What "works" in projects promoting low cost irrigation and linking farmers to markets?

Testing value chain mapping and realist-evaluation to get to some indications

M.Sc. Thesis by Jorge Merino Salom

August 2009

Irrigation and Water Engineering Group

WAGENINGEN UNIVERSITY
WAGENINGEN UR

What "works" in projects promoting low cost irrigation and linking farmers to markets?

Testing value chain mapping and realist-evaluation to get to some indications

Master thesis Irrigation and Water Engineering submitted in partial fulfillment of the degree of Master of Science in International Land and Water Management at Wageningen University, the Netherlands

Jorge Merino Salom

August 2009

Supervisors:

Bert Bruins
Irrigation and Water Engineering Group
Centre for Water and Climate
Wageningen University
The Netherlands
www.iwe.wur.nl/uk

Giel Ton
Market & Networks
Agricultural Economics Research Institute
Wageningen UR
The Netherlands
www.lei.wur.nl/NL/

For my Grandfather, Hector, who is almost 90 years old and still working in building a more Honest society

Acknowledgments

First I want to thank God for been behind every moment of this Thesis.

To Hadewijch, my wonderful wife, for your companionship and for taking care of our daughters during my absence.

To Berthil and Ingeborg, for motivating us to come to the Netherlands.

To my advisors, Giel Ton, thanks for linking me with IDE-Nepal, and providing me with essential information and advice. Bert Bruins, I really appreciate the way you manage to join during this thesis.

To Mark Giebels for dedicating time and interest in this thesis.

To the Dutch People who financed a large part of my Master through the Governmental Agency Nuffic.

I'd like to thank my friends in Ecuador: Manuel Gschweitl, for all the time dedicated in providing important information for this research. To Fernando Caceres, for patiently sharing your experiences and insights in relation to the work we did in Ecuador.

To the farmers of la Providencia, for all we shared in the last ten years.

I would like to give special thanks to the people who contribute in the research of the SIMI Project in Nepal. To Komal Pradhan and Luke Colavito, for the interest and dedication you put in the research; to Bijaya Bajracharyan, for your feedback in the theoretical framework of the research and the valuable information you shared, together with Gun Bahadur and Shanta Tamang. To Bhim Sem, Binod Mishra and Narandra Dahal for your interest in the research, and the information and experiences shared to me.

To Bharat Nepal for the time you dedicate to me during my visit in Kaski, for helping with the contacts, the translations, the safe trips in the motorcycle, in such a joyful way. I enjoyed the talks we had during the field research and the meals.

To Bhim Moktan, for welcome me at your office and share your experiences in the SIMI project. To Gauri Devi Shrestha, for patiently sharing with me the details of your work oriented to develop better markets for the poor. To Bed Kumar Shrestha, Arun Kafle and Bani Bakadur Basnet, for enthusiastically sharing your insights in relation to your work and SIMI project. To Ananda Dahal, Deepak Pradal Chaulagain, for sharing your experiences in Dhikurpokhari. To Dharmatta Subedi, for helping the people in Dhikurpokhari, specially the disadvantage ones. To Manindra Malla and Anil Chitrakar, for sharing openly your work with the people from Dhikurpokhari.

Thanks to you, Santu Subedi, I was impressed by your peaceful and happy attitude to life. To Hari Kumari K.C, for your dedication to the commonweal in Dhikurpokhari. To Yamu Subedi, Kansi Raj, Raj Kumari Pariyar for your dedication to make the markets work better for everyone.

To Guru Datta Dahal, thanks for your dedication to the farmers of Dhikurpokhari, and sharing so much of your experience and time, even though you were very busy. I still have to laugh, every time I remember the last day with you in Dhikurpokhari, nice to met you.

Special thanks to Narayan Gautam and the Chalise Brothers, for the way you make your business a pragmatic and honest service to farmers. To Ramkrishna Duwadi, for make me believe in honest wholesale-vendors. To Ram Madi Dahl, you made me realize how sturdy and important is the duty of a vendor. To Deepak Shrestra, a truly leader, don't give up building a peaceful revolution through your dedication in broadcasting the real prices of the market. To Punya Bhandari, for your inspiring commitment with the entrepreneurs of Dhikurpokhari.

To Lok Bahadur Thapa, keep helping other farmers in such easy and cheerful way. To Pharindra Subedi, for enthusiastically sharing your experience as a leader farmer. To Goma Subedi, you make me realize how sturdy and fruitful can be the contribution of a Leader woman farmer. Shova Bhandari, I was impressed on the way you got involve into the world of your new family. To Bishnu Timilsina, for generously contribute to this research.

To Laxmi Bishwokarma., for dedicating so much of your life to help the people of Dhikurpokhari. To Putali Bhandari and your family, for your hospitality and enthusiastically sharing your experience in your group of women producing vegetables and managing a saving and credit group.

To Rekha Pariyar, for making me realize how important can be for a woman to generate her own income. To Hari Kumari Chattri, for your commitment with your family and your community. To Bishnu Paudel, Shiva Kunwar, Udam Bahadur Kunwar and Narayan Dahal, I'll think on you whenever I fall, and have to stand up and start again with a smile.

To The women of the "Sustainable Women Development Saving & Credit Cooperative Ltda.", for your inspiring example to other rural women.

To Narayan Bishwokarma, a real entrepreneur, keep inspiring others, to start new enterprises in the countryside.

To Arend van Riessen for the socio-anthropological tips you gave me before I start the field research in Pokhara.

To Erni and Herma van Wingerden, for the "gezellig" house you led us live in, and for sharing with me your insights about the Nepali culture and make me feel part of your family, together with Janne and Erick, during the time I spend with you in Kathmandu.

