Through the experience of creating a new product or farming technique, the person and team members enrich their own tacit knowledge base through <i>internalization</i> of the newly learned.

Interestingly, Nonaka shows that the vertical flow of knowledge from tacit to explicit is not just a one-way event. As both processes of articulation and internalization cross the horizontal knowledge boundary, the first field of Ravn's knowledge chain contains a two-way vertical arrow. Nonaka (1998: 30) points out that these two processes that cross the horizontal boundary are the critical steps of a successful knowledge sharing that involves the creation of new knowledge. As discussed in section 3.2.2, such processes can be initiated if tension between members of different CoPs cause creative friction.

The idea that tacit knowledge can be shared by socialization is a vital one and is connected to the importance of embedded social interaction. Sharing of knowledge below the horizontal line presupposes a close relationship, or at least a close collaboration between the knowledge sender and receiver. An example for such a relationship is if an apprentice works together with a master and learns tacit secrets and skills (Nonaka 1998: 29). Through this process the apprentice extends her or his tacit knowledge. When compared with Ravn's knowledge chain, this means embedded social interaction not only includes power dynamics and ways of conceiving of and relating to others. Sound embedded social interaction is basis for personal networks that enable the sharing of both explicit *and* tacit knowledge, and of initiating two-way crossing of the horizontal intra-personal knowledge boundary. However, an individual can face many obstacles to develop such networks, especially if the institutional structure prohibits such relations by power dynamics. But the power of pivotal social roles within this structure can also be used to positively influence knowledge sharing and learning processes.

3.3.3 Pivotal Social Roles and Institutions

Nonaka (1998: 39f) touches on the problem of applying knowledge at different nodes in institutional structures. Like other authors cited above, he underlines the importance of interacting and translating new knowledge into an individual's situation: In the case of a larger firm, employees at different nodes are deluged with specific information and they find it difficult to turn information into useful knowledge. Frontline employees have to find a way to navigate between two extremes. They have to develop meaningful ideas and insights and actively interpret new knowledge to fit their own situation and perspective, while at the same time, they should not get caught up in their own narrow perspective but keep in mind the broader context. These extremes are gaps between individuals' experience and the competence of the group that can function as an obstruction that impairs creative friction or learning. This can be overcome if employees are continuously challenged to re-examine what they take for granted, i.e. their tacit

knowledge. On higher levels of hierarchy, conceptual frameworks are created in order to bundle what comes out of the creative friction. These frameworks can consist of metaphors, symbols, concepts or visions that orient the knowledge-creating activities of the employees. After being created, they are given to the middle level of management. A middle manager would then develop ideas and strategies that embody the top company's vision (Nonaka 1998: 41f). Because teams share the same context and enterprise as communities of practice, middle managers as the team leaders act as the key turning point in a knowledge-creating company. They synthesize the tacit knowledge of both frontline employees and senior executives (top management), make it explicit, and incorporate it into new technologies and products. Therefore, middle managers are, according to Nonaka (1998: 45), "...the true *knowledge engineers* of the knowledge-creating company" (emphasis in original).

The three nodes or social roles or institutions in an intra-firm collaboration – top management, middle management, frontline employee – can be roughly transferred into an institutional structure of a farming village. Although within such a structure, other terms for pivotal social roles are used, it is important to keep in mind that they are part of the social interaction embedded in knowledge sharing and learning processes. The point in comparing the business world and the realm of sustainable natural resource use is not to take a business hierarchy as a role model for a farming village. But since social roles like traditional authorities or other crucial institutions have a decisive influence on knowledge sharing and learning processes, they have to be considered as embedded social interaction that are part of every knowledge sharing and learning process. For multi-party collaborations in sustainable natural resource use, this means two things: First, external as well as locally involved actors that engage in such collaborations need to consider embedded social interaction within the institutional structure where knowledge sharing and learning processes are carried out. Second, such collaborations should not only focus on sharing technical knowledge, but also on knowledge that empowers direct resource users and other locally involved actors to negotiate better within or influence the institutional structure they are part of. These kinds of knowledge are discussed in the following section.

3.3.4 Institutional and Strategic Knowledge

Apart from those roles that influence the way knowledge is dealt with on the community level, the role of every single farmer that manages different types of knowledge to sustain the household's livelihood is important too. The determinants for knowledge development, sharing and application of all involved actors are not knowledge about new farming techniques and crops

but knowledge about the market situation, the scales of production, and capital inputs. Within the local network of different CoPs (direct resource users as well as authorities on the community level that influence knowledge sharing and learning processes), there is usually enough suitable technical knowledge (Künzi, Wiesmann & Maina 2002: 231f). But farmers only secure their livelihoods more sustainably if institutional/strategic knowledge is shared in addition to mere technical knowledge.

The known social and economic environment or institutional structure is the crucial factor when it comes to livelihood security of farmers. In the context of a farming village, the institutional context in which learning and innovation occurs involves access and non-access to knowledge; it either facilitates or impairs knowledge application (Geiser 2002: 167). Farmers should know a lot about the institutional context in which they practice their (technical) knowledge. Knowledge about power relations, state laws, market mechanisms, where to get which kind of support can be called *institutional knowledge*, and would enable farmers and other involved actors to be conscious about embedded social interaction and the institutional structure they have to negotiate. Farmers or other involved actors could even learn *strategic knowledge* that enables them not only to deal with but to influence the institutional structures and to access institutions. To improve livelihoods, a combination of institutional and strategic knowledge might be of much more relevance than better technical knowledge (Geiser 2002: 167, emphasis added).

Farmers will be able to secure their household's livelihood while using natural resources sustainably, if in addition to technical knowledge, institutional/strategic knowledge, as well as knowledge about the environment (see section 3.2.4) is shared and managed by farmers too. In multi-party collaborations that include not only the sharing but *development* of those different knowledge types, embedded social interaction needs to be considered thoroughly. But there is one other issue that is crucial to these collaborations: It is the livelihood of all involved actors and the means that can be allocated for knowledge sharing and learning processes.

3.4 Securing Livelihoods and Allocating Means Adequately

Poorer farmers are usually less innovative because the economic situation of their household is a critical factor; it is a matter of life and death. Their reluctance has two reasons: First, they are much more concerned about livelihood security than profit maximization (Hiremath & Raju 2002: 208). Second, they lack additional capital and labour as well as sufficient space to invest in new farming techniques or in the trial of new crops (Künzi, Wiesmann & Maina 2002: 227). Farmers are not the only ones that have to consider livelihood security before they share and apply new knowledge. As I will show in this section, every practice that deals with knowledge sharing beyond the CoP one is a member of needs additional means to be allocated for.

3.4.1 Adaptations and Interventions to Secure Livelihoods

If farmers' activities do not suffice to enable food security, there is basically no way how they can apply or experiment with new, more sustainable farming technique. This section shows two ways how food security can be brought about: One is to provide and support technical knowledge that is easy to learn and adapt, the other is to launch and support interventions on a bigger geographical level that ensure food security.

Hiremath and Raju (2002: 212) elaborate on the issue to which extent new technical knowledge, i.e. new farming methods, differ from the ones already used. Interestingly, their research findings show that simply fine-tuning existing traditional farming practices is enough to achieve sustainable natural resource use and that there is no need for drastic changes in farming systems (Hiremath and Raju 2002: 212). Simple techniques like proper seed selection, seed treatment, sowing practices, proper timing, and a method of fertilizer application are enough to increase the productivity by the 20-25% that is needed to lift the large majority of poor farmers above the threshold of food security. After that, they will be in the situation to experiment with the mainstream technologies (Hiremath and Raju 2002: 212). Thus, new techniques are much more viable for farmers to change rapidly to more sustainable natural resource usage if they do not differ much from pre-existing practices and are thus easily adaptable.

Apart from providing technical knowledge, livelihood security of farming households can be supported by institutional regulations like price-reductions for seeds: In this context, there was a striking example in Andhra Pradesh, southern India, where the state government announced a

“Rd. 2.00⁸ per kilo of rice” scheme. This price reduction on staple food grains is an indirect subsidy that assured the families’ food security and led to the collapse of [unsustainable] sorghum production in favour of cash crops. “Such assurance from the government is all that was needed for farmers to be willing to experiment with other cash crops” (Hiremath & Raju 2002: 208).

Another state regulation in India and Nepal that secured farmers’ livelihoods while enabling sustainable natural resource use was a low cost and low input technology treadle pump. This regulation focussed on supporting mass-scale distribution, which eventually led to stopping the overuse of local water resources and could, at the same time, establish viable livelihood systems at the local level (North, Bajracharya & Gupta 2002: 223).

These are two examples of how means on a bigger geographic scale were allocated to insure farmers’ livelihoods. Both regulatory interventions are changes in the institutional structure and influenced knowledge sharing and learning processes by assuring secure livelihoods and at the same time more sustainable usage of natural resources. I will show with the case of IRDF adaptation in Hongdong, state regulations can also mean the opposite: ensuring livelihoods of a part of the local farmers by supporting conventional practices at the expense of organic farming.

Once livelihoods are secured, involved actors on different levels might still not be able to engage in knowledge sharing and learning processes. The next section shows why any crossing of knowledge boundaries needs extra means to be allocated for.

3.4.2 Resources to Cross Boundaries

Wenger (1998: 103-110) describes two particular ways human resources can be allocated in order to facilitate and support knowledge sharing processes:

- **Multimembership** and our experience of it have the potential to connect several communities of practice together. Such a nexus of connected CoPs allows a constant reassessment of knowledge that crosses boundaries. Persons who are fluent in different professional and/or scientific disciplines, or who work in different jobs and institutions can be called multimembers.
- **Knowledge brokers** are people who can provide connections by introducing elements of one practice into another. The quality of brokering lies in opening new possibilities for meaning and in not staying at the boundary as a mere “export-import” channel. Rather, one becomes a

⁸ 2 Indian Rupee equals around 0.05 US \$.

practitioner who moves towards the core of practice in each community. Multimembers can be knowledge brokers if they are able to carefully manage membership and nonmembership at the same time, i.e. to maintain enough distance to bring a different perspective and also to maintain enough legitimacy to be listened to.

But multimembership seems to be something which can only be fostered by those who are financially comfortable, and it needs time to engage in other than farming practice. For instance, only wealthier farmers who engage in off-farm work can use connections established through such work to share knowledge (Künzi, Wiesmann & Maina 2002: 228). Different income sources not only enable diversified and thus more secure livelihoods, they are also important knowledge links within an institutional structure that are viable for creative friction. The concepts of multimembers and knowledge brokers are introduced because the diversified practice of such persons must be seen in relation to members that engage in just one community of practice. This perspective shows that stretching the practice of a person more globally (engagement in multiple CoPs) entails a series of trade-offs at the local level. “In these trade-offs, one kind of complexity replaces another, one kind of limitation is overcome at the **cost** of introducing another” (Wenger 1998: 132; emphasis added). Those limitations of a person’s practice are one possible reason for above mentioned limitations of governance in public institutions (compare section 3.2.2). For instance, a government official can know a lot about measurements of soil conditions, but he or she might not know how difficult it is to secure a livelihood only by practice farming within a certain social and natural environment.

Such trade-offs are really financial means, as for successful knowledge sharing and learning that includes embedded social interaction and socialization, i.e. the exchange of explicit *and* tacit knowledge, co-presence is an important pre-requisite (Howells 2002; Morgan 2004, cited in: Ibert 2007: 107). Regular face-to-face contacts are (still) of priceless worth, as they not only are the best situation for knowledge sharing, but they further facilitate the growth of trustful human relations (Ibert 2007: 107). Furthermore, co-presence on a regular basis is meaningful for it forms clusters or centres that are needed to generate and disseminate discourses, collective beliefs and stories. Centres enable social and cultural interaction, they “... act as places of sociability, of gathering information, establishing coalitions, monitoring and maintaining trust, and developing rules of behaviour” (Amin & Thrift 1996: 13). Living or working in or near such a centre means reducing costs and gaining trust (Ibert 2007: 107).

Spatial or cultural distances are knowledge boundaries, and crossing them needs regular co-

presence in order to gain trust, sound embedded social interaction and socialization. Institutional structures that influence knowledge sharing and learning processes thus are not freed from the spatial dimension. In order to support those processes, means can either be provided for regular co-presence, or for multimembership and knowledge brokering activities, or for both.

One way of allocating means for regular co-presence in knowledge platforms is to support local capacities for knowledge sharing within a village.

3.4.3 Supporting Local Capacities for Knowledge Sharing

New knowledge is constantly generated and diffused among rural populations, a process which takes place both within local society and through adoption and adaptation of knowledge originating from external actors (Kistler & Messerli 2002: 251).

Nowadays, it seems common sense that a mere knowledge input from an outside source is not the right way to change a given situation. Because farming households can be economically self-sufficient or can live off their own sales, they can form small communities of practice with only little connections to the rest of the rural population. Interventions that try to establish such connections focus on supporting communal organization as catalysts for local knowledge sharing and learning processes. Effective knowledge sharing and application can be encouraged with particular attention to the specific features and processes of local knowledge management. Künzi, Wiesmann & Maina (2002: 227-230) highlight the importance of such communal organizations as local capacities for knowledge sharing because of what they encountered in the Upper Ewaso Ng'iro River Region in Kenya. Since many peasants from other regions of the country immigrated to the area only recently, local social organizations are sparse. However, they play a particularly important role in knowledge sharing and learning processes, especially for the poorer households, and for women. Self-help groups and cooperatives that are supported by external actors such as churches are key multipliers and mediators of knowledge sharing and learning processes at the intra-community level (Künzi, Wiesmann & Maina 2002: 227-230).

Thus, one way of catalyzing local capacities for knowledge sharing and learning processes is to provide means for supporting and assisting the installation and maintenance of communal social organizations such as self-help groups, co-operatives, and locally involved NGOs (Künzi, Wiesmann & Maina 2002: 233).

3.5 Summary: Analytical Categories

This section summarizes the theories and research findings that described the relevant aspects of knowledge sharing and learning processes within different institutional structures and in the realm of sustainable natural resource use. Three categories are derived as an operationalization that enables a thorough study of the empirical material in the next two chapters. These categories were already introduced and related to the research questions in the first chapter.

Category 1) Adaptation in Knowledge Sharing and Participation in Knowledge Development:

Networks of various communities of practice (CoPs) are part of the institutional structure that influences and is influenced by knowledge sharing and learning processes. Collaborations within a CoP differ decisively from those between CoPs. Mutuality of engagement, accountability to the enterprise and the negotiability of the repertoire are not a given in multi-party collaborations. However, the knowledge boundaries between different CoPs are chances for learning as they can cause creative friction that disrupt the ongoing stream of routines. Thus, external views are often needed to develop and share knowledge for sustainable natural resource use, but they are only viable if involved actors are ready to learn mutually from members of all the involved CoPs. For actors who engage in multi-party collaborations that share and develop new, more sustainable knowledge, this means:

- a) The process of sharing and applying sustainable farming technique should not only consist of mere adoption but of adaptation to the natural and social environment where farming practice happens.
- b) In the process of developing and sharing sustainable technique, not only external actors but direct resource users too have to be able to participate in implementation and research.
- c) Sharing knowledge about the natural environment with farmers could motivate them to develop, share and apply more sustainable know-how or could promote a better understanding and acceptance of development intentions and legal regulations.

Category 2) Embedded Social Interaction and Socialization:

If knowledge is shared across knowledge boundaries, not only explicit but also tacit knowledge should be shared. Routines, skills and inside information that for years were taken for granted can be unfamiliar to an outsider and might be relevant for developing and sharing knowledge too. In order to enable knowledge sharing and learning processes that include the crossing of the inter-personal and the intra-personal knowledge boundaries, sound embedded social interaction

is a crucial matter. The institutional structures that decisively influence those interactions by power dynamics can either hamper or facilitate knowledge sharing and learning processes. In such processes, external actors, communal authorities, and direct resource users need to consider embedded social interactions and different types of knowledge in addition to mere sharing of technical knowledge:

c) Collaborations of members of different CoPs need to consider and establish sound embedded social interaction.

d) To secure livelihoods, knowing about power relations, state laws, market mechanisms, where to get which kind of support (institutional knowledge), and knowing how to influence the institutional structures and to access institutions (strategic knowledge) are important too.

Category 3) Livelihood Security and Adequate Allocation of Means:

Livelihood security is the crucial prerequisite to enable farmers to experiment with more sustainable farming technique, but also other actors to engage in knowledge sharing and learning processes. However, livelihood security does not guarantee that actors involve in such processes, because this involvement causes trade-offs at the local level. Hence, allocating means adequately for knowledge sharing and learning processes can mean:

c) Supporting either technical improvements or state interventions that can provide livelihood security while ensuring sustainable usage of natural resources.

d) Supporting multimembership and knowledge brokering activities, or regular co-presence in knowledge platforms such as communal organisations.

4 Case Study Introduction

This chapter begins with a description of the study area and the many co-present institutions in Hongdong. Institutions that were founded by private or government initiatives like schools, cooperatives and others are all intertwined and play their distinctive roles. This gives a picture of the social and natural environment of the Hongdong area and the Poolmoo Schools. In section 4.2, I introduce the basics of the Integrated Rice and Duck Farming (IRDF) method. This description includes the limitations of the method and how those can be reduced by sound combinations. Furthermore, I describe where (so far) farmers apply IRDF. How IRDF and other knowledge is dealt with Hongdong and the Poolmoo Schools, as well as within networks on national and international levels will be discussed of the following, fifth chapter.

4.1 Study Area Introduction: Hongdong Area

Most often, the discussion on developments concerning knowledge transfer in the field of sustainable natural resource use is only referred to in localities in the geographic South that are conceived of as “to be developed” areas. It is generally assumed that people there would *not* turn to more sustainable practices without some outside support. This thesis looks at a success case in a northern society that has only recently achieved some economic wealth. Many people of the Republic of Korea⁹ (South Korea) still remember the old times, in the 1960’s, when there was not enough rice to feed everyone. Just after that, there was a rapid increase of productivity in the second and third economy sectors and also a dynamic, albeit governmentally implemented, change in rural life brought about by the famous “New Village Movement”¹⁰ (NVM) (World Bank Homepage 2007). Improvements in infrastructure and green revolution improvements were spread to the countryside, which led to food security (and even to rice overproduction since the early 70’s), and also to the widespread use of agrochemicals and fertilizers as well as new rice varieties with increased yield. Through the lens of sustainable natural resource use, farming areas in South Korea (and also most areas in other “developed” nations of the North) can be looked at as spaces that have to be developed: developed to be more sustainable. In the case of Hongdong, this not only means the implementation of organic farming but also re-evaluation of the farming life in rural Korea.

⁹대한민국, Daehan Minguk, in Korean. This means "The Great Nation of the Korean People".

¹⁰ 새마을 운동, Saemaul Woondong, in Korean. This government implemented strategy to develop rural areas by supporting community activities and communities’ human resources is still getting attention. In the World Bank, this issue was discussed at the beginning of November 2007, in relation to “improving community driven development (CDD)” strategies (World Bank Homepage 2007).

Since the activities to develop this rural centre towards what it is today began when the country was just recovering from times of occupation and war, this can serve as an exemplary inspiration for other areas with a similar starting point. However, some differences to other areas like the lack of basic education, and different economical situations have to be taken into account.

4.1.1 The Geographical Setting of the Community

Hongdong-Myon (myon = Municipality) is one of many farming villages in Hongseong-Gun (gun = County) in the Province of Chungcheongnamdo, Republic of Korea (South Korea). Hongdong is indicated by an arrow on the map on figure 4. Hongseong area makes up part of the main farming areas of the west and the south of the country and is said to be famous for good rice quality. Nowadays, South Korea is included in the industrialized nations, leaving behind the



Figure 4: The Korean peninsula (Source: <http://www.globalsecurity.org> 2008. longitude and latitude distance 2°)

sorrowful times of Japanese occupation from 1910-1945 and the Korean War in 1950-1953 (Encarta 2002). In the 1970's and 80's, economy developed rapidly. In those decades, different military juntas yielded power and implemented a nationwide green revolution in order to achieve food self sufficiency (World Bank Homepage 2007). In the years from 1966 to 1974, rice yields were not sufficient to meet the growing population's demand, and up to several megatons of rice were imported yearly (Kim 1978: 168). After having just achieved food autarchy, the central government launched the NVW. The idea was to develop the rural areas that were lagging in comparison to the rapid economic growth in the cities, thus raising rural people's income and their buying power. This programme was launched during one of the six consecutive five-year plans that the government launched from 1961 to 1991. At the beginning of these plans, the per capita income was around 100 Dollars and rocketed up to 11'000 Dollars in 1996, when South Korea became member of the Organization for Economic Co-operation and Development (OECD Homepage 2008). Korea was one of more than one hundred countries that gained independence after World War II, but one of the few that achieved such rapid growth and could then achieve membership in the OECD (World Bank Homepage 2007). Thanks to the NVM, the absolute poverty of almost any part of the population could be overcome; however, relative poverty is still an issue. In 1970, about 50% of the labour force worked in the agricultural sector, which had a share of 27% of the gross domestic product (GDP) (Suh 2002). It is quite a different picture from 2005, when only 6.4% of the work force worked in this sector (Bureau of East Asian and Pacific Affairs 2007), which accounted for 3.41% of the GDP (World Bank Data Query 2007). As economic opportunities are rare in rural South Korea, many people leave for the cities where apartment houses mushroom, and where now more than four-fifths of the total population lives (United Nations 2006). But some people also migrate in the opposite direction. They call themselves "refarmer".