Glossary

AIS: Agriculture Input Suppliers

DADO: District Agricultural Development Office

DA&D: Drip Assembler & dealer

DASC: Dhikurpokhari Agriculture Service Center

DCDO: Dhikurpokhari Community Development Organization

FG: Farmer's group

GSFEPP: Grupo Social Fondo Ecuatoriano Populorum Progressio

IDE-Nepal: International Development Enterprises in Nepal

MDO: Machhapuchhre Development Organization

MPC: Marketing & Planning Committee

PHFA; Plastic House Farmer Association

P4WV: Pokhara four wheel wagon vendors

RADO: Regional Agriculture Development Office

RUPP: Rural Urban Partnership Program

VDC: Village Development Committee

Table of Contents

Acknowledgments 5
Glossary 7
Summary 10
1. Introduction 11

Part I Research Description 13
2. Objectives of the Research 15
3. Background of the Research 16
4. Problem Definition 18
5. Research questions 19
6. Conceptual Framework 20
7. Research Methodology 23

Part II The Case Studies 27
8. The Case Study of Ecuador 29
Mapping the Efforts in the pepper production and marketing. 30
The Theory-based evaluation of the project in Ecuador 35
Tested operative theories of change after implementating the project 36
9. The Nepal SIMI project 38
Mapping the off-season tomato local value chain 40
The Theory-based evaluation of the project in Nepal 59
Tested theory of action of the project in Nepal 61

Part III Discussion and Conclusions 67
10. Discussion of the mayor findings 69
Insights from the projects in Ecuador and Nepal 69
The performance of value chain mapping tools and realist evaluation 74
11. Conclusions 79

12. Bibliography 81
13. Annexes 85

Summary

Low-cost Irrigation Technologies are claimed to be real means for poverty reduction in dry rural Areas (Belder et al, 2007; Shah & Keller 2002; Enfors & Gordon 2008; Kulecho & Weatherhead 2006; Namara et al, 2005 & 2007; Polak & Yoder, 2006). The most progressive programs and projects promoting low cost irrigation technologies expect farmers to buy low-cost irrigation technologies with their own economic capacity, or using micro-credits, specially if they are linked to high value vegetable markets.

This research looks at two projects promoting low-cost irrigation and linking farmers to high-value vegetable markets, one in Ecuador and the other in Nepal. Value chain mapping and "realist evaluation" were selected to develop two case-studies oriented to find out what is about those projects that "works", for whom and in which circumstances

The use of Value chain mapping tools gave a broad picture in relation to the efforts of the organizations influencing local value chains at the meso-level, and the actors working at the micro-level; as well as the outcomes of their efforts in terms of employment, and volumes of vegetables produced and sold at different prices to different market channels The Maps looking at the constraints in the local value chains and the activities of the actors at the meso-level were the most useful in informing "realist evaluation" in relation to the context and the actors. This map invites the evaluator to look at the different stakeholders of the local value chain and how did they act in the project. However, The original theories of the projects were the most used for guiding the data collection, required by the realist evaluation, to understand the context on which the projects were implemented. Realist evaluation requires skills in conceptualization, causal thinking and interviewing with interactive reflection, such skills are hard to find in project's actors. This limits the use of realist evaluation in the hands of local actors. In the case of research with few weeks available for doing field research, realist evaluation must be careful considered.

Value chain mapping and realist evaluation were useful to identify what is about projects that "work", for whom and in which circumstances. The reader can find some of them in the case studies and the discussion part, confirming, though not totally, the impact hypothesis of the projects: "Projects efforts in promoting low-cost irrigation and the production of high-value vegetables, together with, linking farmers to markets, can lead to local value chains generating enough incomes for the different actors to keep them motivated in continue up-grading it year by year".

1. Introduction

This research looks at two projects promoting low-cost irrigation and linking farmers to high-value vegetable markets, one in Ecuador and the other in Nepal. Value chain mapping and "realist evaluation" were selected to develop two case-studies oriented to finding out until what extend a combination of value chain mapping and "realist evaluation" can be useful to identify what is about those projects that "works", for whom and in which circumstances.

The document is presented in three parts: the research description, the case studies, and Discussion and conclusions.

The research description starts with the objectives of the research and some background information in relation to how I came up with this research. After this, the conceptual framework of the research is presented, followed by the problem definition and the questions I wanted to answer with the research.

In the second part, the case study of the project developed in Ecuador is presented, starting with some background information about the project. Then, you will find what about the project was captured by using Value chain maps. After this, you'll find a summary of the "Operative Theories of change" (OTC) of the project, reflecting the causal-reasoning, of the project's designers, in relation to what can "work" in helping people to change their current situation towards expected outcomes, followed by "revised OTC" after identifying how the "designed set of activities" were implemented; what intermediate-outcomes occurred, and how the context affected those outcomes. Furthermore, some complementary information is offered. All this came out from the observations, the interviews and document reviews, in the attempt of applying "realist evaluation" in the case study. The case study of the project in Nepal has the same outline.

The last part of the document, starts with a discussion of the mayor findings in relation to how the two case-studies are questioning the theories of the projects in relation to the promotion of low-cost irrigation technologies with a market-based approach, and what new OTC can be proposed from the two case-studies. Following, a similar attempt is done, for the theories of the projects in relation the production of high-value vegetables and linking farmers to those markets. After this, you will find a discussion driving to conclusions in relation to the effectiveness of value chain mapping and realist evaluation to identify "what works" in the context of projects promoting small scale irrigation and linking farmers to markets.

Part I Research Description

2. Objectives of the Research

- To get some insights in relation to what works in projects promoting low-cost irrigation and linking farmers to high-value vegetable markets.

- To test the use of value chain mapping tools and realist evaluation to identify what works in the context of projects promoting small scale irrigation and linking farmers to markets.

3. Background of the Research

In the last two decades, Low-cost irrigation technologies have been claimed to be a real means to overcome poverty in dry rural areas (Belder et al, 2007; Shah & Keller 2002; Enfors & Gordon 2008; Kulecho & Weatherhead 2006; Namara et al, 2005 & 2007; Polak & Yoder, 2006). Low-cost wells, small-reservoirs, pumps and water delivery systems at farm level are gathered in the concept of "Low cost irrigation technologies". Through low-cost irrigation, farmers can produce cash-crops with higher value than traditional rain-fed crops.

High value vegetable production generates more income to pay back investments in small-scale irrigation, comparing with other crops. Weinberger and Lumpkin (2005), based on studies from South East and South Asia, affirm farmers engaged in the production of vegetables often earn higher net farm incomes than farmers that are engaged in the production of cereal crops only.

High value vegetables require special attention to reach and satisfy markets demands; particularly, from retailers and processors in modern Agri-food chains, in terms of product and transaction conditions. This requires from farmers high efforts in terms of technology, financial capital, human capital and organization (Biénabe, et al, 2007).

Birthal *et al.* (2007), studying the case of vegetable production in India, conclude that linking supply chain actors through strategic alliances and other government modes can substantially reduce transaction costs and reduce risk for farmers. These aspects are normally addressed in value chain promotion programs; as well as, better access to inputs, credit and extension services, and marketing services for farmers.
According to Gabre-Madhin (2003), institutions play five potential roles in strengthening markets for small-scale producers: reducing coordination costs; reducing risks; enforcing contracts; enabling collective action; and building human capital.

A value chain is an economic system composed of chain operators, operational service product to market-providers and their business linkages at the micro-level, and support-service providers at the meso-level. Value chain promotion represents a systemic approach to economic development. (GTZ, 2007).

Many existing value chain analysis approaches are integrated into wider market or demand assessments or integrated into different economic development programs, as Local Regional Economic Development (LRED); or Business Development Services (BDS); Enabling Environment; Private-Public Partnerships (PPP); or cluster development activities. (Meyer-Stamer & Wältring, 2007). Such value chain analyses can be too wide and costly to be used by small NGOs or Farmers Organizations.

Personal Commitment

I have been working with small scale farmers with very limited financial resources, through different rural development projects, in the Central Coast of Ecuador, since 1998. Small Farmers living in this area have limited access to water during the dry season (from May until December). A great majority of rural households still live with incomes below the extreme poverty line.

Since the year 2004, water scarcity has been an important issue in this rural area, the current rain-fed agriculture, became very vulnerable to irregular rainfall patterns. Then I got involved in the formulation of agriculture-project proposals linked with small-scale irrigation. Our NGO supported with micro-credits the initiatives of some groups of farmers willing to build small ponds or wells to produce some cash crops during the dry season. Those groups of farmers made me realize that micro-credits for financing low-cost ponds or wells, together with low-cost pumps and water delivery systems could be a tool to reduce the vulnerability of the economy of their households.

I have been interested in getting to a deeper understanding of low-cost irrigation technologies as tools for rural poverty reduction, since I started following some courses facilitated by teachers from the Irrigation and Water Engineering Group, at Wageningen University. I wanted to know until what extend low-cost irrigation technologies could be accessible for small-scale farmers with access to micro-credits living in the dry coast of Ecuador. Therefore, I researched on that during my internship with Practica Foundation. One of the most important outcomes of the study was that horticultural production could provide enough income to pay back investments in wells, low-cost pumps and water delivery systems, at the time-frame preferred by the Local Finance providers.

Now, that I have the opportunity of developing a thesis-research, I wanted to use it for getting some insights in relation to what works in projects promoting small-scale irrigation and linking farmers to high-value vegetable markets; as well as learning about value chain analysis tools and the realist evaluation by applying it in two case studies.

4. Problem Definition

Low-cost irrigation technologies and linking farmers to high-value vegetables markets have been claimed to be real means to overcome poverty in dry rural areas (Belder et al, 2007; Shah & Keller 2002; Enfors & Gordon 2008; Kulecho & Weatherhead 2006; Namara et al, 2005 & 2007; Polak & Yoder, 2006).

Some Development Agents state that the impact and sustainability of low-cost irrigation technologies depends very much on market-based strategies. The Social Group Fondo Ecuatoriano Populorum Progressio (GSFEPP), the International Development Enterprises (IDE) and Winrock International, are three of them. These organizations have been implementing projects with Farmers Organizations, providing services to develop small-scale irrigation and linking farmers to high-value vegetable markets. Both organizations have similarities in the theories embedded in their projects; however, their projects are implemented in different ways, according to different contexts and lead to different outcomes. How can these aspects be illustrated in a simple and comprehensive way, in order to bring useful information for improving the design and implementation of future projects of that kind?

Value chain analysis, and particularly, value chain-mapping, reduces the complexity of economic reality with its diverse functions, multiple stakeholders, interdependencies and relationships to a comprehensible visual model (Gtz,2007).

Realist evaluation tries to approach the question, What is about projects that “works”, for whom and in which circumstances? Program evaluation approaches combining value chain analysis with other tools, such as the “realist evaluation” are lacking in the current literature.

5. Research questions

Main Research Question

Until what extend can a combination of 'value chain mapping' and 'theory-based evaluation' can be useful to identify what works in projects promoting small-scale irrigation and linking farmers to high-value vegetable markets?

Sub-questions

The main question can be approached by the following sub-questions:

- Until what extend can value chain mapping illustrate the context influencing the outcome of the projects?
- How the theories of the project's promoters in relation to the mechanisms for creating sustainable local value chains of high-value vegetables were implemented and lead to different outcomes?
- What theories were confirmed with the case-studies?

6. Conceptual Framework

In this research I'll combine concepts of value chain promotion and concepts of theory-based evaluation. Value chain promotion will be used as a descriptive tool to map the efforts of the different actors in the local value chain of the two projects. Theory-based evaluation will be used as the framework of analysis of the projects in Ecuador and Nepal.

Value Chain Promotion Concepts

In this research, value chain promotion refers to local value chains or "local economic clusters" combining location-specific with market-specific development interventions. Such value chain approach is used in this research mainly as a descriptive tool to map the efforts of the different actors involved in the production and marketing of high-value vegetables.

A value chain is defined by Meyer-Stamer and Wältring (2007) as a sequence of activities involved in transforming raw materials into a product that is acquired by the final customer. According to these authors, a value chain normally includes business transactions, transactions between companies and supporting institutions in areas like finance, training, research and development.

Promoting a value chain means supporting its development by externally facilitating a value chain upgrading strategy, agreed by the different actors; as defined in the "ValueLink manual" published by the German development organization "Deutsche Gesellschaft fürTechnische Zusammenarbeit" (GTZ), in 2007. In this research, I use the word "upgrading" as it is used in the "ValueLinks" terminology, which implies different activities (improving business linkages, associations, and partnerships; strengthening service supply and demand; and introducing standards and improving policies and the business environment of the chain) to improve the production and distribution of the value added to the product among the different chain-actors.

According to Luigi Cuna and Dominic Smith (in Berg et al. 2007), the analysis of value-chains of agricultural crops is relevant because it maps, systematically, the actors participating in the production, distribution, marketing, and sales of a particular product.
Chain mapping is the core of value chain analysis, it reduces the complexity of economic reality with its diverse functions, multiple stakeholders, interdependencies and relationships to a comprehensible visual model (GTZ, 2007). This descriptive tool, will be used to identify the main actors in the local value chain, either enabling or promoting the local value chain (meso-level), or working in its different core processes, exchanging and adding value to the commodity (micro-level); their efforts in terms of people and time involved, and the outcomes in terms of people employed and volume of vegetables trade in the local value chain. The constraints at the different core processes of the local value chains will be mapped, as well.