4.1.2 From the City to the Countryside: Accompanying a Refarmer

In this environment that changes with ambivalent dynamics, some people think of strategies for revaluing life in the countryside. Many people I met and interviewed in Hongdong talked about their resentment of city life and their work in big companies. People felt some nostalgia and wished to settle down and do the work most Koreans did not so long ago, before the economic boom: farming. They group in affinity clubs¹¹ or NGOs to talk about the issues, or to catalyze

¹¹ One of the groups that visit Hongdong area on regular basis is people who study and discuss the works of Ivan Illich at regular meetings. He was a scholar of theology and philosophy who was born and studied in Europe, wrote several critical books about western society, and who lectured Latin America. Such meetings take place in different cities all over South Korea and some people came to know about Hongdong through this network.

concrete programmes with educational aspects, such as the “Refarmer School”¹² NGO.

To zoom in on the local level, I now reconstruct the path of one of the four people I interviewed who decided to “come back to the farm”, or in short, to reform. This agile middle aged man reversed the rural-urban migration. He left the city with his family, where he worked in a big company and where, because of the crude competition there, “... you have to get higher in hierarchy or you will be fired” (Expert interview, August 23rd 2007, Hongdong). He knew of two NGOs that issue publications and offer teaching programmes to do with farming and re-farming issues. The “Right Farming”¹³ and the “Refarmer School” NGOs are both present in some cities. He attended a course at the refarmer NGO and was one of the first to complete the programme. Some of the teachers of the Poolmoo Schools and other Hongdong village organizations were guest lecturers. Through this connection, he heard about Hongdong and eventually decided to settle there in 1997. After renting accommodation for four years, he could, in 2001, buy land for housing and farming at a relatively cheap price when compared to the actual price¹⁴.

Life in rural areas is not all that idyllic, and farming goods are getting cheaper around the world as a result of bi- and multilateral free trade agreements (FTA) which open markets for agricultural commodities produced on large scales, under heavily subsidized conditions. Such issues are discussed during the refarmer school programme or during interregional meetings like the annual Korea-Japanese IRDF Symposium. Despite these conditions, he and many others I interviewed decided to start or carry on farming, for they understand the reason for being a farmer is not an economic but a humanistic one. This refarmer is one of a thousand members of the Poolmoo Cooperative (Poolmoo Coop)¹⁵ that was founded in the 1980’s as a spin-off of the Poolmoo High Schools cooperative. It grew over the years and currently distributes organic farming products from the 800 producers to about 200 consumer members and to other consumer cooperatives in the cities. He can sell about 90% of his harvest to this Coop, and the remaining 10% he sells directly to family and friends. He improves his professional knowledge in different ways: The Poolmoo Coop has different teaching sessions each year and he also learns from government organizations that visit farms. Further, he looks at other peoples’ farms and crops, and when he sometimes meets neighbour farmers, he seizes the opportunity and tries to talk to them. He farms 1.48 ha of rice paddy and 1.36 ha of other crops.

¹²귀농학교. See the home page on <http://www.refarm.org/>.

¹³정농회, Jeongnonghwe.

¹⁴ He said prices rose from 15’000 Won (16.05 US\$) per Pyong (1 Pyong equals 3.3 square meters) in 1997 to 50’000 Won (53.50 US\$) per Pyong in 2007. One reason for the rising land prices is the movement of the province’s capital from a bigger city far away, to Hongseong, which is just 5 km distant.

¹⁵ 풀무생활협동조합 in Korean. See the home page <http://www.pulmu.or.kr/>.

This refarmer shares similar conditions with other interview partners in Hongdong. This brings us to the farming conditions in Hongdong.

4.1.3 Farming in Hongdong

In 2004, out of a total of 1,24 million households, 738 thousand owned less than one hectare, 279 thousand between 1-2 ha, and 223 thousand 2 ha and over (total average farm size 1.53 ha). In average, two fifth of the land is rented (Ministry of Agriculture & Forestry 2006: 50; Kang 2005: 52). About 58% of the area utilized for agriculture is used for rice production (Suh 2002). From what interviewees told me about their and other people’s land size, these nationwide figures seem to accurately represent the rural environment in Hongdong and the surrounding villages. There, many small scale farms produce a wide variety of agronomical commodities, but most of them farm rice on most of their land. To have an idea of the livelihood of the farmers I interviewed, I usually asked for the size of their “*non*” (논) and “*baat*” (밭): *Non* means flooded rice paddy field or wetfield and *baat* dry- or upland field. In *non*, rice is the dominant crop during the rice growing season from June to October. The same land is used in the non-rice season to plant winter wheat varieties or green manure such as hairy or milky vetch. On *baat*, crops like ginseng (covered with black vinyl for shade), tobacco, red pepper, ginger, Chinese

cabbage, and other vegetables are most frequent. The diversified *baat* fields are situated on the gentle hills that surround the paddy dominated flats. Beside those dry fields, cows, pigs and chickens are raised almost exclusively under roofs or in indoor animal husbandry farms. On almost any Korean farm there is a job division between husband and wife: The husband would farm the wetland *non* and the wife the crops on upland *baat*.

The humid subtropical climate (Cwa), with hot humid summers and cold dry winters, allows for only one rice harvest per year. As can be seen in figure 5, the

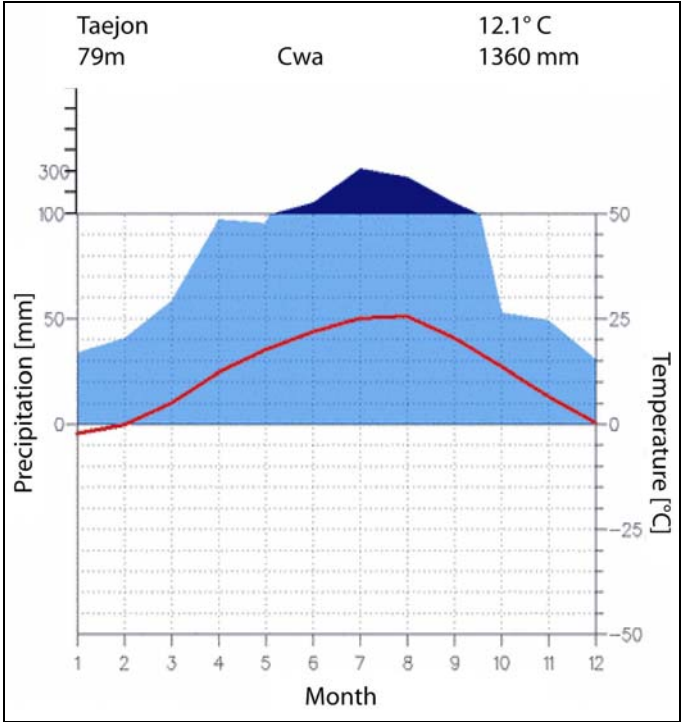


Figure 5: Climate chart of nearby city Taejeon (source: <http://www.klimadiagramme.de>)

mean temperature drops rapidly in autumn to settle into cold winters, and rises fast after. A huge amount of moisture is brought to the country in late June, when the rainy season, which lasts until August, begins. The climate in the West, South, and East of the country is usually referred to as the “East Asian monsoon area”, an area which includes Japan, southern China and Taiwan.



Picture 2: Hongdong countryside with the Poolmoo Coop building left of the vinyl house (Dominik Rutz, 2007. Note the duck houses on the side of paddy fields)

4.1.4 Institutions in Hongdong

The journey of the refarmer has already led us to the place where most of the study for this thesis was done. To understand what Hongdong is about, the various institutions, privately and governmentally founded ones alike, should be characterized in more detail. By this assessment of the institutional structure with many overlaying CoPs in Hongdong, the knowledge related details of the adaptation of IRDF can be better understood. Among those institutions are the two Poolmoo Schools which play the key roles for the local knowledge sharing and learning processes. Poolmoo (풀무) means bellows, and almost every person I interviewed said that the two schools, especially the much older High School, are the catalysts for the development of Hongdong towards being a sustainable community. In the fifth chapter, they are assessed in more detail with regards to the analytical categories.

The various institutions in Hongdong are founded, organized and intertwined in many different ways for various reasons. However, because some of these play a role with regards to knowledge generation and transfer, I will describe some of them with relevant details. I divide the ones that are founded through private initiatives and those that are government initiatives. However, a lot of the privately initiated institutions are supported by the government, which is the case with both Poolmoo Schools and the Kindergarten, although they decide independently how the funds

are distributed within the institution. In the two schools and the Kindergarten, wages are distributed evenly among all teachers, including the principles. They also hire more teachers than usual in order to foster a better teacher/student ratio, albeit at the cost of lower teachers' wages. Note that many institutions have the word "Poolmoo" in their names, which does not necessarily point to a strong connection to either of the schools.

The privately initiated institutes are:

- *Poolmoo High School* (see figure 6 for where it is located, and section 5.2.1 for more detailed information) and the cooperative of their teachers and students. This cooperative makes part of after school activities, where students can learn how to run such an organization.
- *Poolmoo College* (see figure 6 for where it is located, and section 5.2.2 for more detailed



Figure 6: Hongdong from space (The majority of the visible paddy fields are farmed with IRDF. Source: Google Earth 2007. If zoomed in more closely, duck sheds on the field sides can be seen even from space.)

information) and the cooperative of their teachers and students. The cooperative cooperates with the one from the High School.

- The *Kindergarten*, (located between the Poolmoo College and Hongdong Centre) which allows several handicapped children to be looked after in one class of 8-12 children.
- *Hongseong Poolmoo Life Coop Association* (Poolmoo Coop, see figure 6 for where it is located) was founded in 1983 and achieved an organic label in 1992. In 2007, one thousand members constitute this organization of which 800 are producers and 200 are consumers. The cooperative's aim is to provide city consumers with safe food and to pay farmers fair prices for their organic products. It has its own processing and storing facilities for rice and other crops.
- *Poolmoo Credit Coop Association* was founded in 1969 and is now associated with the Poolmoo Coop.
- *Poolmoo Misaengi Sesang* produces microbe assistant fodder that can be fed to livestock instead of antibiotics. This allows organic livestock production and by-products such as animal manure that can be used for organic farming. It is managed by Poolmoo Credit Coop Association.
- *Poolmoo School Life Coop Association* was founded in 1993 and consists of a bakery, a soap factory, and an instant soup factory.
- *Centre for Hongseong Women Farmers* provides education for women and children, has a day nursery, and organizes a flea-market four times a year.
- *Poolmoo Milk Production* is a consortium of diary farmers who produces yogurt.
- The recently opened *Centre for Alternative Energy*¹⁶, an NGO that built its head office in this rural area because it is famous for alternative development.
- A livestock cooperative, which is not yet certified for organic production
- *Mundangri Infovillage*¹⁷ (or Ecovillage, see figure 6 for where it is located) which consists of:
 - ↳ The Hongseong education centre for environment agriculture (the "Mundangri centre"), which organizes the sale of some part of the rice produced locally using the IRDF-method. The centre also organizes many meetings concerning farming, IRDF, and eco-housing¹⁸. Every second year, they host a meeting on IRDF with both

¹⁶ Their webpage is <http://energyvision.org/>.

¹⁷ There are several pictures about IRDF and related activities to be found on <http://mundang.invil.org/>.

¹⁸ Eco-Housing events were for example held in co-work with Bayer (www.bayer.com 2007). There is also a group of several Korean researchers from the Graduate School of Environmental Studies at the Seoul National University that drafted a "Mundang-ri Eco-village Plan for Sustainable Agricultural Society" in 2000 that projects one hundred year into the future (Yang 2000).

Japanese and Korean farmers and other farming experts. The refarmer NGO and other organizations often use the meeting room for teaching activities.

- └ An environmental rice mill, which provides pounding-, packing-, and distribution-services to individual farmers as well as to smaller institutions.
 - └ The Mundangri Infovillage is part of a nationwide network of “Information villages” which is a rural tourism service for families or schools that combine a “trip to the country” with some teaching on what farming or other rural and traditional activities, and, in this case, what integrated duck rice farming looks like.
 - └ In connection with the info-village activities, there are facilities like a farm-life museum, a sauna, a newly opened IRDF museum with a farmer meeting room, and an artificial pond near a natural water well, where people can cool down during the hot and humid summer months.
- In addition, residents have begun many private initiatives that engage in different issues to do with sustainability such as sustainable housing, alternative trading systems like Local Exchange Trading System (LETS), or community life in general.

Government initiated:

- *Hongdong Elementary and Middle School* provide basic education to all the young residents.
- *Poolmoo's People Food Production* which is a corporation, not a cooperative. They produce noodles, other rice products, different teas, and engage in chicken and duck packing.
- *Nonghyop Bank Cooperative*. The main activity of this huge nationwide cooperative is banking, but they also distribute the lion's share of the rice that is produced throughout South Korea.
- *Hongdong Community Office* (local government)

The Poolmoo Coop is the biggest player in organic rice processing and selling in Hongdong, but overall, the local branch of the Nonghyop has more members. Out of the 1500 members there, more than 400 produce organic rice mostly using the IRDF method. This branch of the nationwide Nonghyop is one of the smaller ones and it would have been closed and consolidated into the next bigger branch in the area to save costs some years ago, if there had not been such a boom in organic products nationwide and that the boom could be met by increased organic production in Hongdong (the later development owes a lot to the duck method). Throughout South Korea, the Nonghyop buys about half of the total rice that is produced in one municipality.

Since more than half of the local farmers in Hongdong produce their rice organically and sell it through different channels, the conventional farmers who comprise the other half are happy because the rice they produce has guaranteed acceptance by the Nonghyop. In the case of Hongdong, organic agriculture has not only led to a more secure income for organic farmers, but also to a secure income for conventional farmers. This regulation reduces the incentive for the later group to go organic, and constitutes a relatively stable fifty-fifty ratio between organic and conventional farms. Through this regulation, the efforts of actors of the Poolmoo Coop and related institutions to bring about an area-wide implementation of organic agriculture are decisively influenced.



Picture 3: The duck guides to the main building of the Mundangri Infovillage (Dominik Rutz, 2007)

4.2 Case Study Introduction: Integrated Rice and Duck Farming

Ducks are common in the diet of most Asian countries. Raising ducks is especially widespread in China, the Philippines, Thailand, Vietnam and Indonesia. There is a long tradition of ducks interacting with rice-farming cycles. In many Asian countries, ducks have traditionally been allowed to freely graze on just harvested rice fields, where they can eat weed or grains that have fallen down (Gaguan, Branckaert & Van Hove 2001).



Picture 4: IRDF field in Takahata, northern Japan (Dominik Rutz, 2007. Note that in the area near the duck shed the rice plants are affected by ducks' activities.)

According to Farrell (1997, cited in: Gaguan, Branckaert & Van Hove 2001), the majority of duck production in Asia is closely associated with wet-land rice farming. Especially in South East Asia, ducks are herded to where food is available, particularly after rice harvest, which helps save on the high cost of feed. There are also areas, like the southern parts of the Philippines, where ducks are allowed into rice paddy fields during times of maximum tilling in order to get rid of some weeds and insects (Quisumbing 1983, cited in: Gaguan, Branckaert and Van Hove 2001). In Taiwan, the ducks are used before planting rice to control the golden apple snail (GAS) (*Pomacea canaliculata* Lamarck), an exotic pest that spread dramatically in the

1980's after they were introduced from Florida by the aquarium market¹⁹. In Japan, ducks have been released into rice fields since 400 years (Manda 1992, cited in: Gaguan, Branckaert & Van Hove 2001). These traditions of farming ducks on or near rice paddy fields are about to decline due to western style agriculture that includes the use of agro-chemicals (Manda 1996; Farrell, 1997, both cited in: Gaguan, Branckaert & Van Hove 2001).

As stated towards the beginning of this thesis, the systematic use of ducks for weed and pest control was invented by Takao Furuno who farms land on Kyushu Island in southern Japan. Although similar practices pre-existed in many Asian countries, no available information claim otherwise. Therefore, I will deal with IRDF as being his invention. This section will first look at what his original idea behind the method is, and in what respect it can be adjusted to specific local practices. How it is adapted in Hongdong is the story of section 5.1, and how it is evaluated will be discussed in section 5.4.

The fact that all traces of the systematic integration of ducks in rice paddy fields for control of weeds, pests and fertilisation lead back to one man, or at least to Japan, is confirmed by all the people I could interview in South Korea and Japan, as well as by the documents available online on the web pages of the FAO and IRRI that deal with the integration of ducks in rice fields (see Ahmed et al. 2004c; Chang & Hoffmann 2003; Gaguan, Branckaert & Van Hove 2001; Hossain et al. 2005). If the method is mentioned without its origin, it is always termed as the method which integrates rice and duck farming at the same time and place. Those who do not mention Mr. Furuno, refer to it as “rice-duck farming” (Suew & Leong 2003, in Malaysia; IRRI 2005, in China), “integrated rice cum duck method” (Ahmed et al. 2004a+b, in Bangladesh), “rice-duck cultivation” (IRRI Annual Country Report 2005, in China), and rice and duck mixed farming (Li, Zhao & Du 2003: 136). I interpret those terms as signifying the same method that was originally invented by Mr. Furuno, because they were all written after the method was already well spread in some areas and they do not mention another inventor.

4.2.1 Description of the Duck Method

This description is based on “The Power of Duck”, the 2001 English edition of Takao Furuno's Japanese book “Aigamo Banzai”²⁰. The basic principle of the duck method as Mr. Furuno advocates it, is to raise ducks and rice at the same time in one paddy field. The translation of the

¹⁹ I was told this several times. Other sources say that the intention was to start an escargot industry with them, which failed (www.applesnail.net). However, everybody agrees on the fact that it has become a pest in Taiwan and many other countries in South East Asia.

²⁰ Translated title: „Cheers to Aigamo Ducks“ (USDA National Agricultural Library 2008)

Japanese term means “raising ducks and rice at the same time”, which Furuno (2001) translated as Integrated Rice and Duck farming (IRDF). He graduated from an agronomic university in Fukuoka, Kyushu Island in southern Japan and, in 1977, started organic farming using mostly manual methods to control weeds. That was ten years before he encountered the “Aigamo” duck, a crossbreed of a wild male duck and a water fit type of domestic female duck. He then realized how the traditional idea of letting ducks into the rice field could be revived for a less time consuming way of agriculture: The field simply had to be surrounded by a bamboo fence, a net, an electric fence or other materials in order to keep the ducks inside all the time. One to two weeks after the transplanting of the rice seedlings, one to two weeks old ducklings are released into the paddy field with a suggested proportion of 20-30 ducklings per 10 are²¹. Unlike many Asian villages where the ducks are allowed in the paddy fields only during the day, these are to be held in during both day and night. A small hut is normally provided for the ducks where they can take shelter in the night time. The ducks eat just about everything within reach of their beaks, except the rice plants. However, they do eat rice-ears. Therefore, they must be taken out of the fields, at the latest, just before the rice is coming into ears.