Theory-based evaluation

Theory-based evaluation (TBE) intends to identify possible causal models leading to expected or unexpected outcomes. According to Birckmayer and Weiss (2000), TBE looks at the assumptions on which the program is based, the project or program activities and their expected effects and how these activities were implemented in an specific context. TBE attempts to identify the mechanisms that intervene between the project or program activities and the expected and unexpected outcomes.

In their article (2000), Birckmayer and Weiss, argue that TBE shows "which chains of assumptions are well supported by the data collected, which chains of assumptions break down, and where in the chain they break down". Leading to the development of refine strategies for future interventions.

Theory-based evaluation can be considered as part of "Program Theory evaluations" (PTE). Patricia Rogers, Antony Petrosino, Tracy Huebner and Timothy Hacsi (2000), refer to the publication of Weiss in his attempt of identifying general casual models of a teacher home-visiting program (Weiss 1972, cited by Rogers et. al 2000) as one of the first PTE oriented to identify the mechanisms triggered by project activities that lead to specific outcomes. They also argue that different evaluation approaches such as Bickman's "program theory", Funnell, Lennel and Cleland's "program logic" can be categorized within the same type of evaluation. The "realist evaluation", considered a "theory-driven"

evaluation, is also part of this group, since it tries to determine what is about programs (or projects) that "works", by defining how the context, and the mechanisms triggered by the interventions lead to specific outcomes.

Realist Evaluation

When this research was designed, the "realist evaluation" concept (RE) developed by Pawson and Tilley (1997) was the first TBE I got acquainted with. Realist evaluation was created to identify what is about programs (or projects) that "works", for whom and in which circumstances. I decided to apply RE in the two case-studies.

According to the authors of RE, programs (and projects) are formulated by a vision of change and they succeed or fail depending on the veracity of that vision"; accordingly, the evaluation must validate the underlying theories of one program or project.

Realist Evaluation sees programs or projects embedded in social systems; it is through the workings of entire systems of social relationships that any changes are affected. A key requirement of realist evaluation is thus to pay attention to the different layers of social reality which make up and surround programs or projects (Pawson & Tilley, 2004).

Realist evaluation theory suggests the triggers of change in most interventions are ultimately located in the reasoning and resources of those involved in the program or project. Consequently, effects are generally produced by and require the active engagement of the stakeholders. According to "Realist Evaluation" such programs or projects only work though the "stakeholders" reasoning. Then, an understanding of the interpretations of the stakeholders is essential to evaluate the outcomes of any intervention.

Realist Evaluation tries to make explicit the changing nature of programs or projects. Programs and Projects are consider "permeable" to externalities (unanticipated events around and within the program or project); such externalities affect the implementation of the program or projects and, consequently, their outcomes (Pawson & Tilley, 1997).

Realist evaluation, uses 4 concepts to understand and explain programs or projects: Mechanisms, Context, Outcome patterns and Context mechanism outcome pattern configurations (CMOCs).

Mechanisms.- are processes in which the subjects interpret and act within an specific intervention as part of the program or project strategy.

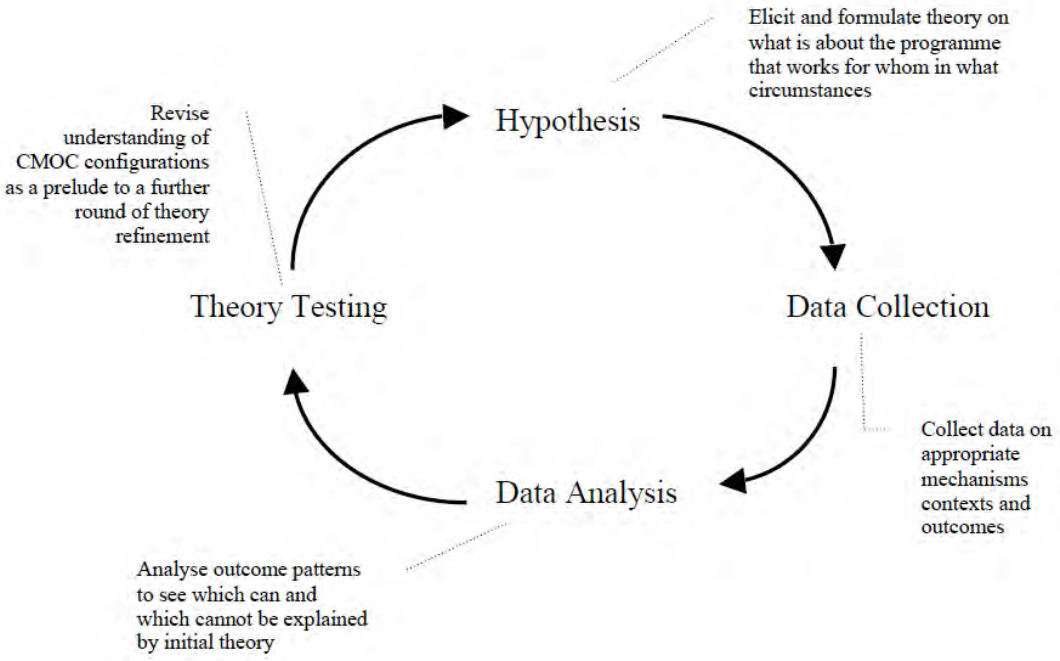
Context.- describes the conditions in which the mechanisms of the programs or projects occur. Contextual thinking addresses the issues of "for whom" and "in what circumstances" a program or project will work. In the notion "context" lies the realist solution to the panacea problem (Pawson & Tilley, 1997).

Outcome patterns.- are the intentional and unintentional consequences of programs and projects resulting from the activation of different mechanisms in different contexts.

Context mechanism outcome pattern configuration (CMOC).- are propositions to explain and/or predict outcome pattern variations, through identifying mechanism-variations and relevant context-variations. CMOC are models indicating how programs and projects activate mechanisms amongst whom and in what conditions, to come up with alterations in behavior or event or state regularities. Therefore, "Realist evaluation" develops and tests CMOC conjectures empirically (Pawson & Tilley, 1997).

Pawson and Tilley propose to use this concepts in a process of "realist evaluation" with continuous up-grading cycles of Hypothesis testing. The following figure, presented by Pawson and Tilley (2004) represents this concept.