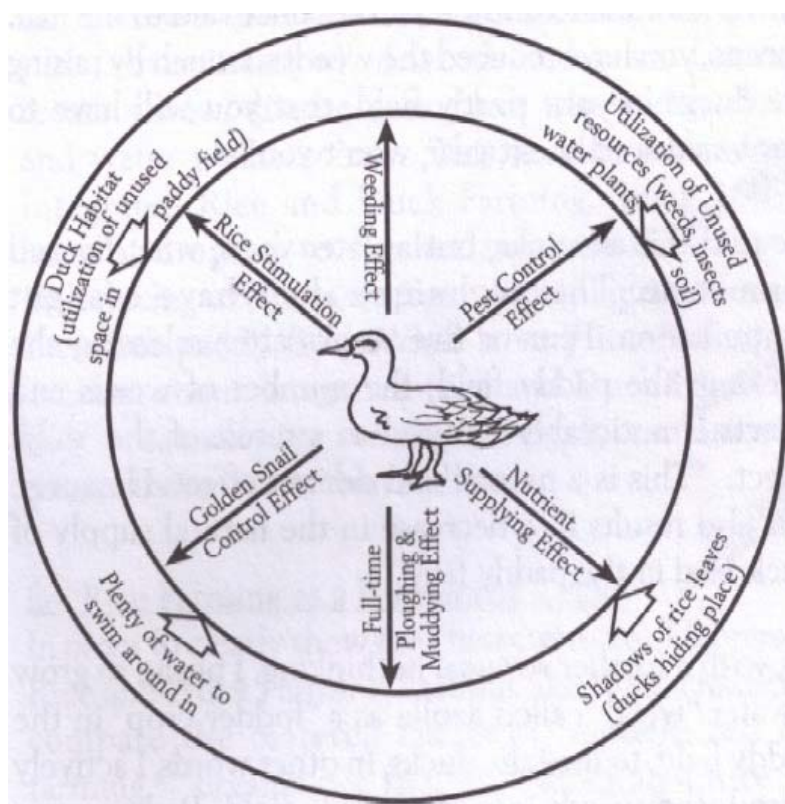


Figure 7: The duck effect (Source: Furuno 2001: 9)

The ducks’ work is a true blessing, especially for those who know what it means to farm rice without herbicides and who have experienced trying to control weeds through long days of weeding in the fields under the burning sun. Figure 7 shows the helpful effects of the ducks’ activities. The ducks eat almost every weed and weed seed with one exception, the Barnyard millet (*Echinochloa crus-galli Beauv.*). This sturdy and fast growing weed is controlled by the ducks, although not through their appetite, but rather through their paddling and ploughing activity. This, however, is only effective if the releasing of the ducks is well timed, as it should be done before the Barnyard

²¹ 1 are is the metric square measure, it equals 100 square metres.

millet is too strong and high. In addition to their weed controlling activities, the ducks supply the earth's flora and fauna with a lot of nutrition in the form of droppings. Furthermore, as ducks love to eat almost any insect and molluscs, including the disastrous apple snails, pests are significantly reduced on duck/rice paddy fields (Furuno 2001: 23-27²²; Ahmed et al. 2004b: 16). They also stimulate rice growth by moving around and brushing the plants, constantly ploughing and paddling, which makes the water muddy – a favourable condition for rice. For the constant paddling that also suppresses germination of sturdier weed that ducks do not eat (in Japan and South Korea: Barnyard millet), a sound levelling of the field prior to transplantation, as well as sound water management is crucial (Furuno 2001: 18f).

There is not a single type of duck which is most feasible for the method, but if native ducks are used, it should be a type of somewhat small size, not weak to water and very active. The breeding of ducklings needs suitable facilities that also include possibilities for ducklings to get accustomed to dabbling in water and eating weed. Altogether, Mr. Furuno alludes that his idea is not restricted to a fixed concept, but that it is a principle that can be applied everywhere if it is adjusted to local circumstances like the availability of materials or duck types. Also, threats like predators or duck stealing should be considered and he sees no problem if in South East Asia, there are a lot more ducks applied per area than he suggests. There are reports of other problems and limitations of the duck method which point to ecological concerns. They are discussed in the following section.

4.2.2 Problems and Limitations Reports of IRDF

Around the duck sheds, which are usually built beside fields, there is an accumulation of duck manure and uneaten feed that can foul and cause unpleasant odour. This attracts flies and eventually becomes unhygienic for raising ducks (Cagauan, Branckaert and Van Hove 2001). Some Philippine farmers do not like entering rice fields pastured with ducks because they fear skin itchiness. This problem can be related to too much manure concentration, but there are also diseases that have domestic ducks as hosts (snails can be intermediate hosts) like *Trichobilharzia paoi*, an aetiological agent of paddy field dermatitis (Hu et al., 1994 In: Cagauan, Branckaert and Van Hove 2001).

In South Korea, there is a debate about the appropriate proportion of ducks per area. Professor Sohn Sang Mok from the Research Institute of Organic Agriculture, Dankook University in

²² Some of the research which Furuno integrates in his books is done in collaboration with staff from the agricultural university.

Cheonan, argues that the number of duck is usually too high. Together with colleagues from other universities, he published detailed figures about N-intake by duck manure. The high figures underline the related contamination of the waterways and the odour in the neighbourhood (Lee et al. 2005). The problem of overfertilization can be caused by too much ducks per area, by too much basal manure, or by a combination of the two.

Cagauan, Branckaert and Van Hove (2001), who mostly did research in the Philippines, state that since the ducks need space to move, paddy fields that are seeded directly are not suitable for IRDF. However, Mr. Furuno is currently conducting research on trial fields for combining direct seeding and IRDF. Results in 2007 were not good: In some areas, the rice would not germinate well, and where it did, tall Barnyard millet plants accompany the rice plants. The sturdy weed is already too high to be suppressed by the paddling of ducks' feet. The aim of Mr. Furuno's trials to integrate direct seeding and duck methods is basically to tap the full potential of the labour saving aspect of IRDF. If he could find a proper way, the labour would be one fourth of that cultivating transplanted rice without ducks. But there are other combinations which potentially enable improved yields on organically farmed paddy fields while enabling a sound allocation of human, financial and natural resources at the same time.

4.2.3 Combinations of IRDF

Mr. Furuno and others experiment with different combinations. For example, he also raises loach on IRDF fields. The small fish can swim along the bottom. Ducks cannot see them in the muddy water, and egrets and herons that are predators to loaches won't enter a paddy field with ducks. If the field is drained, it is important to move the ducks out first; otherwise they would be able to eat the loaches (Furuno 2001: 76-78). Loaches sell at a very good price in Japan. Mr. Furuno also integrates the aquatic fern *Azolla*, which lives in symbioses with a nitrogen fixing bacteria. A proper combination of rice, duck, fish and *Azolla* can improve the harvest of rice, duck and fish while minimizing inputs. For instance, the body weight of ducks in plots with *Azolla* increases significantly faster than in non-*Azolla* plots (Furuno 2001: 65). Possible material cycles of a combination of rice, ducks, loaches and *Azolla* are depicted in figure 8.

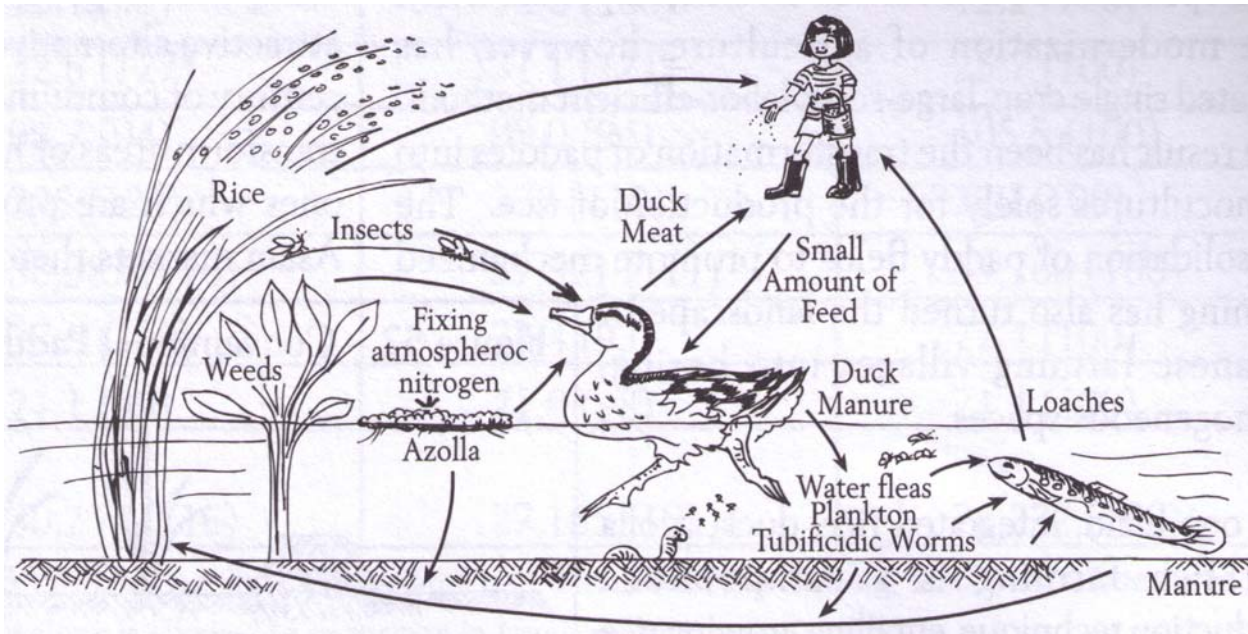


Figure 8: Material cycles of Azolla, loaches, ducks, and rice plants (Source: Furuno 2001)

Combinations can also mean minimizing the problems which come when only raising ducks in rice fields, i.e. too high N-concentration and spilled feed. For instance, duck sheds with holes in the floor could be built over a fish pond which is a contiguous part of the rice field. Duck manure that drops down is nutrition for plankton, and spilled food is re-used by the fish (Cagauan, Branckaert and Van Hove 2001). As I will discuss further down, the technical knowledge about IRDF is, in principle, easy to learn, and resources needed for the method (nets or other types of fences, duck sheds, ducklings, duck feed) are relatively cheap (Ahmed et al. 2004a: 8; Cagauan, Branckaert and Van Hove 2001). However, in order to overcome the mentioned limitations, more sophisticated combinations have to be considered than a mere application of ducks to the fields.

4.2.4 Not the Duck, but the Basic Pattern Goes International

Takao Furuno did not keep his invention to himself, but rather told many others about it, and the method spread to several areas in Japan²³ and beyond. In addition to areas in Japan and South Korea, Mr. Furuno personally looked for opportunities to spread the knowledge in Malaysia, Indonesia, Vietnam, Cambodia, the Philippines, and also Tanzania between the years 1992 and 1997 (Furuno 2001: 57). The following is a list of some of his experiences: He could not confirm the use of ducks in Malaysia. In Indonesia and Cambodia, ducks are allowed to graze in paddy fields after harvest, Bali being an exception where he witnessed ducks grazing in planted fields (before coming into ears). In 1997, IRDF was scheduled for some trial areas in the Philippines.

²³ Takahata in Yamagata Prefecture, about 300km north of Tokyo is one such area.

Mr. Furuno visited Vietnam five times between 1994 and 1997. Through exchanges between farmers and with the Support of Japan International Volunteer Centre (JVC), the method is currently spreading around Haiphong City in northern Vietnam, as well as in Hue in central Vietnam and in the provinces Dong Thap and Ben Tre in southern Vietnam. NGOs such as the Japan Overseas Cooperation Volunteers in Laos, Mr. Sato from the FAO around Vientiane, and the Organization for Industrial, Spiritual and Cultural Advancement (OISCA) in Papua New Guinea are also carrying out trials (Furuno 2001: 59).

Mr. Furuno's work was recognized by the Schwab Foundation, which awarded him a social entrepreneur award in 2001. He was invited several times to participate in the World Economic Forum (WEF) in Davos and the Social Entrepreneur Summit that followed it. The aim of these summits, apart from the media attention they garner, is to support networks between social entrepreneurs from all over the world and private firms, consultants and potential supporters²⁴. The foundation's webpage states that his method has been replicated by more than 75'000 farmers in Japan, Korea, Vietnam, Philippines, Laos, Cambodia and Malaysia (www.schwabfound.org).

This recognition, personal ties with other social entrepreneurs, and the publications in various languages (including English, Japanese, and Korean) are possible reasons why Mr. Furuno has been invited to teach in many parts of the world. When I met him, he was just about to go to China to teach his method.

4.2.5 IRDF Outside Japan and South Korea

In interviews, I could gather some information regarding the spread of IRDF in Japan, Korea, and China. The information I got from other countries is based on papers I gathered through online searches. Apart from international symposia on permaculture or organic farming which provide knowledge platforms on which the method has been shared, there is a special Asian wide IRDF symposium that is held every four years. It has been held in Hongdong, Japan, Vietnam and, at the beginning of 2009, it will be held in the Philippines.

China

Some persons I met know about the situation in North Korea and in the Korean speaking part of China, which is close to the North Korean border (called "Yeonbyeon", 연변 in Korean) and

²⁴ Personal communication with Mirjam Schöning, director at the Schwab Foundation, 26.11.2007.

which, some centuries ago, belonged to the former Korean kingdom. A government official from this area who visited the Utsunomia Symposium said that in China, the usage of chemicals has increased dramatically since the 1980's. He talked of certain "problems" they have there now, and that the demand for organically produced rice from the emerging middle class in cities is increasing rapidly, which allows its sale at greatly increased prices. He not surprisingly showed interest in sustainable rice farming methods. The first farmer who applied IRDF in Hongdong, Mr. Ju, visited Yeonbyeon several times to teach the method, and Chinese government officials also visited Hongdong to learn it. Also, Mr. Furuno visited China during the time of this study, although he was in another area. During the Utsunomia symposium, problems with organic agriculture in China were discussed. One issue is that consumers distrust the government who is basically in charge of all rice production, distribution, and controls for organic labels. Another problem is related to knowledge transfer: It is not possible to talk to actual farming practitioners in China, since international connections are all controlled by the government and its related channels (this was stated by Japanese as well as Korean interview partners).

Li, Zhao & Du (2003: 145), all members of the Jiangsu Agriculture and Forestry Department in Nanjing China, state that IRDF is one of the best ways for organic rice production. Their studies show, that it is effective in the control of weeds, but that it is less economically rewarding than rice and crab mixed farming. The latter method was also mentioned by the Chinese government official I met in Japan, but this method is not for control of weeds or pests but rather only to use the space between rice-plants to raise crabs which yield a very high price. All in all, the situation in China is not easy to assess from the outside, but in other countries, the spread of the method is more easily proven.

India and Bangladesh

In India, there are trials reported in the Assam region (Govinda Rao et al. 2007: 20) and in Kerala (Mathew 2003: 173). In Bangladesh the project of the IRRI called "Poverty Elimination Through Rice Research Assistance" (PETRRA) launched a farmer training programme in 2003 with more than 400 farmers to spread this method. The results were not only good with respect to weed and pest control, but it also increased farmers' livelihood significantly (Ahmed et al. 2004b: 16). The technology was easily accepted, "... as the rice-duck system is simple, cost effective, risk-free and, above all, economically rewarding (...). The neighbouring farmers adopted it in large number after simply observing the result. The success of the system attracted several NGOs who have already started work to introduce it in new areas" (Ahmed et al. 2004b: 26). Due to the large number of farmers who adopted the system, many more ducklings were

needed than could be supplied by traditional production methods. In order to supply the rapidly growing number of IRDF farmers with ducklings, low cost hatcheries were established that proved another source of income (Ahmed et al. 2004b: 10, 15).

PETTRA issued a Bengali “Technical Guidebook on Integrated Rice-Duck Farming System” to provide interested people with information on the findings of their project, which they did in 2001-2004 with resource-poor farm households. This project was under the leadership of Bangladesh Rice Research Institute (BRRI) in collaboration with local NGOs: Friends in Village Development Bangladesh (FIVDB), Sylhet and Bangladesh Development Society (BDS) in Barisal. They say it is an informative and easy-to-read guidebook intended to be used by the GO-



Picture 5: Duck hatchery in rural Bangladesh (source: Mali et al. 2005: 151)

NGO extension agents and farmers involved in Rice-Duck farming (Hossein et al. 2005; www.petrtra-irri.org 2008²⁵).

The next chapter discusses how IRDF was adapted and shared in Hongdong and how networks and institutions on the local, national and international level influence and are influenced by this and other knowledge-related processes. This discussion integrates the evaluation of the different organic rice paddy farming methods used and/or shared there.

²⁵ The Home Page is shut down since the 23rd February 2008. Please contact me if any documents are needed (including Ahmed et al. 2004a+b). There are some resources on IRDF in Bengali and English that can be downloaded on <http://www.knowledgebank-brii.org/>, the Bangladeshi Rice Knowledge Bank.

5 Knowledge Sharing and Learning Within and Outside Hongdong

This chapter discusses how knowledge is shared within the institutional structure in Hongdong, as well within the interregional and international networks of sustainable rice paddy farming in East Asia. Section 5.1 relates the two introduced threads of the fourth chapter with each other, and thus describes and discusses the adaptation process of IRDF in Hongdong. Section 5.2 elaborates on knowledge sharing and learning processes within the two Poolmoo Schools, which include the interconnections between Japan and South Korea. Other local knowledge-related capacities of co-present institutions and CoPs in Hongdong are the contents of section 5.3. Section 5.4 compares IRDF to other organic rice paddy farming methods with regards to their potential for knowledge sharing and sustainable natural resource use.

5.1 Adaptation of IRDF in Hongdong

The story of how the duck-method came to Hongdong is the crucial subject of this thesis and was studied in depth in several interviews with teaching and non teaching farmers, with school teachers who partly farm themselves and with other actors that engage in knowledge sharing and learning processes. In this section, I will first describe how the method came to Hongdong and how it spread, at first slowly and then fast at the end of the past decade.

The first time a Hongdong farmer heard of the method was in 1993 when Mr. Ju Hyeong Lo (주형로), who graduated from the Poolmoo High School several years before, received a translation of Mr. Furuno's first book. At that time, Mr. Hong was the principle of the Poolmoo High School. He already had read of the IDRF method in a Japanese agricultural journal, and when he found the book in 1993, he immediately translated it into Korean and handed it over to Mr. Ju. Together with teachers and students of this school he was the first to make trials. Already during the first few years, those people visited Mr. Furuno's farm several times; a collaboration began that still goes on.

5.1.1 The Precondition for IRDF Adaptation in Hongdong

The time when the method was introduced was depicted to me as when the school and the farmers in Hongdong were like dry sponges absorbing anything around them that was related to organic farming. Since the 1950's the community and the school knew about organic farming, because of when teachers from Japanese sister schools paid a visit, they said that organic farming

would be the only way to get rid of agrochemicals. There was an interval of approximately fifteen years during which people of Poolmoo/Hongdong realized the importance of organic farming but did not convert to it. After they did in the 1970's, another two decades elapsed, during which people did not know how to implement organic agriculture. Furthermore, there was no particular market or organic label that allowed farmers to secure their livelihoods better. Also conventional farmers began to have difficulties with selling their rice, as the demand for rice was exceeded by supply with the help of green revolutionary techniques. In this time, teachers and school graduates tried several ways to control weed, pests and nutrition through hard manual work, and many practitioners were exhausted. No real system for organic rice paddy farming could be found that proved a solution to the strenuous manual weed control which filled days and days during the hot and humid growing season. Many farmers were almost at the point of total exhaustion and at the edge of giving up farming and migrating to the city.



Picture 6: IRDF field in Hongdong on July 17th 2007, one week after the ducks were removed (Dominik Rutz, 2007)

It was this precondition that not only led people to think such a method could be interesting, but could also be a release from overwork or worse: from dying. Two organic farmers died of overwork before the IRDF method was discovered and brought to Hongdong. The utterance of

the principle of the Poolmoo College highlights what fundamental change the method could bring to that rural society: “If Mr. Furuno would not have invented and spread his method, there would have been no sound of baby in the village any more, only senior farmers would have stayed, because all young people would have left rural areas for the city” (Interview with Mr. Hong, Poolmoo College principle. Hongdong. 12. August 2007). This shows that in Hongdong too, farmer’s livelihood security is the most crucial factor. If it is ensured, farmers are able to secure their livelihood by farming, and eventually to experiment with or share sustainable methods to farm.

When I asked interview partners to comment on the role of the Poolmoo Schools (see interview guideline in the annex), many stated that if it would not be for the teachers’ tireless efforts in Hongdong, the desirable outcome one can experience today couldn’t have been achieved. This highlights the importance of some crucial social roles and institutions, for they initiated the implementation of IRDF in Hongdong, allocated means to experiment with it, and they are also responsible for the pre-condition that finally led to its application by thousands of South Korean farmers.

The governmental institute for organic labels recognized the method as sound for organic farming (Chang & Hoffmann 2003: 35). During the first years, trials were carried out only on few fields. In the late 1990’s, more and more farmers adopted the system and with that, the production of duck rice in South Korea began to increase. There are two reasons in particular for the system’s rapid dissemination thereafter: The first is that more and more farmers, especially Poolmoo graduates and refarmers, were profoundly convinced that organic farming is important. This development was fuelled by a growing consciousness about the long-term health of nature and humanity. The other is that changes in the market situation gave incentives for many people to produce and sell organic rice and other organic products. These developments in the agrobusiness are the subject of the next section.