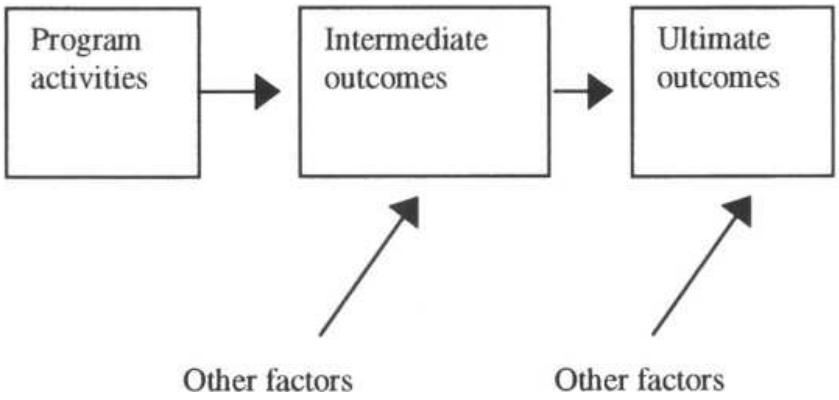
Figure 1. Evaluation as Hypothesis testing



Theory-based evaluation concepts applied in the research

In my attempt of applying "realist evaluation" in the two-case studies, I transformed, though not deliberately, the RE concepts of "mechanism", and consequently the "Context mechanism outcome pattern configurations" (CMOCs) as Pawson and Tilley (1997) really meant. The logic behind it was that project's activities reflect the causal-reasoning in relation to what can "work" in helping people to change their current situation towards expected outcomes. Therefore, for each project the expected final-outcomes were identified, and consequently, the chain of planned-activities to produce the intermediate-outcomes necessary to reach the final outcomes. After this, the research was oriented to identify how this set of activities was implemented; what intermediate-outcomes occurred, and how the context affected those outcomes. The following program theory diagram developed by Sue Funnell (1997 cited in Rogers 2000) is useful for explaining the causation model used during the implementation of the research.

Figure 2. Program Theory causation model



During the research I put attention to the reasoning and opinions of the interviewed actors in relation to what really "works" in the project. Only after the first draft of this document was finished, I realized that instead of creating CMOCs, as conceived by "realist evaluation" I configured propositions in the line of "Operative theories of change" (OTC), a concept used by Henning Baur, Michael Bosch, Stephan Krall, Thomas Kuby, Alison Lobb-Rabe, Paul-Theodor Schütz, and Andreas Springer-Heinze (2001) in their paper oriented to establishing "plausibility" in the impact assessments of programs from the realm of Agricultural Research in Development.

7. Research Methodology

In this research I was interested in finding out what is about projects, promoting low-cost irrigation and linking farmers to high-value vegetable markets, that really "works", and if so, under which circumstances. Value chain mapping and realist evaluation were selected for approaching that question.

Selection of the projects

In this research I used two projects promoting low-cost irrigation and linking farmers to high-value vegetable markets, one in Ecuador and the other one in Nepal. The two projects used for the case-studies had the three components I was interested in looking at: low-cost Irrigation technologies, high-value vegetable cultivation and linking farmers to markets.

The project in Ecuador was implemented in the central coastal region, during the year 2004; at that time, I was involved in the project as a coordinator, participating from it's formulation until the final report. The case-study focuses in the local value chain of peppers produced by the Farmers Group from "La Providencia", I worked with them through different rural development projects, from the year 1999 until 2005. The project linked this Farmers Group[1] with the wholesale-store of one of the most important Supermarkets in the Guayaquil, the largest city in Ecuador.

In the year 2008, I met the director of IDE-Myanmar, I became very much interested in IDE's market-oriented development model "Poverty Reduction through Irrigation and Smallholder Markets" (PRISM), because it was in the same line of the project in Ecuador promoting low-cost irrigation and linking farmers to high-value vegetable markets.

The Irrigation and Water Engineering Department of Wageningen University, had some good experiences working with the offices of IDE-Zambia, IDE-Nepal and lately with IDE-Ethiopia. The SIMI project implemented in Nepal was perceived as one of the most successful ones, according to key informants. The existing cooperation between Wageningen University and IDE, and particularly; together with the good reputation of Nepal-SIMI project, make me decide to contact them to propose the research. The research proposal was welcome in Nepal.

The first day in IDE-Nepal Head office, in Katmandu, a meeting with staff-members from IDE and Winrock involved in the SIMI Project was conducted. In the meeting, the research proposal was presented and the participants were invited to define the place and local value chain for the field-research. On the second day a commission of 5 staff-members selected Dhikurpokhari and the off-season tomato local value chain for the study. They were interested in finding out how this local value chain was working. The commission considered Dhikurpokhari because in the high level of cooperation between the organizations involved in the project.

General Impact hypothesis of the projects

The promoters of the two projects assume low-cost Irrigation technologies can help farmers to get more income if they succeed in reaching markets that would allow them to pay back the investment in short time. In both projects, there is a believe that high-value vegetable production can generate high income, depending on the irrigable-area; price obtained for different qualities; the production-costs; post-harvest & trading-cost. The promoters of the two projects take for granted that investments in irrigation are necessary to assure good vegetable-quality and yields.

The general "impact hypothesis" used in this research for embracing the two projects has a value chain approach, and is formulated as follows: "Projects efforts in promoting low-cost irrigation and the production of high-value vegetables, together with, linking farmers to markets, can lead to local value chains generating enough incomes for the different actors to keep them motivated in continue up-grading it year by year".

[1] 8 farmers were involved in the collective production and marketing of peppers of the case-study

The Research process

When the research was in the "proposal stage", a combination of value chain mapping tools and "realist evaluation" was selected. Value chain mapping was used to identify the stakeholders at the different core processes of the local value chain, their functions and investments; as well as volume and value distributions. Special attention to the constraints in the local value chain was given, before testing the incentive-theories applied by the multiple actors promoting the projects. Realist evaluation was meant, according to Pawson and Tilley (1997), for finding what is about projects that "works", for whom and in which circumstances. I was captured by this sentence, because it summarized what I wanted to find out. Therefore, I tried to apply "realist evaluation" in the two case-studies, the one in Ecuador looking back at previous field work and accessing key informants by international phone-calls, and the one in Nepal, with only 4 weeks available for field research.

I was particularly interested in finding out how effective the combination of value chain mapping and RE, could be, in determine, what works, for whom and in which circumstances in projects promoting low-cost irrigation and linking farmers to high value markets; not only, because I wanted to learn from both projects using a value chain approach, but also, because of my personal interest in learning about value chain analysis and "realist evaluation", to use them in the case I got to be involve in future project evaluations.

Realist evaluation tries to approach the question, What is about projects that "works", for whom and in which circumstances?, by creating Context-Outcome-Mechanisms configurations (CMOCs). In my attempt to elaborate such configurations, I looked at the activities of the projects, under the reasoning that project activities were thought, by the project designers, to strategically address the current situation (context) with specific actors to produce expected changes.

Only ten days before this document was submitted, one of the research advisors make me realize that my conceptualization of a CMOC was more in the line of what the Impact model of the GTZ regards as the "Operative Theories of change" (OTC) than what "realist evaluation" really meant. Then I search for the literature on the impact model of the GTZ, and found that indeed, what I applied was very much in that line. Further, I got into some literature on theory-based evaluation and found the concept of "Theory-based" evaluation embraces the attempt of realist evaluation and the impact model to find out what is about projects that "works" in which circumstances.

In the case studies, I present the attempt of CMOCs, better named as "Operative Theories of change" (OTC), of the two projects. In the beginning of the discussion of the results I put an example of my last understanding of the implementation of "realist evaluation" looking at the theory of the supply chain of Micro-irrigation technologies with a market based approach.

In this research I started applying the value chain mapping for the project in Ecuador. Interviews by phone, with key informants, the manager of the Farmers Organization (CAAM) and my ex-college who was directly involved in the project; as well as, my own experience with the project, in the year 2004, were used as the main source of information. Project records were used, as well. Information from the study I conducted in the central coast of Ecuador, in November 2008, a feasibility study for developing a Supply Chain of Low-cost Irrigation Technologies, was also useful. The incentive-theories of the project in Ecuador were summarized, but, were tested after the field research of Nepal, because of time constraints.

The field research in Nepal was developed in the 4 weeks of May, 3 of them in Kaski district, were Dhikurpokhari and Pokhara are located. The first 2 days of the first week, the main actors from the Head offices of IDE and Winrock, involved in the project were interviewed to find out what was the project about. Project papers and reports were gathered. As I previously mentioned, two meetings were used to define the place and local value chain for the study.

On the third day of the first week, I arrived to Pokhara. The project proposal was presented in one meeting with IDE and Winrock officers involved in the project. The next day, the plan of visits was set with the help of the District marketing Manager of IDE, Bharat Nepal, he was assigned by the Head office of IDE to join the field research and helping in contacting the key informants and help as translator during the interviews when it was required (26 out of 40 interviews). He was actively involved in the workshop of value-chain mapping[2] conducted in Dhikurpokhari, and the SIMI office in Pokhara. the meeting-room of the local NGO in Dhikurpokhari, which was implementing an important

[2] Bharat Nepal, showed good skills in facilitating Value Chain Mapping, he was familiar with the technique, since, he has been involved in many value chain analysis workshops in the District.

part the SIMI-project in the area; as well as in the workshop of value-chain mapping done with SIMI-staff members in the meeting room of the SIMI Office in Pokhara.

The value chain maps from Nepal presented in the case studies were made from two workshops. One workshop took place in the meeting-room of the local NGO in Dhikurpokhari, which was implementing an important part the SIMI-project in the area. The workshop was done with the main actors of the local NGO "Dhikurpokhari Community Development Organization" (DCDO) involve in SIMI-Project and two women involved in the Marketing and planning Committee, who are off-season tomato producers, as well. The second workshop of value-chain mapping was done with SIMI-staff members in the meeting room of the SIMI Office in Pokhara. This second workshop provided additional information.

At the end of the first week, after reading the documents related with the project, reviewing the summaries of the interviews I had with IDE and Winrock officers, and looking at the Nepal-SIMI planning matrix, with more 300 activities, I elaborate a summary of the Incentive-theories of the project in relation to the Development of the Supply Chain of Micro-irrigation technologies and agricultural-inputs, the Vegetable Market Development and the inclusion of women and people from disadvantage groups, and the Public and private sectors partnership. The summary was sent to the current director of IDE-Nepal office and the director of Nepal-SIMI project, with the request of give their comments about it. The Director of IDE-Nepal replied the summary of the incentive-theories "captured well the overall approach" of the Nepal-SIMI project, recommending to distinguish the activities oriented to the sustainability of services and the ones oriented to more efficient project implementation (as in the case of the involvement of leader farmers).

The summary of the incentive theories was sent to the two advisors of the Thesis, one of them replied and suggested to take out the part of Public and private sectors partnership because it was not strongly directed to the local value chain I was looking at; as well as write down the theories as "theories-hypothesis", in order words "how do the project promoters think it works and how do they think the incentive-activities will make that change takes place". Taking into account this suggestions the new summary of the incentive –theories was rephrased, but kept in the line of "Operative Theories of change" rather than the "mechanisms" meant by Pawson and Tilley (1997).

The summary of the project's incentive-theories was used as a reference for the open interviews conducted with the different actors of the local value chain of tomatoes produced under greenhouses in Dhikurpokhari for finding out what were the outcomes of the projects, which factors influence those outcomes; as well as, which activities of the project worked well and why. During the field research in Kaski, 6 SIMI-officers were interviewed, as well as, 5 actors from the local NGO DCDO, 3 Officers from the District Agriculture Development Office (DADO), 4 members of the marketing and planning committee running the vegetables collection center in Dhikurpokhari, 15 Farmers (5 of them not currently joining the project), 3 vegetable traders and 3 dealers of agricultural inputs and micro-irrigation systems (2 in Pokhara and 1 in Dhikurpokhari).

The last two days of the 4th week additional data was collected from the head office of IDE in Nepal, as well as two lasts interviews: one with the manufacturers of the plastic parts of the Micro-irrigation technology (excluding the tank) and the other with the head of the irrigation department. The last day the mayor findings of the field-research were presented to IDE and Winrock officers involved in SIMI project.

One part of the presentation of the mayor findings was oriented to add the efforts for developing the local value chain of tomatoes from Dhikurpokhari, in terms of a total number of people and total time invested each year. Some participants did not agree in this attempt because of the fact that many activities were oriented not only for off-season tomatoes, but also for many other vegetables at the time, it was not possible with the data available to appropriately attribute such "efforts" to the specific local value chain considered for the study.

Some of the findings questioned the theories of the project in relation to the sustainability of the supply chain of the MIT. During the presentation, possible amendments were proposed by SIMI-staff, those are presented in the last attempt of elaborating CMOCs, which is presented in the discussion part of this document.

Following the field-research in Nepal, the "Operative Theories of change" (OTC) of the SIMI project were rephrased and the "revised" OTC were elaborated. After this I attempt to apply the realist evaluation to the project of Ecuador.