5.1.2 IRDF under the Market Situation in Recent Years

Changes in the wider economic structures effect farming practice of IRDF but also of the entire agrarian economy sector in South Korea. The rapid economic growth of Korea and other Asian tiger states came to a sudden stop with the financial crisis in Asia in late 1997 and early 1998. Like in most of the other affected states, South Korea was granted support by the International Monetary Fond (IMF), but this financial aid came with clear obligations for the government and

big firms to economize, and to open markets. Interview partners talked about two related effects on rural areas and organic farming: One was that many had to take early retirement from big firms. Quite often, those people would invest their pension in real estate, which caused land prices to raise several fold in urban as well as in rural areas. The other outcome was that many people feared that the price of agricultural products would fall due to the opening of markets, so they looked for other, more local and thus more secure markets²⁶. Within this market environment, a diversified production seems to be most suitable, which is a strategy that the repeatedly re-elected head of the Poolmoo Coop successfully pursues.

Knowledge about the market situation motivated many farmers to go organic. Repeatedly, interview partners said this was why organic agriculture has spread so fast since 1994, when Korea became member of the World Trade Organization (WTO). Prices for organically grown rice were about 25% higher than conventionally produced rice (Chang & Hoffmann 2003: 35), and the market was steadily growing. Until 2005, The Poolmoo Coop had no problem in selling the goods produced by its increasing number of members. However, in the last two years, the competition has also increased on the organic market.

One reason is a confusion between true organic production, and so called “environmentally friendly” production. As can be seen on figure 9, the labels for both look the same, but



descriptions below the apple-like figure indicates an important difference. Farms certified with no or low chemicals can sell their products with the label “environmentally friendly”.

Figure 9: Organic labels (organic and transitional) and environmental friendly labels (no and low chemicals) (Source OTA 2004: 6)

The many interview partners I talked to about this matter said that consumers are not able to distinguish between environmentally friendly and organic production. In a study of the Korean market potential for U.S. organic food exports, it is said that “... confusion exists within the system, consumers think the “no chemical” or “low chemical” products are better than organic” (OTA 2004:6). Interview partners confirmed this statement. The following table 3 indicates how much faster the growth of environmentally friendly producers has been in the past few years.

²⁶ In this respect, the development of more secure post-harvest control methods also plays a role. They allow trading of many goods with long freights, which earlier would have been a cause for quality loss.

Table 3: Numbers of organic and environmental friendly farms in Korea in 1996 and 2003 (sources: *Chang & Hoffmann 2003: 33; **OTA 2004: 7, 24).

	1996*	2003**
<i>organic farms</i>	1'172	1'863 (0.2% of total farms)
<i>environmental friendly farms</i>	5'558	16'258 (2.5% of total farms)

An understanding of marketing is said to be neglected in both the Poolmoo colleges' curriculum and the Poolmoo Coop. The College of Agriculture of the Dankook University in Cheonan, a city about 70 km away from Hongdong, follows a different approach. It runs courses for farmers who want to go organic. The head of the College²⁷, who leads this education programme and whom I interviewed, said that he would not persuade anybody to go organic. The producers would have to learn basic techniques and, more importantly, marketing knowledge. The prioritization of marketing would enable individuals to decide for themselves which production system they would like to use. He criticizes government officials for pushing farmers to go towards organic or environmentally friendly production without teaching them sound understanding of market systems. If the market situation worsens, as it has from 2005 to 2007, government officials would claim that farmers were the ones to be blamed for overproduction.

However opaque the market situation is, the organic market boom around the turn of the millennium motivated many farmers around Hongdong to go organic, and the number of members of both Poolmoo Coop and the organic group at the state run Coop, the Nonghyop, grew fast. The head of the Poolmoo Coop said that IRDF is important because it is an easy method to implement organic rice farming, and thus allows producers to quickly meet market demands.

Now that the system is widespread in the area, experience has accrued and researchers from both within the village (the Poolmoo Schools) and outside it (e.g. the agricultural College in Dankook University) are critically examining the method, in order to better define what organic agriculture is, and what methods are sound for organic rice cultivation. These critics are the subjects of section 5.4, but first it is vital to understand how the principle of IRDF was adapted in Korea and how it differs from the method's use in Japan.

²⁷ Prof. Sohn also leads the Research Institute of Organic Agriculture (RIOA, www.rioa.or.kr/rioa) as well as the Asian Research Network of Organic Agriculture (ARNOA, www.rioa.or.kr/arno). Both state run institutions are connected to the International Society of Organic Agriculture Research (ISOFAR, www.isofar.org).

5.1.3 How the Principle Was Altered Due to Local (Market) Conditions

The rapid spread of the method did not only lead to problems with rice sales, but even before that, farmers had difficulty selling their ducks. In Korea, unlike most Asian countries, ducks are not part of the traditional cuisine. Only recently, Seoul’s restaurant industry experienced a boom in “duck-houses”: Chinese or fusion food restaurants that specialize in duck menus. I could not discern whether this boom is that recent that the call for good duck meat quality did not yet filter down to IRDF farmers. The selling of the duck was working out well only at the time when IRDF was in its trial stage. Then, some niche in the market for “wild duck” could be found. What followed was a steady increase of the IRDF production when more and more people used ducks with the stronger focus on weed control in paddy fields than on duck meat production. That focus is clearly held on to until today: “... the work of the duck, not the duck is the aim” (Expert Interview. Hongdong. 1st September 2007).

The leaking demand for duck meat led Korean farmers to adapt the method differently than Mr. Furuno proposes it: As can be seen in figure 10, ducks are allowed to graze in the paddy fields about one month only. The time around the 10th of July is considered the point when the “work” of the duck is done. Then, almost all the ducks that were used in the many IRDF fields around Hongdong are brought back to where they hatched for further feeding. This duck production facility is situated about 150 kilometres south of the community in Jollanamdo Province. They sell about 75’000 ducklings to farmers in the Hongdong area in mid June for about 1’800 Won each (= 1.80 US\$) and rebuy most of them one month later for just 2’000 Won per duck. I asked many people what becomes of the ducks there, but nobody could tell. The way IRDF is carried out by the large majority of farmers in and around Hongdong therefore cannot be called fully organic, as material cycles are not closed on the local level. This way of farming is in fact focussed on the symptom (too much weed) and not on the cause (no sound biodiversity). However, it meets the requirement for a quick adaptation to changes in economic structures, and thus secures livelihoods.

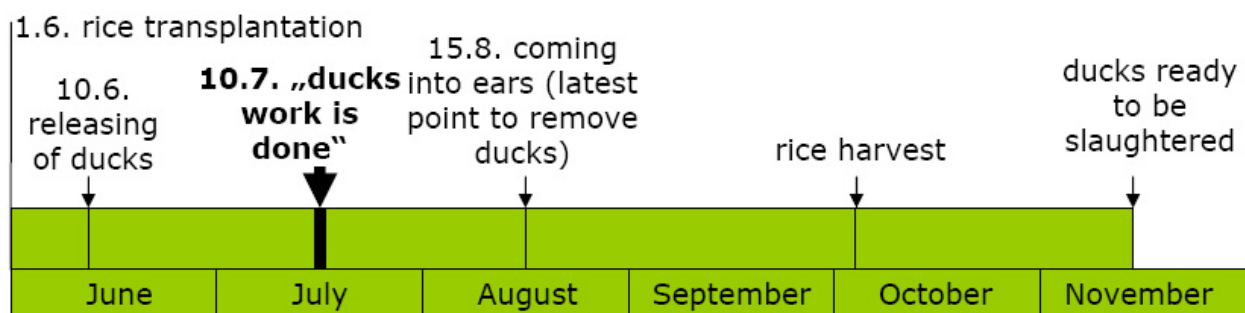


Figure 10: IRDF adaptation in Hongdong (Source: own design)

To summarize, the difference between the usage of the method in Japan and in Korea is that in Korea, the ducks are only allowed in the paddy field for one month, whereas in Japan they are removed at the latest possibility, before the rice is coming into ears. The following is a list of reasons for that difference that were stated by interviewees:

- The cost for food is too high, and gets higher in the second month when there is much less food (weed and insects) around for the ducks.
- Feeding twice a day on the paddy fields takes a lot of time and is binding. For instance it is difficult to be employed in other than farming work, or to travel, during the time when ducks are released in the paddy fields.

I was told only one reason for releasing the ducks for a longer period. The farmer who told me this was the only local I heard of to have the ducks in the fields for two months. He sells them at a very cheap price or simply gives them away to people he knows:

- Ducks eat most pests, to let them inside the paddy for more time means more security for the harvest due to better pest control.

The principle was altered to fit the different social environment. Since the market situation is different than in Japan, the raising of the ducks is not the aim but their weeding work is what farmers are (much more) interested in. Except this difference, Hongdong farmers stick to the almost same way of applying IRDF as Mr. Furuno proposes:

- The type of duck is similar to the one used in Japan.
- A type of duck is used that is a breed of different varieties including local ones.
- For field fences, nets are used whereas Mr. Furuno applies low-voltage wires.
- The number of ducks per area is the same.

5.2 Knowledge-Related Processes in The Poolmoo Schools

In this section, the Poolmoo High School and the Poolmoo College are compared against the background of the relevant aspects of transcending knowledge boundaries. As the pre-condition of IRDF adaptation shows, those two educational institutes are important for knowledge sharing and learning in Hongdong. Many interview partners expressed their gratitude to the founders, principles, and teachers of the Poolmoo High School for the efforts they devoted to the community during the last decades. The schools are another reason why more and more people from urban areas in South Korea choose to relocate their homes to Hongdong, as parents either want their children to study there, or they find employment in either the schools or in an another institution.

After a more detailed introduction of the Poolmoo High School and the Poolmoo College, the way knowledge is shared and prioritized in the two schools will be elaborated. This includes the role of Japan and Japanese farming experts, and the cultural differences between the two nations in terms of how knowledge is dealt with in organic farming networks.

5.2.1 The Poolmoo High School

The Poolmoo High School, the full name is Poolmoo Agricultural Technical High School²⁸, will celebrate its 50th anniversary in 2008 and can look back on a long, turbulent and successful history. Just five years after the Korean War, and long before the NVM occurred, the founders faced many challenges in starting a school in rural Korea. The acting principle, Mr. Chung (from now on referred to as the principle of the Poolmoo High School²⁹), said that the founders begged parents to send their children to school instead of overburden them with farm work. Poolmoo has a long history of teaching principles that bridge a normal High School curriculum with contents related to organic farming, community development and activities related to the village. From early on, the school operated an own cooperative which gives students the possibility to learn how to run such an organization. The Poolmoo Coop is a spin-off from this school cooperative.

Regular three-year classes at the Poolmoo High School provide the basics for a nationwide academic test, which all Korean High School graduates write at the same time each year, a crucial moment in personal history: The credit one achieves there decides what grade of ranked

²⁸ 풀무농업고등기술학교 in Korean. See the home page <http://www.poolmoo.or.kr/>.

²⁹ This attribution of the role of Mr. Chung and of the principle of the Poolmoo College, Mr. Hong is not in line with the decent and modest attitude they have. But for simplicities sake, I will use those titles.

Universities one will be able to enter. In addition to these courses, students have two important learning opportunities: One is field work on the school's farm land; the other is that they can choose from a variety of club activities. These "after school programmes" are common in almost every South Korean school, but the Poolmoo High School is famous for a special blend as they range from running cooperatives to discussion in literature circles. Students can take on those opportunities to learn to act in self-organized groups with only little support from the teachers as needed. To get some closer insight into the content of the school, its ten working principles are listed in table 4. They were translated and commented by the principle of the school during the interview.

Table 4: The ten working principles of the Poolmoo High School (Interview with acting school principle, Hongdong, September 4th 2007)

1. Christianity; the school on the bible	Christianity is quite widespread; about a third of Koreans are Christians, another third are Buddhists ³⁰ and another third is without religion. There is no religious service in the school, but people group to study the bible independently from religious institutions.
2. Growing ordinary people as the basis of the nation	In this context, some ideas of Heinrich Pestalozzi ³¹ are held in high esteem in Poolmoo.
3. Head, heart and hand are connected	The schools curriculum is not only intellectual, but also practical and humanistic.
4. Small school	In Hongdong, there is a recent debate as to how many students should be allowed in one year's class; the general assumption is that classes should not be too big.
5. Dormitory life: All students, even local ones, live there	Mr. Chung lives on the school grounds, but even his and the other teachers' children live in the dormitory during their High School time. One important element, if not the most important one, that Poolmoo students learn in school is embedded social interaction like how to relate to others and how to build lasting friendships.
6. We have no head and no tail, so it is a participatory democracy	Decisions are made not by the principle but in weekly meetings where all the teachers have equal say.
7. Bright school life	This means that students can do things for themselves and in groups. This is something quite different from almost every other Korean High School, where students study day and night, and

³⁰ Buddhism was the dominant religion over the past several centuries.

³¹ Johann Heinrich Pestalozzi (1746-1827) was a Swiss paedagogue, whose basic ideas are found even in modern paedagogy.

	where after school programmes decreased during the last decades in order that students have more time to study.
8. Living together with the community	The school is part of the community; it is called "school without a wall".
9. International understanding	Students have to get a sense of what is going on around them, not only in the village and in Korea, but around the globe.
10. We do not forget the duty and the role of a private school	The Poolmoo School is an alternative school that has a special role. Preparation for the nationwide exam is not the only goal.

Religious believe is one aspect of how knowledge and perception of the environment influences farming practice. Although interview partners that graduated from Poolmoo High School did not state to be particularly religious, they claim that they learned a caring attitude and also knowledge about the environment there. Furthermore, this kind of Christianity, the independent study of the bible, led to connections to Japanese sister schools like the Ainou School near Kyoto. Another important knowledge-related aspect of the school's curriculum is that it allots more means than usual for students to learn about embedded social interaction: In dormitory life, in joint labour on the fields, and during club activities they have to learn how to relate to others, and eventually develop lasting friendship with students and teachers that allow socialization as a basis of explicit and tacit knowledge sharing. Additionally, students learn institutional and strategic knowledge by participating in the operation of the cooperative.

The Poolmoo High School is one of many alternative schools in Korea, but the particular difference between Poolmoo and the others is its connection to the village's community. Interview partners repeatedly uttered that this link is the reason Hongdong has become what it is today: a centre for alternative teaching, organic farming and community life, which draws not only national and international attention, but also motivates people to change their housing situation to settle down in the area. But this link also means a lot of work for the community that has to be done inside the school. Because this work demanded too much of the teachers and students time, at the beginning of this millennium, teachers decided that the High School should focus on the education of the students, and that the community related work and thorough teaching of farming related knowledge should be done by another institution. Those efforts were supported by the government and finally led to the establishment of the Poolmoo College in 2001.

5.2.2 The Poolmoo College

Students of the Poolmoo College, the full name is Poolmoo Ecological Agriculture Course³², attend a two-year course at the school, where they usually have lectures in the morning and practical work in the school's fields in the afternoon. The aim of the college is to educate people who want to settle down to farm or do some farming related work. Apart from farming techniques, social science and research is taught in the lectures. Those include: history, learn how to write research papers about community and agriculture, art, literature, how to assist community development etc. Not long ago, the curriculum shifted to emphasize social studies over teaching the technical aspects of farming. Mr. Hong, the former High School principle and now acting principle of the College (from now on referred to as the Poolmoo College principle), underlines the fact that production is just one of six important matters that must be considered within the long-term development of sustainability. The other five are: Processing, Marketing, Energy, Religion/Culture, and Education. The shift towards more social science and research can be understood within the context of what one is able to experience in Hongdong. Because enough technical knowledge is shared within neighbour groups or institutions such as the Poolmoo Coop, there is a far greater need to understand the wider social and natural environment. Because of this insight, college teachers realized that the work that must be done in Hongdong is no longer just that of a farmer who only tills their farm and sells what he or she has produced to a customer or to an institution who will in turn look after everything else. Consequently, a variety of jobs are being developed in Hongdong's different institutions, and for those jobs, social science and research skills that includes knowledge of different spheres of society is of great importance. Such job profiles shift from mere membership in one group of local society (for instance farmers) to that of multimembers (working part-time as a farmer and as a teacher or Coop staff member). This is why the College's main organiser and person in charge of agricultural research, whose name is also Mr. Chung (from now on referred to as the head of research and organization at the Poolmoo College), says that if a student does not want to study farming, it is *not* a problem. However, if a student wants to stop learning social sciences, they will have to leave the school.

The above mentioned emphasize on social science has to be understood within the College's general aim. It is about farming and the development and teaching of related knowledge. But since different people prioritize different knowledge, the reasons for application or non-application have to be looked for elsewhere. Some, but not all locals who have a great deal of

³²풀무환경농업전문과정 in Korean. See the home page <http://www.poolmoo.net/>.

visionary conviction are influenced by their own non-institutional study of the bible. Others derive their visions by understanding the social and natural environment. These people strive to give a broad vision to a loose and informal conglomerate of both alternative and conventional people and institutions. Many differing aspects and understandings of this vision were highlighted in the different interviews. Interview partners said that the vision that underlies their work for organic agriculture is a caring attitude for all living beings, for other humans, and for the soil too. To adjust this principle to reflect more closely the broader social sphere, it means a society which is organized not (only) by democratic nations but by a meshwork of democratic cooperations at the community level.

Farmers, cooperative leaders, students and teachers talked of this attitude without being asked for reasons why they learn, share and implement organic agriculture. On one hand, people that moved to this rural village already carried such an attitude with them. On the other hand, several interview partners that grew up in Hongdong said that it is what they learned in the Poolmoo Schools that motivates them for their efforts. These statements point to an awareness of knowledge about the environment and to crucial roles within the institutional structure in Hongdong that influenced the sharing of these visions and types of knowledge.

5.2.3 Socialization in the Poolmoo Schools: Network Transfer

The importance of socialization was already described in the third chapter as the basis for personal networks that allow the sharing of tacit knowledge. The importance of this dimension of learning is obviously recognized by teachers of both Poolmoo Schools. Based on what college teachers experienced with graduates who started farming, they say that students' education is not finished after graduation. Graduates usually come back to the school for visits to ask teachers about farming practice. The readiness to talk to former students even after their formal student-teacher relationship has ended is one important outcome of the valuation of personal relationship during the students' courses. A Poolmoo College graduate I interviewed expressed her gratitude for that during her time at the college, she could learn about the importance of good relations to other farmers and teachers in the neighbourhood. The importance of socialization is that it involves the sharing of both tacit and explicit knowledge, and it is another reason to value spatial closeness of actors who are to share knowledge with each other. Many people in Hongdong are well aware of this value. Networks are built more easily if the teachers, students, graduates and farmers live close to each other. This is why more and more people who interact with locals and understand the importance of co-presence eventually choose to live there.

However, even still in Hongdong, where many efforts are being made to get closer not only in spatial but also in cultural terms, there are still some cultural distances that prolong and even hinder knowledge sharing throughout all the borders between the locally present communities of practice. How those boundaries structure the local society will be discussed in section 5.3.3.

Apart from networks as a basis for accessing persons as knowledge sources, texts are also an important source of knowledge and information. Because of this, the Japanese language plays an important role in organic farming networks in South Korea.

5.2.4 The Role of Japan and the Japanese Language

Integrated Rice and Duck Farming and other methods that are used in Hongdong to systematically farm organic rice have their origin in Japan (one of the methods I will describe later on is the snail method, which is an exception in this respect). The inventiveness of Japanese society is impressive in many areas, and organic farming is just one of them. During the Utsunomia symposium, not only farming techniques but also many mechanized and manual implements and a wide variety of books and journals were displayed. Korean interviewees said that in terms of technical knowledge and gear, Japan is an important source. I was taught two possible reasons for the inventiveness of Japanese farmers and other farming experts. One reason is that only about 70% of Japanese paddy fields are planted with rice during the growing season. Farmers receive subsidies for areas that are not farmed. If rice would be grown on all the paddy area, this would mean overproduction with prices not suitable for global trading. Japanese farmers gain less than 50% of their income from their crops, the rest being off-farm work. The situation in Korea is quite different, where farmers' livelihoods are not that diversified and where farming incomes are crucial. As outlined in the third chapter, and as the case of rice farming in Japan clearly illustrates, livelihood security, as well as enough space to allot to testing new methods is an important precondition to inventiveness in farming. The second reason is that there are many Japanese publications, books and periodicals alike, that deal with farming inventions.

Japanese publications about organic farming are widely read in Hongdong. Organic farmers can benefit from those information and knowledge sources, but only if they understand the language. Therefore, Japanese is an integral part of the curricula of both Poolmoo Schools. For several graduates, learning Japanese was the fundament of student-exchange programmes with Japanese sister schools, where they not only shared knowledge but friendship as well.

Interviewees repeatedly stated that the Japanese have a long tradition of writing books as well as translating a tremendous amount of foreign literature. Japanese as well as Korean is related to Chinese (they both make use of Chinese characters as words of foreign origin), and both languages share a similar grammatical structure. Hence, learning Japanese it is not too difficult for Koreans. Moreover, if compared to English which might be considered more universal, Japanese and also Chinese are much more related to the knowledge demands of North East Asian rice farmers as publications in those languages are more likely to deal with farming conditions similar to those in Korea.