To apply the "realist evaluation" for the project of Ecuador, the project's documents were revised and the two key informants were interviewed, once more, by phone. As it happened in the project of Nepal, OTC were built and tested, in the attempt of creating CMOCs.

The OTC of both projects were used to build "New OTC" to be taken into account in future projects promoting low-cost irrigation and linking farmers to high-value vegetable markets. As I had mentioned, the denomination of OTC came after searching for literature on Program theory, once I realized there were not CMOCs as Pawson and Tilley conceptualized for the "realist evaluation". A new attempt of approaching the CMOCs was made and it is presented in the discussion part of this document.

While writing the case studies, some important information could not be showed by using the value chain maps and the theory-based evaluation only. This information comes from the same source of data (interviews, workshops and documents) in the attempt of understanding the context, the OTC and the outcomes in the two case studies. The information was presented as complementary to what the value chain maps and OTC elaborated in each case study could show.

Limitations of the study

The limited time available for the field-research in Nepal, was one of the main constraints for applying "realist evaluation". However, one of the objectives of doing this research was to find out until what extend it was possible to identify what is about the projects that works, for whom and in which circumstances, with only 4 weeks of field-research, by using value chain mapping and "realist evaluation". In the world of the International Cooperation for Rural Development, it is very common to find external consultants evaluating projects using less than 4 weeks for field research. I wanted to find out until what extend this methodology was suitable for that kind of consultancies or not.

Another limitation for the case-study in Nepal was that I did not speak Nepalese. Because of this I depended on a translator for most of the interviews (26 out of 40 interviews). Even though I could trust on the quality of the translation, in those interviews, were translation was needed, the communication with the interviewers was not fluent, and the dialogue was constantly interrupted, this affected how deep I could get with the interviews. This was a mayor difficulty, particularly, in my attempt to apply the "realist evaluation".

In the case of the project in Ecuador, my understanding of the local reality[3] and the project in which I was involved was a great advantage; nevertheless, it affected the research because I started looking at the project with a "preconceived notion" of what was going on; the part of the research more affected by this was in relation to the understanding of farmers behavior; specially because I could only see their actions, and use my interpretations by looking at the context, but not by interviewing them. I could interview by phone the manager of the Farmer Organization and my ex-colleague who joined the Farmers Group of La Providencia during the entire process, but the farmers not. This was an essential constraint for applying "realist evaluation" as meant by it's creators, Pawson and Tilley, aiming to get deep into what triggers the reasoning and actions of the individuals.

Before designing and applying the value chain maps for the case studies the main literature in value chain analysis was extensively reviewed. In the case of the "realist evaluation", only literature from Pawson and Tilley were reviewed[4]. The experience of Bharat Nepal and the participants in value chain mapping helped to involve the participants in an intensive interaction to create the value chain maps, without this experience the workshops might last longer, affecting the quality of the participation at the end.

The implementation of realist evaluation had a different scenario, no one was experienced in this type of evaluation. This was an important factor, because RE requires of skills for conducting the interviews and leading the informants to came up, not only with, why the incentive-theories didn't work, but, how can they better "work". The inexperience with RE and my background as a "project promoter" drive me to came up with something different that "realist evaluation". After I realize this, I got into literature on "Program Theory" evaluation and "Theory-based" evaluation. Interestingly, I found what I did was in the line of the theory-based evaluation, and particularly, as oriented by the evaluation team of the GTZ (2001) looking at the impact of the "Consultative Group on International Agricultural Research" (CGIAR), a network of independent institutions working in the field of agricultural research and development.

[3] For the case of Ecuador, a research I did in the area in November 2008, looking at the current low-cost irrigation technologies, the availability of water, land labor-force, crops and markets; as well as the existing farmer organizations, NGOs, Savings and credit Cooperatives, was very useful for enforcing my understanding of the local reality.

[4] See Pawson 2001, 2002a,2002b, 2003, 2005; Pawson et al 2005; Pawson and Tilley 1997, 2004; Tilley 2004, 2009.

Part II The Case Studies

8. The Case Study of Ecuador.

The project "Construyendo juntos una nueva Economía" introduced rain-fed maize producers into the cultivation and marketing of high-value vegetables. The project was implemented with several groups of farmers living in the Central coast of Ecuador. Most of those Farmers Groups used to produce maize during the raining season (the Central Coast of Ecuador is a Tropical dry-forest area, whit about 1100 mm of annual rainfall, from the end of December until the first weeks of May). In the years 2002 and 2003, most of the members of the Farmers Groups hardly harvested any maize, because of irregular rainfall, and got into an economic crisis. The members of the "Comité de Desarrollo Comunal La Providencia" were among them. They request to be included in the project at the beginning of the dry season of the year 2004.

The project, promoted by the Ecuadorian NGO "Fondo Ecuatoriano Populorum Progressio" (FEPP), and funded by the "Kuss Foundation", include the collective cultivation and marketing of peppers (*capsicum annum*) or watermelon (*citrullus lanatus*), on irrigable fields of about half an hectare; together with the assistance for starting a saving and credit union within the Farmers Group. This study looks, particularly, at the first part of the project: the promotion of low-cost irrigation and linking farmers to high-value vegetable markets.

The project assumes farmers need to be sure of the profitability of new irrigable-vegetable production and marketing, taking into account, the investments in agricultural-inputs, labour and marketing. The project promoters believe Farmer's Field Schools method, if it is well done, can be effective in developing the skills and knowledge for producing new vegetables with Integrated Pest management, as well as, useful to show the new irrigators the real costs related with irrigation.

This research, looks at the local value chain of peppers produced by the Farmers Group from "La Providencia", during the project intervention in 2004. The project linked this Farmers Group[5] with the wholesale-store of one of the most important Supermarkets in Guayaquil, the largest city in Ecuador. The following Map shows the geographical location of La Providencia and Guayaquil.

Map A. Location of La Providencia, in the Central Coast of Ecuador.

In the year 2004, I was involved in this project as the project's coordinator. The project combined the production and marketing of peppers (*Capsicum annum*) and the creation of savings and credit unions. In this study I'll look at the experience of the farmer organization in La Providencia, located in the county of Pedro Carbo, in the central coast of Ecuador. I will focus on the pepper production and marketing experience.

The theory at the back of the project was: "by the collective production and marketing of high-value vegetables, from irrigation-fields equal or larger than half hectare, Farmers groups can generate incomes high enough to overcome their current economic crisis and continue in the activity year after year".