Both the Poolmoo Schools thus integrate Japanese into their curriculum, and thus provide time and effort in order that farmers have the ability to pull from many more written knowledge sources related to rice paddy farming. This allows more opportunities to integrate latest information on organic farming within the body of knowledge of South Korean farmers, and furthermore to more opportunities of building social relations between farming experts of the two nations. But such friendly connections are not self-evident, if one recalls the history of conflictual interactions between the two nations. The long history of collaboration of the Poolmoo Schools with Japanese sister schools, as well as meetings between Hongdong and Japanese farmers and other farming experts actually base on sound embedded social interaction between the involved actors. This was enabled by the official apology of teachers of the Poolmoo sister schools for the dread their ancestors brought to Korea.

If South Korea and Japan are compared concerning the way this farming method has spread, interesting insights how both cultures differ in terms of knowledge sharing and learning come to the fore. These differences in embedded social interaction are outlined in the next section.

5.2.5 Cultural Differences in Community Life and Marketing

There is a striking difference between Japan and South Korea when it comes to the assessment of how farmers and other farming experts engage in knowledge sharing and learning activities. The way IRDF spread differently in both countries shows a revealing insight into this matter. All the IRDF farms in Japan that were visited during the Poolmoo College study trip, including Mr. Furuno's one, were one of few that use this method within one community or region. Interview partners in South Korea and Japan confirmed that the way IRDF spreads in Japan looks more like small points on a map. It is quite a different picture in South Korea, where in several regions IRDF is used by more than a hundred farmers. On a map, this looks like several clusters.

Interview partners mentioned two possible reasons for this difference: *First*, farming goods are marketed differently in the two countries, especially in the organic market. In Japan, farmers usually sell their goods directly to costumers, whereas in South Korea, farmers are usually members of bigger cooperatives. Within those institutions that often have the size of several hundreds or thousands of members, marketing is taken care of without great involvement of most of the producers. The *second* aspect interviewees pointed at is the importance of community life inherent to the Korean culture. Spontaneous chats are frequent as are events to come together and share friendship, thoughts and experiences. Such events reach from gatherings of usually 5-10 farmers just after work near the fields to organized festivals in the community. I doubt that any traveller that visited both countries would deny that Koreans are much more outgoing than Japanese, speaking and chatting a lot more to people they do or do not know. Together with the insight that Japanese have a history of devoting more energy into written communication, it can be concluded that in the realm of farming, Japanese circulate more written information, whereas in Korea circulation of oral information is emphasized. As can be seen in both countries, these forms of communication have different impacts considering application of IRDF.

Interview partners said that especially for hard work on rice paddies like planting, weeding and harvest, groups of neighbouring farmers work together. Traditionally, only men join in such common working groups on paddy fields, whereas women work on upland fields usually alone. A huge repertoire of songs were sung during such hard but joint labour, and they are still being sung on occasions, like meetings of farmers, of refarmers or of city people that tinker with the idea of becoming a farmer. Although the culture of sharing hard work diminished rapidly with the application of machines and agrochemicals, farmers still meet regularly in groups.

Those groups can be seen as an informal institutional structure that overlays the more formal one of cooperatives and other formal institutions. Like communities of practice of professional teams, the boundaries around those groups can either enable knowledge sharing within the group but hamper this process in connections to the outside of the CoP.

Embedded social interaction is an important aspect for knowledge sharing and learning processes within an international network of organic farming, but also within the local institutional structure of Hongdong. The next section discusses how this aspect influences knowledge sharing within Hongdong.

5.3 Institutions and Embedded Social Interaction in Hongdong

In Hongdong, formal institutions like already established or projected communal organizations, as well as informal institutions like neighbouring groups influence the way knowledge is shared and developed. Section 5.2.1 discusses already established formal institutions that support knowledge sharing and learning processes. Section 5.2.2 deals with how means are allocated for more knowledge platforms to further fuel those processes. Section 5.2.4 assesses cultural characteristics of different networks in Hongdong more thoroughly.

5.3.1 Interregional Connections of Hongdong Institutions

This section explores how people engage in communication to or from outside the community. The people that visit the place or settle there permanently highlighted many such interregional connections. In order to understand the personal connections they foster, I would usually ask them how they first knew that Hongdong existed.

Many locals who practice farming in either one of the schools or on their own farm engage in teaching about their experience in NGOs or programmes for farmers. Such teaching meetings are either held in Hongdong with people from inside or outside the village, as well as in other farming areas or even cities. The refarmer NGO and the right farmer NGO organize most of the teaching on organic farming that is done outside the village, and in which Hongdong farming experts participate. In nationwide publications³³ that deal with issues such as organic farming, alternative housing and handicrafts, the experiences and developments in Hongdong are regularly recognized. Furthermore, schools, other institutions, and famous farmers release their own publications. The school has a quarterly journal called “School and Community”³⁴, and the Mundangri centre has a monthly publication on IRDF. The principle of the Poolmoo College, Mr. Hong, who is fluent in several languages, has translated many books about sustainable living, mostly related to organic farming techniques. As mentioned above, he translated almost every Japanese publication of Mr. Furuno.

The fact that organic farming has, without government initiation, spread so well in Hongdong has even found recognition in UN publications: In the United Nations Economic and Social

³³ One publication that was mentioned was the magazine "green critics" (녹색평론).

³⁴ In 2008, the name has changed to “Community and School“, indicating that the community stands in front, not the school.

Commission for Asia and the Pacific (UNESCAP), Hongdong is heralded as a success case for community development with organic farming, a development in which IRDF played a particularly important role in raising farm income (Suh 2002). The Poolmoo Coop and the Mundangri centre also opened their doors for another UNESCAP case study on the position and participation of women in cooperatives (Sicat 2006).

The biggest outside connection is certainly the Mundangri centre. It receives up to 20'000 visitors yearly, of which most come in carloads on tours that are organized within a nationwide infovillage programme. The buildings of the centre consist of meeting and dining halls, as well as accommodation facilities for overnight stays. These buildings are not only used to receive such tour-like organized guests, but also teaching and meeting activities are held there, and are sometimes organized in consultation with Poolmoo teachers. The symposium of Japanese and Korean IRDF farmers and other farming experts was one such occasion. It is held every year, alternating between Hongdong and Japan, and is an opportunity for farmers and scholars from both in- and outside South Korea to come together and discuss, at a grass-roots level, various issues related to IRDF. Two Poolmoo teachers and one graduate, who completed part of their education in sister schools in Japan, would translate Japanese into Korean and vice versa.

The just mentioned knowledge activities range from providing information in journals to teaching and meetings. Although I wouldn't call mentioning a success case in a respective publication a knowledge transfer, such information can act like a seed for future collaborations. For many people, such information was the starting point for lifetime connections they foster to community residents, or they become residents themselves.

5.3.2 Project Outlooks in Hongdong

As discussed in the third chapter, multi-party collaborations that deal with farming practice have to allow not only participation in implementation but also in research. In this context, two developing projects in Hongdong are of utmost interest: The "Agricultural Information Centre" and a joint research team between college teachers and farmers.

During my stay at the Poolmoo College from July to October 2007, a new building was being constructed nearby. It will house the new "Agricultural Information Centre" that will have laboratories where farmers can test their soil's quality, something on which a great deal of agricultural practice relies. This centre will also play a leading role in knowledge generation

through field and crop tests, which will significantly reduce the work and responsibility of Poolmoo College teachers. The reason for building such a centre within the village, without the direct control of the government, is that many people in Hongdong criticize state run agricultural institutes: The work done there is not relevant enough to farmers' daily needs and practices, and, like many other bureaucratic institutions around the globe, they close at 5 pm and on weekends which gives the impression that government institutions are not as devoted to farmers' practice as they should be. It is the long cherished wish of many people in Hongdong to decentralize not only institutes of knowledge sharing (like schools), but also institutes that generate knowledge directly linked to farmers daily needs such as this new information centre. In their eyes, such institutes should be built where the knowledge is needed: not in cities but in the countryside, and they should adjust their opening hours and practices to the needs of the farmers. In addition to those considerations, it is also intended that this institute would connect different networks of local farmers that so far were separated. This matter will be discussed in next section (5.3.3).

Another project is a joint research team with several local farmers that the head of research and school organization at the Poolmoo College is currently establishing. This team conducted tests of various rice farming methods and possible combinations and could already prove that the harvested rice quantity is lowered only insignificantly if methods that differ from the mainstream are used. In his eyes, the cooperation between him and the farmers should be further developed. They were already able to conduct test crops in the last two or three years. Hence, the first step of collaboration (that of implementation) is well established. The next would be that farmers learn to generate scientific data themselves, but so far, they say they are too busy to do that.

Another future plan is to establish a lifetime education centre that would enable knowledge sharing and learning by socialization after the school years. It would combine a community library and a meeting place for spontaneous or arranged gatherings, where not only knowledge could be exchanged but – maybe more important – friendship and networks could be fostered.

Although in Hongdong, many endeavours have been made to connect different (groups of) farmers, a fluid communication with all the different CoPs could not (yet) be established. Possible reasons for that are discussed in the next section.

5.3.3 Different Networks Have Different Access to Institutions

I was told repeatedly that teachers of either Poolmoo Schools were easy to access but only for some of the farmers in the region. Graduates from both Poolmoo Schools, refarmers, and members and leaders from both the Poolmoo Coop and the Mundangri centre can, in this respect, be seen as a network of several groups, and this network includes access to teachers. People of this part of local society tend to be more active in community life than others, and they are more outgoing to members of other CoPs than their own. I did not have the opportunity to talk to people of the other network of groups, but interviewees said that their reluctance to ask teachers for assistance is an aspect of Confucian culture in which teachers are held in extremely high esteem. This manner is prevalent in daily language; a teacher is usually addressed only as “teacher” and not by his or her name, and teachers are addressed in more polite language forms³⁵.

Although both mentioned networks of groups make a similar use of polite language, the respect for teachers is deeply rooted in the more traditional culture of the locals who did not attend one of the alternative Poolmoo Schools, and thus they are more reluctant to address the schools’ teachers. Furthermore, this group seems to have its own community life within smaller neighbour groups. Their gatherings are most often opportunities to drink and chat together, and they are usually only for men. Hence, knowledge boundaries are created that hamper sharing but also generation of more sustainable farming practices.

It is important to note that the boundary between the two networks in Hongdong is not congruent with the one between organic and conventional farmers. Many locals switched to organic production usually applying the IRDF method, without being part of the “Poolmoo network”. This fact shows two things: That the boundary does not seem to block knowledge sharing completely, and on the other hand that IRDF seems to be very easy to learn from neighbouring farmers. Although I could not talk to direct resource users of the network that is more distant to the Poolmoo Schools, I could question a staff member of the Nonghyop, the nationwide cooperative whose members usually are a part of this network. Her office is a contact point for a group of about 400 (mostly IRDF) organic farmers who seek help with paper work that is needed to access and communicate with institutional regulations concerning organic agriculture. She is a refarmer and tries to use her multimembership to connect the two networks. However, Poolmoo

³⁵ Politeness is a prevalent issue in the Korean as well as in the Japanese language. In both languages, verbs are not conjugated but altered in accordance to the social positions of both the speaker and the listener, and other phrases are also chosen carefully. There are more than ten levels of politeness in the Korean language of which most often only three are used.

College teachers are suspicious that the Nonghyop's influence on organic farming might not be in line with the long-term aims of community development. However, Poolmoo College teachers, and people from both the Nonghyop and the Poolmoo Coop agreed to establish the soon to be opened agricultural information centre and to pay for the running costs. The government agreed with that plan and paid the building. In the case of this newly established institution, means were allocated originating from different involved institutions. If the outcome enables collaborations between all involved groups and networks, as well as generation and sharing of knowledge for sustainable natural resource use, has yet to be proved.

It is a great opportunity to study the adaptation of the IRDF method in Hongdong, where farmers and other farming experts can look back on long and big scale experiences with it. Members of the driving local institutions such as the Poolmoo College and the Poolmoo Coop, as well as of national institutions such as universities, engage in the discussion about and the critical examination of the method. The next section deals with how they evaluate the method.

5.4 Evaluation of IRDF and Other Organic Methods

The ducks are a true blessing since they free farmers from the use of chemical fertilizers, herbicides, and pesticides or from strenuous manual weeding. Furthermore, to some extent, they allow secure and diversified incomes at the same time. However, some farmers, teachers and other experts in and outside Hongdong are somewhat critical about “how organic” and how economical the method is in terms of allocation of human and natural resources. Combinations of the method, or the application of other methods that are used by organic rice farmers in Hongdong or other areas in South Korea and Japan might allow a more adequate allocation of human, financial and natural resources. In order to understand how the methods potential can be evaluated a comparison to those other methods is insightful. Not only local farmers and other local farming experts take part in this ongoing evaluation process. Mr. Furuno, Mr. Inaba and Mr. Iwabuchi, the three ambassadors of three different methods also visited the Hongdong area in order to share thoughts and ideas about organic rice farming, to teach details about their own method, and to be conducive to the discussion.

For the comparison of the different organic farming methods that extrapolates to other regions in Asia too, several criteria have to be taken into account. First of all, only if a farming method can fulfil the precondition of secure livelihood, direct resource users can carry on farming and/or experimenting with other methods as well. Second, those methods have to enable farmers a sustainable allocation of human, financial and natural resources. In addition, a third criterion plays a role: The different methods have different potentials for sharing knowledge with different parts of society, like between producers and consumers.

5.4.1 Comparison of IRDF with Other Environmental Sound Rice Farming Methods

Table 5 is a comparison of the four methods. I call Mr. Furuno and others who actively promote those methods “ambassadors” because the different methods are usually referred to as “Furuno’s method”, “Inaba’s method”, or “Iwabuchi’s method”.

Table 5: Different organic farming methods taught and/or evaluated in the Poolmoo College and other Hongdong institutions.

Method	Ambassa- dor / Origin	Description	Evaluation
IRDF	Mr. Takao Furuno	Ducks control weed and pests, and manure and paddle the soil. About 150-300 ducklings per ha of a crossbred or small size type are applied. The field has to be surrounded by a fence which keeps predators outside and the ducks inside. A shed for the ducks should be provided.	Ducks do not only eat harmful weeds and pests. The biodiversity is reduced to some pests, microbes and sometimes a small amount of sturdy weed that are not eaten by ducks. IRDF allows very clear (almost weedless) results that secure farmers' livelihoods by rice and (in most regions) additional duck meat production. The method can further be combined with fish production and Azolla input. Installation of nets or other kinds of fences, as well as the important levelling of the field, can be difficult and is, like the feeding of the ducks, time consuming.
Snail method	Origin probably South-East Asia	A type of apple snails (not the golden apple snail) eats most weeds very efficiently but neither the rice plants, nor any pests. About 20kg of small snails per 33 are (1'000 Pyong) are applied.	The method is easy to learn and apply. It requires less labour than IRDF since there is no need for feeding twice a day and thus it enables farmers with diversified incomes to better pursue other work (multimembership). Snails can possibly cause a problem to the local flora or fauna, but in South Korea, there has been no prove for that yet. There, the snails do not survive after the water on the paddy fields is drained.
Rice-bran method	Mr. Mitsukuni Inaba and his NGO	Rice-bran, raw or in form of manufactured pellets, are spread after transplantation. The earth is covered with a layer that inhibits germination of weeds, and microbes change the material slowly to nutrition. Additional weed control has to be carried out manually (by machines): before transplantation by two-time rotary, and during the growing season by manual rotary between the lines.	The recycling of rice processing wastes (rice bran) as nutrition and weed suppressor allows closed material cycles of rice by-products. As rotary and levelling of the fields is a delicate and strenuous work that is disliked by farmers, two-times rotary that is needed for this method has not yet been carried out in Hongdong. If applied properly and continually over some years, plant and insect communities are balanced and allow the same quantity of rice yield as other methods (also conventional ones). However, the field needs several growing seasons to adjust to the method. Rice harvest is possibly lower during that time but similar after this period. An additional biotope area that border on the paddy fields is needed to allow aquatic species year-round hideaways.

Winter Flooded Rice Field (WFRF)	Mr. Shigeki Iwabuchi and his NGO	The technique is similar to the Rice-bran method. Rice-brans are applied too, but no rotary or ploughing is carried out at all. Furthermore, paddy fields are flooded almost all year round, allowing migrating birds to winter there.	The WFRF has the same ecological benefits as Rice-bran method, but the year round flooding (except during the harvest-month) leads to a difference in the plant and insect communities. Depending on the area, migrating birds enrich the biodiversity spectacularly. The method has a close relation to waterfowl preservation and is restricted to areas with enough water and distinct winter seasons. This method has not yet been implemented in Hongdong, but on rice paddy fields in a marshland close by.
---	----------------------------------	--	---

IRDF has already been introduced. The costs and efforts for the fence, sheds and feeding can be considered more expensive compared to means for other methods. However, the fact that most farmers used and still use it shows that IRDF is most suitable to secure livelihoods. The environmental impact can only be balanced by sound combinations, i.e. by integrating fish and/or Azolla. For the snail method, no fences or other additional materials are needed, only small snails in a suitable number have to be bought. It is used by a growing number of farmers and is evaluated as the easiest of the four methods to learn and apply. However, there are concerns about the environmental impact of the snails. The methods of rice-bran and Winter Flooded Rice Field (WFRF) both allow similar harvests like the other two methods, but in addition, they enable the development of a rich biodiversity on the rice fields. However, additional land for year-round hideaways (see pictures on page 86) for water creators that cannot be used for rice growing has to be provided, and harvest is possibly decreasing for the first years after the method is introduced.

Members of the two biggest organic farmer groups in and around Hongdong municipality use those methods in about the following ratios: The big Poolmoo Coop with about 800 farmers: Roughly 65% apply ducks, 35% snails, and only a small number of farmers use rice-bran for weed control. Within the Nonghyop group of 400 farmers, about 70% use ducks and 30% snails, with almost no rice-bran users. The share of IRDF users was bigger some year ago, before the snail method became more popular. WFRF is not yet used in Hongdong, but trials are going to be conducted on the fields of the Poolmoo College. A pond for year-round hideaways is already constructed beside those fields. In addition to the members of the two organic farmer groups, there are organic farmers who directly market their products.

Efficiency in organic weed, pests and plant disease control is not only dependent on which of the four compared methods is used. Other, more general knowledge like skills with machines and

the quantity of rice seedlings per hill is important too. In addition there are more technical details to be considered like proper seed selection, and in organic rice farming, a proper seed sterilization technique has to go without chemicals³⁶.

5.4.2 Communicative Aspects of the Different Methods

This section looks at how the above mentioned methods are communicated between farming experts as well as to consumers who influence the use of methods by what they buy. All the three “method ambassadors” had paid at least one visit to Hongdong. They were also visited by community leaders, teachers and/or students several times. Interviewees from Hongdong are very fond of the three ambassadors and speak about them as “good teachers”, meaning that their thinking is close to the farmers’ practical needs. All of them farm own land and therefore are not only able to display what they teach, but also to learn from what they practice themselves. The reason why I comment on those persons in more detail is that, following the arguments from chapter three, they are members of multiple communities of practice who actively use their membership to connect different CoPs and to create knowledge.

Integrated Rice and Duck Farming

I already commented on Mr. Furuno’s efforts to spread IRDF. A possible reason why his method is a solution to the practical needs to organic or other low input farmers is, that he combines knowledge that is derived from own practice with what he garnered from his educational background at an agri-



Picture 7: Mr. Furuno explains details on Integrated Rice and Duck Farming to Poolmoo College teachers and students (Dominik Rutz, 2007)

³⁶ A possibility to sterilize rice seeds organically was shown to the participants of the Utsunomia Symposium. Rice seeds are soaked several times in 60° C hot water for ten minutes. For an impression of machines that are developed for that seed sterilization process see <http://www.tiger-k.co.jp/tig/saigatop.html>.

cultural university. The English issue of his book is a practical guidance not for mere adoption but for adaptation according to the local conditions. This guidance includes conducting own trials with test plots. This way, his book not only teaches the basics of his method but it is also a guidance to do unsophisticated and practical research. In addition, he uses connections to Universities to integrate reliable data on weed and pest control effects of the ducks in the English issue. He not only issues practical publications but was awarded an agronomical PhD for the publication of his thesis in 2007.

Rice-bran method

The rice-bran method has already come to use in Hongdong for some years, but all interviewees

that commented on it said that it is difficult to control weed with it. But they did not follow all that is taught by Mr. Inaba: Two-times rotary as preventive weed control was not yet applied. Mr. Inaba's NGO organized the main part of the Utsunomia Symposium. The solution to the main difficulty of his method – weed control – is a creative mechanization: To spread the rice bran evenly after transplantation is a lot easier with unprocessed bran but much more difficult with



Picture 8: Mr. Inaba's rice transplantation machine with a mechanism that spreads rice-bran pellets evenly (Dominik Rutz, 2007)

the somewhat more effective pellets made of rice-bran or other material. Therefore, Mr. Inaba adjusted a mechanism on his transplantation machine depicted in picture 8 (grey tubes out of a green container for pellets) just behind the transplantation mechanism. As this method's efficiency demands quite an excessive use of well equipped machinery, this method is only feasible for the better off, or it can be combined with other methods.

Winter Flooded Rice Field

The way fields that are farmed with the WFRF method were presented to all the participants of the Utsunomia symposium was remarkable. During this event, the biodiversity of the fields and

the neighbouring ponds were displayed in plastic bins, a visualization of the creatures that are usually hidden from human eyes. Participants would catch insects and amphibians with nets which were then arranged in shallow plastic bins, showed on picture 9. Furthermore, the soil quality assessment that was done in the meantime showed measurements that pleased all the pundits.

There are many other similar events that are organized by Mr. Iwabuchi and several NGOs or NPOs he leads or is part of. Different sorts of people gather in those events, and given the admiration many

Japanese pay to the nature, such events are well frequented. Some events include an additional attraction to the rich biodiversity: Wild geese or other migrating birds winter where precious first quality rice is grown in summer. Therefore, this method combines three issues of interest: organic rice production, biodiversity and migrant bird preservation.



Picture 9: Biodiversity from WFRF made visible with the help of Korean and Japanese Symposium participants and Mr. Iwabuchi (with the hat) overlooking the result (Dominik Rutz, 2007)



Picture 10: Hideaways beside rice-bran fields above (the man on the left with the megaphone is Mr. Inaba) and WFRF below (Dominik Rutz, 2007. Pictures were taken during the Utsunomia symposium)

The link to the consumers is one of the important aspects of alternative farming methods, since much of their success is determined by the demand side of the market. Accordingly, a method has not only to be evaluated by how well related knowledge is shared with producers but also with consumers. Consumers need some information that allows them to know what quality they buy. Organic labels provide such information, but especially in South Korea, where there is some confusion about those, some extra connection to the rice production is vital. An example for such information could be what impact the method has on the environment or information about the area where it has been produced. On the other hand, producers would like to know what quality and what kind of products consumers demand. Consequently, people foster communication between both groups in order to bring about mutual understanding.

In this respect, the ducks are said to play a decisive role. For instance, they can be observed by consumers who visit the Mundangri Centre on Infovillage events. One yearly event (see picture 11) is organized for city families when they can take part in releasing the ducks into the fields³⁷. To watch the ducks playfully control weed and pests is great fun for city people. Interviewees said that this communicative potential of the duck is a great difference to snails that are little and unimpressive and dwell mostly beneath the water surface.



Picture 11: Pictures of the duck releasing event in Mundangri, Hongdong (source: mundang.invil.org 2007)

³⁷ The event's name can be translated with "Duck-Rice Story Festival" (오리쌀 이야기 축제) and makes part of a programme called „Urban-Rural Co-living and Co-operation" (함께 하는 도농상생)

But city people are not the only ones who enjoy sitting on the fields' edge and watch the ducks. Farmers are especially happy to watch those animals playfully eating weeds and pests. These happenings are repeatedly said to have a great impact on the successful sharing of the method. It is like a spiral: Farmers have more time to do other than farming work, while at the same time, they can observe how the ducks take pleasure in what farmers would call strenuous work.

The next section comprises of case studies of the farmers I interviewed. The comparison of the different cases allows a more subtle evaluation of the different methods.

5.4.3 How the Methods are Used in Hongdong

The six farmers I interviewed use and used different methods. In order to get information about what methods they use, I usually let them tell me when they changed to IRDF or to other methods and why. The farming practices of the different persons are compiled in table 6:

Table 6: Organic rice farming methods used by interview partners

Issue Inter-view Partner	When started farming	When went organic	Other work in the household than farming	Method story
Interview Partner #1: She moved from Seoul to Hongdong in 2002 and graduated from the Poolmoo College in 2004.	In 2004, main crops are ginger and rice.	2004	Sustains her livelihood alone. She cares for her niece who studies at the Poolmoo High-school. For that she receives money from niece's parents.	No rice in 2004. She applied Snail method in 2005 and 2006, but didn't use a specific method in 2007 with a lot of weed as a result. Therefore, in 2008, she will apply snails again.
Interview Partner #2: He graduated from the Poolmoo High School in 1987.	1987	In 1998. Before only partly.	Secretary work in a county group for organic farming and in Poolmoo Coop. His wife is a nurse because both agreed that farming is not a secure income.	When he transferred all his land to organic production, he started to apply ducks and also snails. But he doesn't want to apply ducks or snails any more, for he understands these methods not as environmentally sound any more.
Interview Partner #3: She and her husband are refarmers.	1998	1998	Secretary in the Nonghyop group of organic farmers. Her husband farms land in another village, half of it organically.	She used IRDF for the first six years. Since 2005 she switched to the snail method that allows later plantation, a method she prefers.

Interview Partner #4: He graduated from the Poolmoo High School.	1980's	1980's	Head of the Poolmoo Coop since 2001	He does not use IRDF but snails for weed control and rice-bran for nutrition. He also raises fish in paddy fields.
Interview Partner #5: He is a refarmer.	1998	In 2000. Before only partly.	He engages in teaching activities and writes books on the issue of sustainable housing.	In 1998, he farmed 50% of his land organically with IRDF, in 1999 75%. Since 2000, he uses IRDF on all the rice paddies.
Interview Partner #6: He is the first refarmer; we already accompanied him in section 4.1.2.	1997	1997	He engages in some teaching activities. Classical job division like in almost any Korean farm; he would farm the wetland and his wife the crops on upland. Nevertheless, they help each other sometimes.	Between 1997 and 2001, he applied only IRDF. Since 2001 he uses ducks 60%, snails 20%, and both together 20%. On mixed system plots, he cannot see many snails, the ducks eat them.

Interview partner #1 uttered the same concerns as #2 that snails as foreign species can be harmful to the environment. But she experienced a year without using snails or other methods at all that resulted in decrease of harvest because of too much weed. Consequently, she will focus on her livelihood at the expense of environmental concerns and will apply snails again. Interview partner #6 is the only farmer I heard of who tried IRDF the way Mr. Furuno teaches it: In 2007, he took the ducks out just before the rice plants came into ears, after two months of releasing them in the fields. He did so because he wanted to test the benefits of the ducks' pest control effect. The results were good, but he did not notice a significant difference to other years or to neighbouring fields.

5.4.4 The Future of IRDF in Hongdong

Many people in the area have followed the principle and they were successful with it. Farmers and other farming experts in Hongdong can look back on a stock of experiences with the ducks in the paddy fields. So far, it seems that the graph of the number of people which are using the method is following a bell-shaped curve. The present situation is around the peak or just after it. In and around Hongdong, the number of organic farmers is not increasing any more. Many organic farmers change to either more delicate methods such as rice-bran or WFRF, or to the simpler and less time consuming snail-method. Therefore, there will be less ducks playfully

weeding around Hongdong in the future. Integrated Rice and Duck Farming helped many to make a quick change to organic farming what allowed them to sustain their livelihoods by adapting to market conditions with a method that allows for a secure organic rice harvest. But the method will, for some part at least, give way to other methods.

IRDF gave not only individuals more opportunities for sustainable natural resource use. The whole community profits from the connection that the ducks allow: to consumers in city areas, to city people who decide to migrate to the countryside and start farming, and finally to other people who promote other farming methods or critically think about sustainability concerning different aspects of human action. We have to wait and see if those opportunities will be seized.

6 Summary and Discussion

6.1 Summary

This thesis describes and analyzes knowledge sharing and learning processes within the international network of Integrated Rice and Duck Farming (IRDF) and within the local institutional structure of Hongdong in South Korea. IRDF is used by the large majority (65-70%, around one thousand) of organic farmers in the Hongdong area. Other than there, the method has found practical application in many countries in Northeast, South East and South Asia. In those other countries, ducks have been raised and herded either near or on rice paddy fields for centuries. Thus, it is not totally clear if the invention of this method can be ascribed to one person. Based on what I learned through qualitative research in South Korea and Japan, and in literature available on the Homepages of Food and Agriculture Organization of the United Nations (FAO) and the International Rice Research Institute (IRRI), the *systematic* use of ducks to control weed, pests, and fertilization in organic rice paddy farming was invented in the late 1980's by a Japanese farmer and agricultural PhD, Mr. Takao Furuno. Those sources claim that some tens of thousand farmers use the method in this manner. A moderate number of farmers use the duck method in different areas of: Japan, the Philippines, northern, central and southern Vietnam, Laos, Papua New Guinea, Cambodia and Malaysia. A greater number of farmers per region apply the method in different areas of China, Bangladesh and India. In addition to Hongdong, there are several areas in South Korea where the method is used by more than hundred farmers per area. A few days after rice transplantation, around 10 day old duckling in a sufficient number per area (150-300 ducklings per hectare) can be released to the rice paddy fields where they control weeds by either eating or paddling down sprouts, eat the pests within reach of their beaks, and fertilize and paddle the soil. Ducks do not eat rice plants but they do have to be taken out of the rice paddies latest when the plants grow ears, which the ducks do eat.

In order to thoroughly study how actors on various levels deal with knowledge about IRDF, analytical categories were derived from theory and other research findings about knowledge sharing and learning from both the business world and the realm of sustainable natural resource use. These insights showed that sustainable natural resource use can be supported through knowledge sharing and learning processes if these processes are understood and carried out with the right focus. This focus includes: A heterogeneous institutional structure of different groups of actors that includes collaborations between those groups, a culture of (mutual) learning, a shared focus on farmers' (and other involved actors') livelihoods, a sound mix of different knowledge

types, and an adequate allocation of means.

An institutional structure that influences, and is influenced by, knowledge sharing and learning processes can be assessed by looking at different groups and institutions. Processes of learning and knowledge sharing are ways of participating in different groups of people who share their human endeavour, called communities of practice (CoP). Boundaries between such CoPs allow a deeper level of professional specialization but hamper fluid knowledge flow across the boundary. For sharing and creating new knowledge, collaborations between different CoPs have somewhat more potential than collaborations within one and the same CoPs, but the further need more effort and more means. Thus, the means for knowledge-related activities is soundly allocated by supporting knowledge brokers who bring together and mediate between different CoPs, or multimembers who experience connections between different CoPs. Information is shared and stored differently than knowledge. As knowledge is always incorporated by any actor as personal practice and experience, collaborations between members of the same or different CoPs should not just allow for a mere sharing of crude information, but for a constant adaptation of mutually exchanged knowledge in order to fit it into new natural and social environments.

In the process of adaptation and sharing of IRDF in Hongdong, the following institutions played crucial roles: the Poolmoo Schools (Highschool and College), the local Poolmoo Cooperative (Poolmoo Coop), the Mundangri Centre, and the nationwide cooperative for farming and banking - Nonghyop. The Poolmoo Coop members consist of about 200 consumers, and of 800 producers of which the large majority produce rice with IRDF. It is a spin-off from a cooperative of Poolmoo School teachers and students, and it fosters close ties to other cooperatives in the village and to consumer cooperatives in Seoul, the capital of South Korea. Another important link to the city area is the Mundangri Centre, which per year receives about 20'000 visitors from urban areas who are interested in farming life and IRDF. About the half of the population in and around Hongdong belong to a network of the following groups: people that migrated from the city to this rural area (called refarmers), teachers, students, and graduates of both Poolmoo Schools, and members of the Poolmoo Coop and the Mundangri Centre. Within this network, people easily connect with each other: Many farmers request teachers for technical support, and teachers together with farmers and cooperative members engage in multi-party collaborations about organic farming or various other community related subjects. Farmers from the other part of local society are reluctant to address teachers or collaborating actors. They are mostly members of the local branch of the nationwide Nonghyop cooperative, which consists of about 400 organic farmers who mostly use IRDF, and of about 1'000 farmers who grow rice and other

crops with conventional methods. Both networks are more or less separated, but efforts are being made from both sides to establish connections. One outcome of these efforts is a new Agricultural Information Centre which will house not only equipment to test soil conditions but also teams that engage in activities such as joint research and management of organic labels.

The fact that farmers of both networks use organic farming methods like IRDF shows that the boundary does not completely block knowledge sharing. One possible reason for this is the quality of community life in small neighbourhood groups which is inherent to Korean culture: Groups of usually 5-10 farmers (mostly men) gather in informal communities of practice that either engage in joint labour on paddy fields or chat together. This tradition of sharing thoughts in groups, face-to-face, and on a regular basis is a cultural institution that is decidedly different from Japanese society, and it influences the way IRDF is shared and applied in the two countries: Most of the farms in Japan on which IRDF is used are one of few within a region, whereas in South Korea, there are several regions where more than hundred farmers use the method. Another reason for this difference is that, especially in the organic market, Japanese farmers usually sell their products directly to consumers, whereas in South Korea, people strive to establish cooperatives with hundreds of members, or with multiple branches in which the marketing of the goods occurs.

The Nonghyop brings to the market the lion's share of rice produced in South Korea and is responsible for maintaining a fifty-fifty divide between organic and conventional farmers in the Hongdong area: Throughout the state, the Nonghyop guarantees buying half of the total conventional rice that is produced within one municipality. Because half of the farmers in Hongdong produce rice that is sold via the organic market the conventional farmers who comprise the other half can easily sustain their livelihood with the production of conventional rice. This institutional structure hampers the efforts of actors within the Poolmoo Coop and related institutions, who strive for an area-wide implementation of organic agriculture.

The above mentioned cultural characteristic of sharing community life within small groups of neighbouring farmers is an aspect of embedded social interaction inherent to knowledge sharing processes. This notion derives from the perspective that knowledge always consists of two complementary levels - the explicit and the tacit. Thus, knowledge processes and activities need to consider not only verbal aspects of communication but also embedded social interactions like: power dynamics, ways of conceiving and relating to others, socialization, and different social roles within an institutional structure. The notion of coexisting tacit and explicit knowledge leads

also to the assumption that knowledge is place-bound in the same way humans are. Thus, to settle in or near a cluster of many overlaying CoPs (like Hongdong) usually reduces the cost of accessing knowledge bearers and also allows for more trustful relationships.

The perception that knowledge is placebound has a decisive meaning in the context of agriculture: If knowledge concerning farming practice is shared across spatial distances, it always has to be adapted to new social and natural environments. Actors from different levels and regions who collaborate to bring about sustainable natural resource use thus have to understand and respect indigenous practices and have to focus not on mere adoption but on a creative *adaptation* of new techniques. Although the natural conditions in southern Japan and the west, south and east of South Korea are similar, the method was adapted differently in Hongdong. In these areas, one rice harvest per year can be yielded in the humid subtropical climate, and times for transplantation (around June 1st) and harvest (around October 10th) are very similar. The fields can be used to grow winter wheat or green manure in the remaining time. Applying ducks for one month after transplantation is enough to clear the rice paddy fields of weed. As the weeding activity is the main reason Hongdong farmers use ducks in Hongdong, most farmers simply “rent” them from a large breeding company about 150 km south of the village for one month, between around June 10th and July 10th, and give them back after the “ducks’ job” is done. In Japan however, ducks are allowed in the paddies for a maximum of about two months, are taken out before rice plants come into ears in mid August, and can be sold in November.

Often, farmers face financial difficulties and thus have limited possibilities for managing different types of knowledge in order to secure their livelihood. Collaborations in the realm of farming practice thus have to consider sharing of different types of knowledge as well as shared problem perspectives on livelihoods. Most of the farmers in the Hongdong area depend largely on the income from harvests. Therefore, they are not willing to conduct or allow tests with new “adventurous” methods on their fields. When IRDF was tested in Hongdong on fields of the Poolmoo High School and of a graduate’s farm, success had to be demonstrated for several consecutive years before more and more farmers of the region were willing to apply it.

The Japanese language is integrated into the curriculum of both the Poolmoo Schools, and especially that of the Poolmoo College that educates people who want to become farmers. For future organic farmers, Japanese is a kind of institutional knowledge which will enable them to benefit from the discussion and inventions concerning organic farming occurring in Japan: Most technical knowledge, as well as advanced agricultural gear originates in Japan. There is a long

history of collaborations between the Poolmoo Schools and sister schools in Japan, as well as meetings between Hongdong and Japanese farmers and other farming experts. These collaborations are not self-evident, as the interactions between the two countries have not always been peaceful. For the people in Hongdong, the foundation for this collaboration is an important embedded social interaction: the official apology from teachers of the Japanese sister schools for the dread their ancestors brought to Korea during the Japanese occupation from 1910-1945.

The curriculum of the Poolmoo Schools also emphasizes other knowledge that empowers students to access different knowledge sources: All the students live in the dormitory and frequently work together on fields or engage in group activities after school. These are important opportunities to learn about embedded social interactions that make knowledge sharing and learning between each other and the teachers more fluid and long lasting.

The four organic methods that are used by rice paddy farmers in Hongdong are: IRDF, the snail-method, the rice-bran method, and the method of Winter Flooded Rice Field (WFRF). Compared to conventional rice paddy farming, these methods not only have ecologic benefits, but also economical benefits since the harvested rice can usually be sold for higher prices. Since the turn of the millennium, many farmers and farming cooperatives in South Korea applied IRDF, snail-method, or the rice-bran method to enter the organic market, which already led to growing competition and to problems in marketing the locally produce rice through the Poolmoo Coop. All methods need good water management during the rice growing phase, and on Winter Flooded Rice Fields, this applies all year round except for the one harvest month.

When the first IRDF trials were conducted in Hongdong in 1993, most farmers who cultivated either organic or conventional rice had difficulty sustaining their livelihoods. As the method proved to be sound for organic agriculture, and as the market for organic rice boomed, farmers could count on secure incomes and thus could refrain from migrating to cities. Furthermore, more and more refarmers chose life in the area that became famous for organic farming and alternative education. Knowledge about IRDF was not just kept inside Hongdong. Mr. Ju, the first farmer who allowed tests on his fields with IRDF and who now works for the Mundangri centre, engages in teaching the method in North Korea, as well as in the bordering part within China where a minority of Korean speaking people live (Yeonbyeon). Government officials from this area also visit South Korean areas to learn IRDF and other organic rice paddy farming methods.

6.2 Discussion

The research questions are elaborated following the operationalization of different analytical categories derived from other research and theory outlined in the third chapter. The three questions are:

Question one: How is knowledge shared and developed within institutional structures in Hongdong?

Question two: How is knowledge shared and developed in organic rice cultivation networks in Japan and South Korea?

Question three: What are the potentials for sustainable natural resource within of IRDF and other organic rice paddy farming methods?

<p>Question one: How is knowledge shared and developed within institutional structures in Hongdong?</p>	<p>Operationalization: Knowledge sharing and learning processes on local networks that aim for sustainable natural resource use consist of:</p> <ul style="list-style-type: none"> • A focus on adaptation rather than on adoption based on a culture of mutual learning. • Participation of Farmers in Implementation <i>and</i> Research. • A consideration of embedded social interactions and socialization. • Livelihood security enabled by a consideration of different knowledge types (sound technical knowledge, institutional/strategic knowledge, and knowledge about the environment) • An adequate allocation of means for knowledge sharing processes.
--	---

The way IRDF has been adapted in Hongdong shows that most involved actors focused pragmatically on their livelihoods. The first years, IRDF helped desperate farmers to move from the exhausting work of manually weeding fields while still sustaining their livelihoods. Although it became clear that the method has its problems with overfertilization and material cycles that are not closed, this focus on secure livelihoods is upheld rather rigidly despite concerns for the environment. The outcome is that after a month, when the fields are cleared of weeds, the ducks are taken out and given back to the breeding company. The fact that nobody knows what becomes of the ducks after that, as well as the fact that the material cycle is not adequately closed, points to a clear focus on livelihood at the expense of environmental concerns. Thus, the institutional structure of market conditions, as well as farmers' focussed approach on securing

livelihoods (by having organic rice paddies cleared of weeds) led to IRDF being adapted differently in Korea than in other countries. Only a few farmers, among them the first who applied IRDF in Hongdong, try to overcome these problems either through combinations with other techniques, or by switching to the rice-bran method, which is both more ecological and more sophisticated. The knowledge sharing activities within Hongdong and other parts of South Korea that followed the implementation phase emphasized fast and large-scale *adoption* to meet the booming market for organic rice. Therefore, it is evident that an ongoing *adaptation* process, which would have suited the market and the natural environment more sustainably, was neglected.

In most cases, the focus on livelihood did not lead directly to more inventiveness or more sustainable practice, but rather to a pragmatic way of using the ducks merely as “herbicides”. However, the fact that those methods proved that it is possible to sustain livelihoods through organic farming motivated people to stay in or even move to the rural area of Hongdong. Therefore, IRDF *indirectly* led to more inventiveness: Compared to other areas in South Korea that are being drained of (especially young) people, a growing number of locals, refarmers, their interlinkages, and their networks extend the realm of possibility for creative friction. Actors live in close proximity to each other and about the half of the population benefits from this nearness which reduces the costs of collaborations and allows for more trustful personal relationships and networks.

Furthermore, the method also allowed more resources to be allocated for sharing the method interregionally and internationally. Mr. Furuno, as well as Mr. Ju who was the first to whom the method brought a secure livelihood in Hongdong, were both farmers who had to weed manually before they applied IRDF. Today, they both engage in collaborations that reach beyond regional and national boundaries.

The fact that no market for ducks could be found or developed highlights the relevance of institutional and strategic knowledge in sustainable natural resource use. Institutional knowledge to negotiate within the market setting and strategic knowledge to influence it would both be important to integrate ducks not only in rice paddies but also more meaningfully within the material cycle. Given the fact that eating ducks is unusual for Koreans, a project to do so would demand quite a lot of financial and human efforts such as a collaboration between different CoPs, for instance between (chains of) restaurants and producer cooperatives.

Institutional/strategic knowledge, as well as consciousness of sound embedded social interaction are both important aspects for successful multi-party collaborations. Those skills are, to some extent, integrated in the curricula of the Poolmoo Schools. The fact that the Poolmoo Coop is a successful spin-off of the school cooperative shows that what students learned through participation, i.e. regulations concerning organic agriculture, how to run a cooperative, as well as social skills, found practical application. However, the lack of market integration for the ducks, as well as the fact that the Poolmoo Coop reacted insufficiently to the growing competition within the organic rice market, shows that marketing skills have to increase in importance at either the Poolmoo Schools or Cooperatives.

As more people migrate to the area, and as the number of institutions grows, the structure of overlaying CoPs in Hongdong is getting more heterogeneous. On one hand, this expands the realm of possibility for creative friction. On the other hand, more means need to be adequately allocated for knowledge sharing processes across a persistent boundary between two networks, as well as across new boundaries caused by the growing variety. In the case of Hongdong supporting such multi-party collaborations could be brought about by: supporting locals in learning institutional/strategic knowledge, supporting refarmers in learning technical knowledge about farming, supporting institutions that employ multimembers or multi-party collaborations. Efforts in this direction are being made by:

- The Poolmoo Schools that are teaching even more social science and research than farming technique. With this curriculum, graduates should not only be able to farm land but also to negotiate in or influence the institutional structure (which is getting more heterogeneous), and to achieve membership not only in farming but also in research CoPs.
- The “Refarmer School” NGO, the “Right Farmer” NGO, and the Mundangri Centre that focus on sharing technical knowledge concerning organic farming with refarmers or those who become refarmers. This enables refarmers to broker knowledge between the farming practice and the network they already had before they came to Hongdong.
- The Poolmoo Coop that is establishing collaborations with different institutions in both the Hongdong area and in the cities.

Until today however, those communities of practice and their interlinkages neither support the further development of IRDF, nor do they share enough institutional/strategic knowledge and social relationship with members of different CoPs of the Nonghyop network. We have to wait and see the results of the new Agricultural Information Centre, the village library and life education centre, and the projected regular community festivals to see if they help overcome these shortcomings.

The story of IRDF adaptation in Hongdong demonstrates that different knowledge types as well as the means for sharing them were – and still are – crucial for the process. Knowledge about the natural environment and a caring attitude that motivates farmers to apply organic farming methods played and still plays a crucial role in Hongdong. But even with the pre-condition of motivated farmers in the early stage of IRDF adaptation in Hongdong, success had to be demonstrated for several consecutive years before farmers would apply the method on their own fields. The resources that the Poolmoo Schools as well as those that an individual who graduated from the school allocated by conducting tests on their rice paddies, were crucial in the initial stage of IRDF adaptation. As IRDF and other organic paddy rice farming techniques need to be further evaluated and developed in order to adapt them to a healthy long-term way of farming, more financial and human efforts are needed. Those should include not only learning Japanese in order to better share knowledge internationally, but also more profound knowledge about the natural environment (soil condition, biodiversity of plants and animals) as well as the social environment (marketing setting).

The various efforts mentioned above did already bring about organic agriculture on roughly half of the rice paddy fields. But both the nationwide regulations and the pragmatic focus on the livelihoods of the remaining conventional farmers hamper the area-wide implementation of organic farming. In the case of Hongdong, the interplay between the institutional setting at the national level and the conversion of a large part of the local farmers to organic agriculture helped conventional farmers better sustain their livelihoods as well.

<p>Question two: How is knowledge shared and developed in organic rice cultivation networks in Japan and South Korea?</p>	<p>Operationalization: Knowledge sharing and learning processes in international and national networks that aim for sustainable natural resource use consist of:</p> <ul style="list-style-type: none"> • Embedded social interaction like cultural characteristics and interactions. • Livelihood security of involved actors • The way means are allocated
--	--

The history of the Poolmoo High School shows how important livelihood security is for knowledge sharing in natural resource use: The founders had to beg parents to send children to school instead of overburdening them with farm work. This was a long time ago, and these days, the income per capita has risen dramatically. Education has become affordable, and in Hongdong, more and more means are allocated for supporting knowledge sharing institutions. However, when compared to Japan, the livelihood of South Korean farmers is not very diversified and secure. In Japan, farmers receive more subsidies than in South Korea and usually

sustain their livelihood with a diversified income that largely depends on off-farm work. Hence, less means can be allocated for developing technical knowledge about organic farming or for developing sophisticated agricultural gear. This possibly explains the difference between the “inventiveness” of Japanese and South Korean actors in organic agriculture networks.

The market for duck meat in Japan and South Korea is quite different, which led to different adaptations of the method in South Korea. Additionally, there are differences in the way this and other methods are shared within the two countries: First, Koreans traditionally have a culture of verbal knowledge sharing, usually within neighbouring groups. Knowledge is shared more locally than in Japan, where written knowledge sources play a more important role. Second, the way most of the organically produced goods are marketed is different: Direct marketing is common in Japan, whereas marketing in South Korea is done in bigger cooperatives. Both knowledge sharing traditions and marketing styles are embedded social interactions that influence knowledge sharing and learning processes. In order to find better ways to market organic products, producer members of Hongdong cooperatives would have to participate in developing new ways to market products, a participative process for which knowledge sharing traditions in small groups may have some potential.

The foundation of the cooperation between Poolmoo and Japanese sister schools was an official apology. This base enabled a peaceful social interaction, from which more and more links between Hongdong and the Japanese network of organic farming grew. Those links were the starting point for acknowledging the importance of organic agriculture in Hongdong, and later for sharing knowledge about Integrated Rice and Duck Farming, the rice-bran method, and the Winter Flooded Rice Field method. After these ties were developed, they needed to be fostered through frequent visits, gatherings, and collaborations. Those are all knowledge-related activities that need to have resources allocated like for translations during knowledge platforms such as regular meetings, symposiums, and of discussions in media such as books and journals. In this context, the resources that the Poolmoo Schools allocate to teaching students Japanese are crucial. Those resources may be much more relevant for the interconnection within the organic farming network in the two countries than mere translations of texts, because they enable students and graduates to share not only explicit but also tacit knowledge with Japanese people with whom they eventually get to know personally.

<p>Question three: What are the potentials for sustainable natural resource use within IRDF and other organic rice paddy farming methods?</p>	<p>Operationalization: The potential of a rice paddy farming method in terms of sustainable natural resource use depends on how it enables knowledge sharing and learning processes. This involves:</p> <ul style="list-style-type: none"> • The ease with which individuals can alter and adapt the method to local conditions. • Securing farmers' livelihoods through a sound allocation of human, financial, and natural resources.
--	--

If carried out correctly, all the four methods yield the same amount of rice. Thus, the possibility for South Korean organic farmers to secure their livelihoods using any method *can* be the same. But for sustainable livelihoods and the knowledge-related processes that support them, different aspects of sustainability, i.e. how human, financial and natural resources are allocated, have to be considered:

Sound allocation of human resources: The least labour intensive method is the snail-method. It not only needs less labour than IRDF, but is also less binding. Farmers who do not have to feed ducks twice every day can be better employed in off-farm work. Diversified incomes are important for securing livelihoods in a rapidly changing economic environment, as well as for fostering joints within the institutional structure with respect to knowledge sharing processes. However, farmers who use ducks to control weeds have much more time for work other than weeding. In contrast, weeding or other activities for managing biodiversity on rice-bran and WFRF fields is not balanced and can be time-consuming.

Sound allocation of financial resources: If snails are used instead of ducks, investments in buying and building basic equipment for infrastructure needs such as duck sheds, nets or other type of fences, and facilities to breed and train ducklings are not needed. Both the initial and the running costs are less for the snail method compared to the duck method. However, for effective weed and pest control (including Golden Apple Snail), and fertilization, the ducks can be an alternative to expensive agrochemicals. In some countries, the duck meat or eggs are an additional income for farmers, and they can use the same field to farm both rice and duck at the same time, except, or course, the month before harvest. Costs for nets can be high if predators are a threat to ducks. The rice-bran method needs investment in good gear for a two-time rotary.

Sound allocation of natural resources: In South Korea, unlike in countries where ducks are eaten, IRDF ducks are not integrated within a sound material cycle. However, the method allows farmers to do away with agrochemicals that are harmful to both nature and humans. A sound combination with fish and Azolla can help to overcome the ecological limitations of IRDF. The ecological impact of the snails has not yet been measured, but it has been used for several years, and there have been no reports a negative impact. The rice-bran and the WFRF method consider

a sound allocation of natural resources: Unlike the other methods, those fields include all different sorts of plants and animals. If those creatures are well managed, they enable an adequate rice harvest. Furthermore, they meaningfully re-cycle rice-bran as fertilizer and weed suppressor. The rice-bran and the WFRF method need more area than the other methods for additional ponds beside paddy fields.

IRDF can be altered to fit within different environments. The basic pattern is easy to learn through mere observation. However, to use the method sustainably, farmers have to consider combinations to overcome ecological limitations. In areas where duck herding traditions near or on rice paddies pre-existed, the method needs only to be fine-tuned in order to focus on systematic weed control. In South Korea, the way the IRDF as well as the snail method are used by the large majority of organic farmers does not differ much from the symptom focused attitude prevalent with conventional farming. Compared to the rice-bran method and WFRF, which demand a deeper understanding of biodiversity, those methods allow a quicker adaptation to local conditions and the market for organic rice. Using ducks and snails for weed control thus better secures farmers' livelihoods, but those methods can cause ecological problems. Fields farmed with the rice-bran and WFRF method need a few years before they provide a secure harvest. Together with a sound combination of IRDF with fish and/or Azolla, they can, if correctly carried out, secure farmers livelihood without causing ecological problems.

Apart from their potential to react to a changing market environment, the four methods have different potentials for influencing this setting through communication between producers and consumers. The attraction that ducks have for people is encouraged by the Mundangri centre in Hongdong. It organizes events that demonstrate how the ducks can make farming fun for both producers and consumers. Although at first sight, the biodiversity on rice-bran or WFRF farms do not attract people as much as the ducks, the variety of creatures that live in those fields can be made visible during events. In winter, migrant birds on WFRF are another attraction that can be used to share knowledge about organic farming methods with consumers. Knowledge about the environment can motivate producers to use natural resources more sustainably, and it can also motivate consumers to buy more goods that are produced in this manner.

6.3 Conclusion

The systematic integration of ducks to control weeds, pests and fertilization can be considered an unsophisticated rice paddy farming technique, which empowers farming households to sustain their livelihood without agrochemicals. The process of adapting Integrated Rice and Duck Farming (IRDF) in Hongdong shows that various characteristics of institutional structures in the involved regions influence the way knowledge is dealt with. Differences between South Korea and Japan in terms of farmers' livelihood security, the organic market, and embedded social interaction influenced the development and sharing of IRDF in both countries. The local network of co-present communities of practice and different institutions in Hongdong was a starting point for the sharing of IRDF in South Korea, which eventually led to more farmers using the method than in Japan. In Hongdong, the physical proximity of members of different communities of practice who engaged in collaborations, as well as the fluidity of verbal communication between local farmers were crucial for this process. However, these collaborations have not yet addressed the method's inherent limitations in terms of sustainable long-term usage of natural resources.

IRDF not only offers possibilities for more sustainable *natural* resource use. Because it is less time consuming than manual weeding practices, farmers can engage in work other than weeding, such as knowledge sharing and learning activities. Hence, it also enables a more sustainable allocation of *human* resources. As this thesis shows, providing additional capital, labour and sufficient space for knowledge sharing processes and activities is crucial for sharing and adapting sustainable farming methods. The community development in Hongdong was largely determined on the one hand by a mix of private endeavours begun by motivated farmers and other individuals who founded and maintained different institutions which eventually led to the allocations of official resources *after* the success of the school and the Integrated Rice and Duck Farming was proved.

When comparing the developments in the Hongdong area before and after IRDF found wider application in Hongdong, this comparison deepens understanding of the impact an organic farming method can have. In this case, its success functioned as a catalyst for the development of the rural area, in which now, a growing number of overlaying communities of practice now engage in creative collaborations. These collaborations will eventually develop more sustainable ways of applying IRDF and other methods.

In regions with a booming organic market, as well as in regions where agrochemicals are not readily accessible for farmers, IRDF has the potential to allocate human, financial and natural resources more sustainably. When compared to other organic rice paddy farming systems, IRDF can be called a stepping stone to applying and sharing more sustainable combinations or methods that allow biodiversity and complete material cycles like the rice-bran or the Winter Flooded Rice Field method. The story of the IRDF method is a telling example of how knowledge can enable a more sustainable practice, and how this practice can catalyze knowledge sharing and learning processes.

IRDF was altered in consideration of the local conditions. However, after developing a basic working model, it has since been shared with a focus on *adoption* rather than on creative *adaptation*. In this case, the process of adoption has facilitated the implementation of organic rice farming on many South Korean farms. However, the environmental concerns merely shifted from agrochemicals to the negative effects of ducks and this shows that IRDF is only one step towards sustainable natural resource use. The pragmatic focus on livelihoods of farmers who use ducks this way, as well as of farmers that produce conventional rice that has guaranteed acceptance due to nationwide regulations lead to limitations to the implementation of long-term sustainable natural resource use. To overcome these shortcomings, either technical, or institutional/strategic, or environmental knowledge will have to be shared mutually between involved actors, and thought and developed further. Mutual learning in such collaborations does not only depend on a shared vocabulary, but also on sharing problem perspectives, which can only be brought about by continuous knowledge sharing and learning processes that take into consideration embedded social interactions.

6.4 Outlook

In this thesis, the impact of sharing and applying Integrated Rice and Duck Farming on sustainable natural resource use was studied. A focus on a particular locality was maintained, which considered the cultural characteristics of actors involved on the national and bilateral level, and as such, the arguments that are derived from those insights might have limitations. The analytical categories could not all be applied to a larger geographical scale, especially with regards to areas in South and South East Asia. Statements from interview partners as well as those found in literature pointed to connections between these areas and the network that was studied in this thesis, such as the Asian symposium on IRDF that is held every 2-3 years. Both the statements and the literature that is available in English only briefly mentioned practices similar to IRDF that pre-existed in those areas. Further research with a focus in other Asian nations, as well as literature research in other languages would be necessary in order to scrutinize if the systematic integration of ducks in rice paddy field is really a new invention or an age old method, or both. Such research should also consider more technical aspects of the method. It still needs to be seen if the long-term application of IRDF is suitable to the environment and to secure livelihoods, and what will become of ducks that are used in one growing season the next time rice is transplanted, as by then they are generally too big to suit the basic principle of IRDF.

Nevertheless, the data collected in this study proved that the IRDF method is discussed in various regions, and is shared in networks between and within them. In the vast areas of this earth where rice is grown in paddy fields, providing nutrition to a growing number of people, it is essential to see to it that green revolution techniques may already have replaced the tradition of herding ducks beside or on rice paddies. In this context, sharing and applying Integrated Rice and Duck Farming could mean a revival of those traditions with a more systematic – and a more acknowledged – integration of ducks, and thus helps mitigate poverty.

In Hongdong, it will be interesting to see if new joint research teams and institutions will consider environmental sound combinations of IRDF that are already used in different Asian regions, and about which scholars have issued publications. There, solutions have to be found how to treat ducks within more integrated material cycles. If this can be achieved, knowledge is not only pragmatically shared and applied, but also cultivated and further developed.

Literature

- Agrawal, Arun** 1995: *Dismantling the Divide Between Indigenous and Scientific Knowledge*. In: Development and Change, Vol. 26. No. 3. 413-439.
- Ahmed Gazi Jashim Uddin; Malik Anwar Khan; James P Biswas; Rafiqul Islam & Aminul Islam** 2004a: *Completion Report on Integrated Rice Cum Duck Farming for Resource Poor Farm Households*. Poverty Elimination Through Rice Research Assistance (PETTRA). Bangladesh. (Published June 2004, accessed 4.7.2007: http://www.pettra-irri.org/html/sp_details.asp?sec=2&sub_sec=2.1&id=21&task=desc).
- Ahmed Gazi Jashim Uddin; Malik Anwar Khan; James P Biswas; Rafiqul Islam & Aminul Islam** 2004b: *Evaluation Report on Integrated Rice Cum Duck Farming for Resource Poor Farm Households*. Poverty Elimination Through Rice Research Assistance (PETTRA). Bangladesh. (Published March 2004, accessed 14.11.2007: http://www.pettra-irri.org/html/sp_details.asp?sec=2&sub_sec=2.1&id=21&task=desc).
- Ahmed Gazi Jashim Uddin; Shaikh Tanveer Hossain; Md. Rafiqul Islam; Md. F. Rabbi** 2004c: *Rice-duck Farming Reduces Weeding and Insecticide Requirement and Increases Grain Yield and Income of Farmers*. In: International Rice Research Notes (IRRN) 2004. Vol 29, No. 1. 74-77.
- Amin, Ash & Nigel Thrift** 1996: *Living in the Global*. In: Amin, Ash & Nigel Thrift (Eds.) 1996: *Globalization, Institutionalization and Regional Development in Europe*. Oxford: Oxford University Press. 1-22.
- Bernard, Harvey Russell** 1994: *Research Methods in Anthropology: Qualitative and Quantitative Approaches*. Thousand Oaks CA., London, New Delhi: Sage Publications.
- Botkin, James W.; Mahdi Elmandjra & Mircea Malitza** 1979: *No Limits to Learning*. Oxford: Pergamon Press.
- Bouwen, René & Tharsi Taillieu** 2004: *Multi-party Collaboration as Social Learning for Interdependence: Developing Relational Knowing for Sustainable Natural Resource Management*. In: Journal of Community & Applied Social Psychology, Vol. 14, No. 3. 137-153. Published online: Wiley InterScience (www.interscience.wiley.com).
- Bureau of East Asian and Pacific Affairs** 2007: *Background Note: South Korea*. (Last updated September 2007, assessed 1.4.2008: <http://www.state.gov/r/pa/ei/bgn/2800.htm>).
- Chambers, Robert** 1983: *Rural Development: Putting the Last First*. Essex: Longman.
- Chambers, Robert** 1994: *Participatory Rural Appraisal (PRA): Analysis of Experience*. In: World Development, Vol. 22, No. 9. 1253-1268.
- Chang Chul-lee & Hoffmann, Heide** 2003: „Umweltfreundlicher Landbau“ in Südkorea. In: Rohwedder Maren (Ed.) 2003: *Ökologie und Landbau*. Vol. 126, No. 2. 33-35. (Available online on Organic Eprints: <http://www.orgprints.org/1258/>).
- Cloke, Paul; Ian Cook; Philip Grang; Mark Goodwin; Joe Painter & Chris Philo** 2004: *Practising Human Geography*. London: Sage Publications.
- Drucker, Peter F.** 1998: *The Coming of the New Organization*. In: Harvard Business Review on Knowledge Management. Boston: Harvard Business School Press. 1-20.
- Encarta** 2002: *Microsoft Encarta Professional 2002*. DVD-ROM mit Multimedia-Enzyklopedie, Atlas und Recherchertools. Microsoft Cooperation 2002.
- Flick, Uwe** 2005: *Qualitative Sozialforschung: eine Einführung*. Reinbek bei Hamburg: Rowohlt-Taschenbuch-Verlag.
- Freudenberger, Karen** 1999: *Rapid Rural Response Appraisal & Participatory Rural Appraisal (RRA/PRA)*. Baltimore, Maryland: Catholic Relief Services (CRS).
- Furuno Takao** 2001: *The Power of Duck*. Tasmania, Australia: Tagari Publications.

- Gaguan A. G.; R. D. S. Branckaert and C. Van Hove** 2001: *Rice-duck farming in Asia: Increasing its production potentials by integration with fish and the nitrogen-fixing aquatic fern Azolla*. In: The First INFPD/FAO Electronic Conference on Family Poultry. (Accessed 12.11.2007 <http://www.fao.org/ag/aga/AGAP/LPA/Fampo1/freecom4.htm>).
- Geiser, Urs** 2002: *Knowledge, Knowledge Management, and Sustainable Natural Resource Use: An Introduction*. In: Flury, Manuel & Urs Geiser (eds.) 2002: *Local Environmental Management in a North-South Perspective: Issues of Participation and Knowledge Management*. Zürich/Singen: vdf Hochschulverlag AG an der ETH Zürich. 157-180.
- Giddens, Anthony** 1995: *Konstitution der Gesellschaft*. 3.Auflage. Frankfurt am Main: Campus Verlag.
- Google Earth** 2007: *Maps and Satellite Images for Complex or Pinpointed Regional Searches*. (Free Software on <http://earth.google.com/>). Google™ 2007.
- Govinda Rao, M.; Rita Pandey; Barua, Alokesh; Manoj Pant; Anuradha Bhasin & Gautam Naresh** 2007: *Peace, Progress and Prosperity in the Northeastern Region: Vision 2020*. New Delhi: National Institute of Public Finance and Policy. (Available online: <http://necouncil.nic.in/document/Volume18506392625.pdf>).
- Hart, Chris** 1998: *Doing a Literature Review: Releasing the Social Science Research Imagination*. London: Sage Publications.
- Herweg, Karl & Gebre Michael Yohannes** 2002: *Adaptation or Adoption? – Integrating Different Perceptions of Soil and Water Conservations in Ethiopia*. In: Flury, Manuel & Urs Geiser (eds.) 2002: *Local Environmental Management in a North-South Perspective: Issues of Participation and Knowledge Management*. Zürich/Singen: vdf Hochschulverlag AG an der ETH Zürich. 181-190.
- Hiremath, Basawaraj Namasayya & Kesi Raju Venkata Raju** 2002: *Technology Adoption in Semi-Arid Gujarat: The Importance of Livelihood Security*. In: Flury, Manuel & Urs Geiser (eds.) 2002: *Local Environmental Management in a North-South Perspective: Issues of Participation and Knowledge Management*. Zürich/Singen: vdf Hochschulverlag AG an der ETH Zürich. 203-213.
- Hossain Shaikh Tanveer; Hideki Sugimoto; Gazi Jashim Uddin Ahmed; Md. Rafiqul Islam** 2005: *Effect of Integrated Rice-Duck Farming on Rice Yield, Farm Productivity, and Rice-Provisioning Ability of Farmers*. In: *Asian Journal of Agriculture and Development*, Vol. 2, No. 1. 79-86. (Available online: <http://ideas.repec.org/s/sag/seajad.html>).
- Hopf, Christel** 2000: *Qualitative Interviews – Ein Überblick*. In: Flick, Uwe; Ernst von Kardoff & Ines Steinke 2000: *Qualitative Forschung – Ein Handbuch*. Reinbek bei Hamburg: Rowohlt-Taschenbuch-Verlag. 349-360.
- Ibert, Oliver** 2007: *Towards a Geography of Knowledge Creation: The Ambivalences between ,Knowledge as an Object' and ,Knowing in Practice'*. In: *Regional Studies*, Vol. 41, No. 1. 103-114. London: Routledge. 103-114.
- IRRI (International Rice Research Institute)** 2005: *Irrigated Rice Research Consortium (Phase 2): Final Report*. (Accessed 28.11.2007: <http://www.irri.org/irrc/aboutirrc/pdf/Final%20report%20IRRC%20Phase2%20June2005.pdf>).
- IRRI Annual Country Report** 2005: *China Country Report 2005*. (Accessed 14.1.2008 www.irri.org/corra/2007%20Country%20Reports/CORRA_China.doc).
- Kang, Hye-Jung** 2005: *Changes in Farm Size Distribution in Korea: Evidence from Farm-Level Panel Data 1998-2002*. In: *Journal of Rural Development*. Vol. 28, (Summer 2005). 49-63.
- Kim In Kwan** 1978: *The Green Revolution in Korea – Development and Dissemination Of New Rice Varieties*. Korea: Association for Potash Research.

- Kistler, Pierre & Peter Messerli** 2002: *Livelihood Strategies, Knowledge Management, and Innovation in a Slash-and-Burn Cultivation System in Madagascar*. In: Flury, Manuel & Urs Geiser (eds.) 2002: *Local Environmental Management in a North-South Perspective: Issues of Participation and Knowledge Management*. Zürich/Singen: vdf Hochschulverlag AG an der ETH Zürich. 237-254.
- Knox, Paul L. & Sallie A. Marston** 2001: *Humangeographie*. Berlin: Spektrum Akademischer Verlag.
- Künzi, Erwin; Urs Wiesmann & Francisca Maina** 2002: *Innovation and Adaptation in a New Environment – Knowledge Management among Peasants in the Upper Ewaso Ng'iro River Region, Kenya*. In: Flury, Manuel & Urs Geiser (ed.) 2002: *Local Environmental Management in a North-South Perspective: Issues of Participation and Knowledge Management*. Zürich/Singen: vdf Hochschulverlag AG an der ETH Zürich. 225-236.
- Lee Yong Hwan; Lee Sang Min; Choi Doo Hoi; Lee Sang Kae & Sohn Sang Mok** 2005: *Odor and Irrigation Water Contamination by Duck-Rice System and Its Effect in Weed Control, Rice Growth and Yield*. In: Köpke, Ulrich et al. (Eds.) 2005: *Researching Sustainable Systems. Proceedings of the First Scientific Conference of the International Society of Organic Agriculture Research (ISO FAR)*, Adelaide, Australia, September 21-23, 2005.
- Li Rong Gang; Zhao Yan Wen & Du Yong Lin** 2003: *Organic rice standard and experiment of duck and rice mixed farming in Jiangsu Province, China*. In: Sohn Mok Sohn (Ed.) *Development of Basic Standard for Organic Rice Cultivation. Proceedings of 2nd RDA / ARNOA International Conference on Asia Organic Agriculture*. Dankook University / Cheonan / Republic of Korea, 11-15th November 2003. 136-148. (Accessed Online 3.11.2007: http://www.rioa.or.kr/arnoa/inc.php?inc=en/arnoa_conference).
- Mali Anwar Khan; Ahmed Gazi Jashim Uddin; Noel P. Magor & Ahmad Salahuddin** 2005: *Integrated Rice-Duck: A new farming system for Bangladesh*. In: Van Mele, Paul, Ahmad Salahuddin & Noel P. Magor (Ed.): *Innovations in Rural Extension – Case Studies from Bangladesh*. CABI Online Publications. 143-155.
- Mathew, Jose** 2003: *Potentials of rice based farming systems in organic rice production*. Dept. of Agronomy, College of Horticulture, Kerala Agricultural University. Kerala, India. In: *Proceedings of the 2nd RDA/ARNOA International Conference on Asian Organic Agriculture*, 11-15 November 2003, Dankook University. Korea. 167-174.
- Merriam-Webster Online** 2007: *Merriam-Webster Online Dictionary*. (Accessed 22.10.2007: <http://www.m-w.com/dictionary>).
- Ministry of Agriculture & Forestry (Republic of Korea)** 2006: *Major Statistics of Agriculture and Forestry 2006*. September 2006.
- Müller-Böker, Ulrike** 1991: *Knowledge and Evaluation of the Environment in Traditional Societies of Nepal*. In: *Mountain Research and Development*, Vol. 11, No. 2. 101-114.
- Nonaka, Ikujiro** 1998: *The Knowledge-Creating Company*. In: *Harvard Business Review on Knowledge Management*. Boston: Harvard Business School Press. 21-46.
- North, Nicole; Sushma Bajracharya & Sujata Gupta** 2002: *The Adoption of Small-Scale Irrigation Technologies for Sustainable Livelihoods in India and Nepal*. In: Flury, Manuel & Urs Geiser (eds.) 2002: *Local Environmental Management in a North-South Perspective: Issues of Participation and Knowledge Management*. Zürich/Singen: vdf Hochschulverlag AG an der ETH Zürich. 213-225.
- OECD Homepage** 2008: *Organization for Economic Co-operation and Development. Korea Country Web page* (Accessed 17.4.2008 <http://www.oecd.org>).
- OTA** 2004: *South Korean Organic Market: A summary of South Korean market potential for U.S. organic food exports*. International Cooperation and Development program of Foreign

- Agriculture Service and the Organic Trade Association (OTA). April 2004. (Available Online: <http://www.ota.com/pics/documents/koreanmarketoverview.pdf>).
- Pahl-Wostl, Claudia; Marc Craps; Art Dewulf ; Erik Mostert ; David Tabara & Tharsi Taillieu** 2007: *Social Learning and Water Resources Management*: In: Ecology and Society. Vol. 12, No. 2. 1-19. (Available online: <http://www.ecologyandsociety.org/vol12/iss2/art5/>).
- Ravn, Johan E.** 2004: *Cross-System Knowledge Chains. The Team Dynamics of Knowledge Development*. In: Systemic Practice and Action Research. Vol. 17, No. 3. 161-175.
- Reuber, Paul & Carmella Pfaffenbach** 2005: *Methoden der empirischen Humangeographie*. Braunschweig: Westermann.
- Roux, Dirk J.; Kevin H. Rogers; Harry C. Biggs; Peter C. Asthon & Anne Sergeant** 2006: *Bridging the Science–Management Divide: Moving from Unidirectional Knowledge Transfer to Knowledge Interfacing and Sharing*. In: Ecology and Society. Vol. 11(1), No. 4. 1-20. (Available online: <http://www.ecologyandsociety.org/vol11/iss1/art4/>).
- Ruggeri Laderchi, Caterina** 2001: *Participatory methods in the analysis of poverty: a critical review*. In: QEH Working Paper Series, Working Paper No. 62. 1-16.
- Sicat, Marie** 2006: *Guidebook on Developing Women’s Entrepreneurship among Agricultural Cooperatives in the ESCAP Region: Emerging Social Issues Division*. Presentation on the International Workshop on Entrepreneurship and e-Business Development for Women: APEC Women’s e-Biz Training 2006. UN Economic & Social Commission for Asia & the Pacific. Seoul, Korea (3-8 July 2006). (Accessed Online 12.11.2007 <http://planet.unescap.org/icstd/applications/projects/Green%2DCoops/ws1/doc.asp>).
- Sotheary, El** 2005: *Sustainable food-feed systems and improved livelihoods of the poor in rainfed lowland areas: socioeconomic components*. In: M.A. Sombilla and B. Hardy (ed.) 2005: *Integrated Crop-Animal Systems in Southeast Asia: Current Status and Prospects*. IRRI Limited Proceedings Series No. 11. 29-46. (Available online: <http://www.irri.org/publications/limited/pdfs/LP%20No.%2011.pdf>).
- Suew Tam Pak & Steven Leong** 2003: *Integrated Organic Rice Farming Development in Malaysia*. In: Organic Alliance Malaysia OAM News, December 2003. 5-7.
- Suh Chong-Hyuk** 2002: *National Study: Republic of Korea*. In: United Nations Online Publication 2002: *Organic Agriculture and Rural Poverty Alleviation: Potential and Best Practices in Asia*. Poverty and Development Division. 146-157. (Accessed 10.11.2007: <http://intranet.unescap.org/rural/doc/OA/OA-Bgrd.htm>).
- The Club of Rome** 2002: *No Limits to Knowledge, but Limits to Poverty: Towards a Sustainable Knowledge Society*. The Club of Rome Contribution to the World Summit on Sustainable Development 2002 (WSSD). (Accessed 3.11.2007 http://www.clubofrome.org/archive/publications/clubofrome_screen-1.pdf).
- United Nations** 2006: *World Urbanization Prospects: The 2005 Revision Population Database*. (Accessed 9.11.2007 <http://esa.un.org/unup/index.asp?panel=1>).
- USDA National Agricultural Library** 2008: *Tracing the Evolution of Organic/Sustainable Agriculture – Chronological List of Books, Book Chapters and Reports*. United States Department of Agriculture Alternative Farming System Information Centre. (Accessed 1.4.2008 <http://www.nal.usda.gov/afsic/pubs/tracing/TESA1980.shtml>).
- Wenger, Etienne** 1998: *Communities of Practice. Learning, Meaning and Identity*. Cambridge: Cambridge University Press.
- World Bank Data Query** 2007: *Data Query* (Accessed 25.11.2007: <http://devdata.worldbank.org/data-query/>).

World Bank Homepage 2007: *Improving Community Driven Development (CDD) Strategy: The Case of New Village Movement in Korea.* (Accessed 9.11.2007
<http://info.worldbank.org/etools/bSPAN/PresentationView.asp?PID=2101&EID=955>).

Yang Byoung-E 2000: *Mundang-ri Eco-village Plan: for Sustainable Agriculture Society.* English Abstract. Seoul National University: Graduate School of Environmental Studies. Pages 177-202.

Online resources without authors specified:

mundang.invil.org 2007: *Homepage of the Mundangri Centre* (Accessed 26.11.2007
http://mundang.invil.org/theme/farming/farm_event/contents.jsp).

energyvision.org 2007: *Homepage of the Centre for Energy Alternative* (Accessed 28.11.2007
<http://energyvision.org/>).

www.applesnail.net 2007: *Apple Snails* (Accessed 12.11.2007 <http://www.applesnail.net>).

www.bayer.com 2007: *Shaping the Future Together* (Accessed 26.12.2007
<http://www.bayer.com/de/Shaping-the-future-together.pdf>).

www.globalsecurity.org 2008: *Reliable Security Information* (Accessed 18.03.2008
<http://www.globalsecurity.org/military/world/rok/images/map-big.jpg>).

www.isofar.org 2008: *International Society of Organic Agriculture Research* (Accessed 1.4.2008
www.klimadiagramme.de 2008: *Klimadiagramme Weltweit* (Accessed 14.11.2007).

www.knowledgebank-brri.org 2008: *Bangladeshi Rice Knowledge Bank* (Accessed 3.4.2008).

www.petrira-irri.org 2008: *Poverty Elimination Through Rice Research Assistance* (Accessed 20.02.2008).

www.pulmu.or.kr 2008: *Homepage of the Poolmoo Coop* (Accessed 1.4.2008).

www.poolmoo.or.kr 2008: *Homepage of the Poolmoo Agricultural Technical High School* (Accessed 1.4.2008).

www.poolmoo.net 2008: *Homepage of the Poolmoo Ecological Agriculture Course* (the Poolmoo College) (Accessed 1.4.2008).

www.refarm.org 2008: *Homepage of the Refarmer NGO* (Accessed 1.4.2008).

www.rioa.or.kr/rioa 2008: *Research Institute of Organic Agriculture* (Accessed 1.4.2008).

www.rioa.or.kr/arnoa 2008: *Asian Research Network of Organic Agriculture* (Accessed 1.4.2008).

www.schwabfound.org 2007: *The Schwab Foundation for Social Entrepreneurship* (Accessed 24.11.2007).

Annex

Interview guideline:

Introduction: I would like to know how your farming has changed over the years and why. The most important thing for me is how you learned the knowledge of these farming methods and how you changed the methods in your farm.

- Would you mind if I record this interview?

Part 1: Livelihood

- What is the size of your wet and dry fields?

- What other work you or your family members do besides farming?

Part 2: Farming techniques

- What is the history of your rice farming techniques? (TimeTable)

- Why did you change to IRDF (integrated Rice and Duck farming)? What knowledge was important for that?

- If you apply other methods than IRDF, which one(s) and why?

- Did you help other farmers to change to IRDF farming? If yes, how?

- Furunos method is a little bit different than yours. How and Why?

Part 3: Knowledge sharing

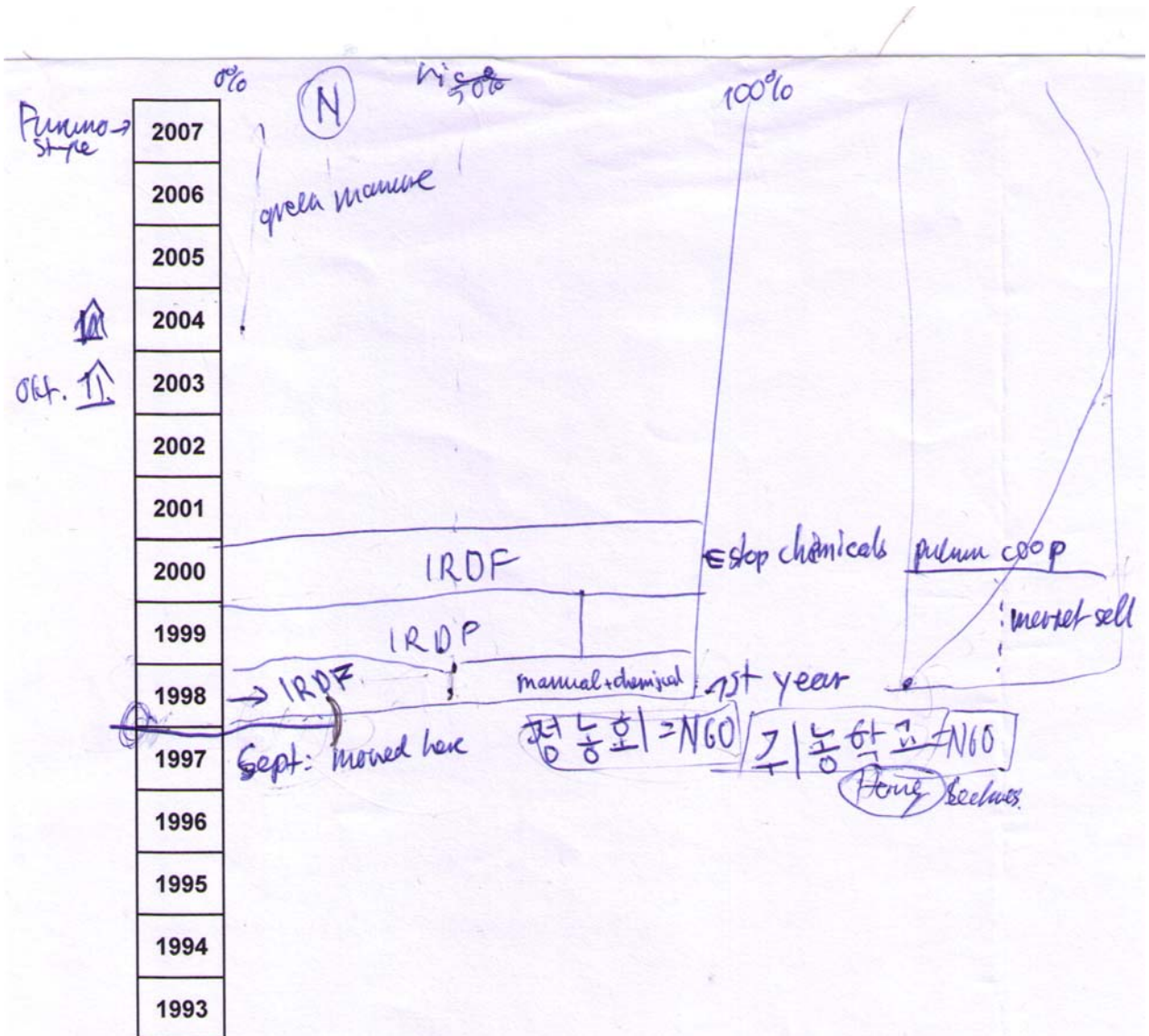
- You are a professional farmer. How do you improve your knowledge? (Knowledge platforms like symposia, regional gatherings)

- How important are these knowledge platforms for your work and for the community?

- Do you exchange knowledge with other (neighbour) farmers? How?

- What do you think about the Hongdong community and the Poolmoo Schools?

Timeline for technique histories (Sample):



Declaration

I certify that I autonomously composed this thesis and that it does not contain any material previously published or written by another person except where due reference is made in the text.

Ich erkläre hiermit, dass ich die vorliegende Arbeit selbständig verfasst und die den verwendeten Quellen wörtlich oder inhaltlich entnommenen Stellen als solche kenntlich gemacht habe.

Dominik Rutz, Zurich, 8th of May 2008