[5] 8 farmers were involved in the collective production and marketing of peppers of the case-study

The project promoters started with a survey of high-value crops which may grow well in the area, using irrigation. From the study, pepper became a promising one, the project promoters started the first trials using Farmer's Field Schools (FFS) to train farmers.

The project provide technical assistance to locate the irrigation field and design the furrow irrigation systems; as well as, the irrigation equipment and the agricultural inputs for cultivating at least half hectare of high value vegetables.

The project offered training, with a learning by doing approach, on plant-nursery, furrow-irrigation, transplanting, artificial-fertilizing, harvesting. A Farmer's Field School (FFS) was set on the irrigable field, to facilitate interactive learning on the essentials of integrated pest management (IPM).

The Farmers producing the peppers received weekly follow-up from FEPP's agricultural technician. Once in a week, farmers got together in the FFS, analyse the agro-ecosystem, exchange their observations and experimentations, and decide on pest management.

The project offered training with a learning by doing approach in post-harvest management, as well as, the training and follow-up for marketing peppers, using the pick-up of the NGO for transporting the peppers to the markets.

The project linked peppers producers with the Supermarket wholesale-store, through a Farmers Organization registered as a Supermarket supplier.

Mapping the Efforts in the pepper production and marketing.

The project did not work on the development of the Supply Chain of low-cost irrigation technologies and agricultural-inputs, contrary to the Nepal-SIMI project. The project lent to the Farmers Group of La Providencia, without charging any interest rate, a gasoline-pump with a plastic hosepipe, to take water from the river to the field; together with a set of plastic pipes to discharge the water into furrows[6]. The agricultural-inputs for cultivating half an hectare of peppers was lent to the Farmers Group, under the agreement of paying back to the NGO the costs of the agricultural-inputs after selling the peppers. The irrigation equipment would be returned to the NGO after the last harvest.

The group of farmers in La Providencia traditionally cultivate maize during the raining season, they got micro-credits from the local NGO "Fondo Ecuatoriano Populorum Progressio" (FEPP) for acquiring agricultural-inputs. The last two years they had crop failures, because of irregular rainfall. Therefore, the revolving fund stopped because they didn't payback the NGO's loan. Then FEPP proposed to them to participate in the project, learn to produce and sell high value irrigable-vegetables, as peppers, get out of debts and start their own rural bank.

Through value chain mapping I'd like to show: the efforts of multiple stakeholders on the local value chain of peppers produced collectively by a Farmers Group in La Providencia, and, the outcomes in terms of volumes sold and prices obtained from the different traders.

This project involved two direct actors at the meso-level: the local NGO FEPP, which is labelled in the following Maps as "NGO A"; and the Farmers Organization "Centro Agroartesanal Nuestra Senora de las Mercedes" (CAAM), labelled as "Farmer's Organization". Map 1 also shows the governmental agencies which provided control and a legal framework for marketing: The provincial transit police "Comisión de Tránsito del Guayas" CTG ("Agency A"), and the national tax agency "Servicio de rentas internas" (SRI), labelled as "Agency B".

In the first core process of the local value chain, FEPP purchased the irrigation equipment[7], and the agricultural inputs for producing half and hectare of peppers, see Annex 1; and brought them to the field where the Farmer Field School

[6] In November 2008, I did a research in the central coast of Ecuador, looking at the feasibility for developing a supply chain of low cost-irrigation technologies in the area. I compared the economic-feasibility of this irrigation method with low-cost micro-tube irrigation, on a 5400 m^2 irrigation field, for a return period of one, two and five years. The advantage in terms of costs decrees along the years; however, even with the return period of 5 years, the furrow irrigation method is cheaper than the low-cost drip irrigation.

[7] The irrigation equipment consist of a pump with a motor (4 Horse Power) powered by gasoline, discharging about 11 liters per second; 150 meters of PCV hosepipe of 50 millimeters of internal diameter and 60 PVC tubes, 3 meter long and internal diameter of 50 millimeters.

(FFS) of pepper took place. The farmers organization from "La Providencia" signed an agreement to payback the agricultural-inputs with the income generated by the project[8].

The next core process was the pepper cultivation. FEPP helped to build the knowledge and skills for pepper cultivation by using the Farmer Field School (FFS) methodology. The FFS lasted 18 mornings, one per week. Every FFS session started with the analysis of the agro-ecosystem, the farmers discuss and decide on the agricultural activities based on the common agreement, after participating in group activities in the field, related to the cultivation of peppers. At the very beginning of the FFS, the participants of defined the topics they wanted to learn in the FFS. Besides the FFS, one agricultural technician from the NGO provided technical assistance to the ones who got involved in the collective cultivation of half hectare of peppers.

The training also included the marketing of peppers. The NGO, together with the Farmers Organization, CAAM, searched for markets in Guayaquil city[9], about 60 Km from the fields. CAAM provided the service of marketing the peppers, they provided the plastic containers, plastic covers, transportation, communication and accountancy-work. The costs involved in the activity (USD 148) were recovered from the sells. The facilitator of the FFS joined the Farmers from la Providencia to the different market-spots, transporting the peppers in the NGO's pick-up truck. This service was subsidized by the project.

In the trade of vegetables in Guayaquil, the provincial transit police (CTG) played an important role; they were responsible for controlling the trucks with vegetables coming into the city. If the transporters could not show the legal transport documents issued by the buyer of the vegetables, the truck was not allowed to enter into the city and had to sell the vegetables at the Guayaquil's wholesale-market located at the entrance of the city. According to the Guayaquil's wholesale-market regulations, once a truck loaded with vegetables enters the market-compound, it can only get out if it is empty. Wholesalers take advantage of this rule to pay whatever they want for the vegetables. As an informal rule, new suppliers have to endure the price and marketing conditions set by the wholesalers, until they are able to build friendship and/or regular commercial relations with one or two wholesalers.

Because of the uncertainty on wholesaler prices and weighing, the project promoters decide to invest on linking farmers to Supermarkets. The two main supermarket chains were visited, CAAM got the chance in one of them. They could register because they had a legal status, a bank account and formally-audited accountability. The document asked by the CTG, for transporting vegetables into the city, could be issued in the same day of the delivery, once the manager of the Supermarket wholesale-store (SWS) set the required volume and price. It took about two hours to get this document and to send it by bus to Pedro Carbo, were the CAAM office is located.

The CTG has numerous policemen in the city; as soon as they see a bad-looking truck they stop it, and ask the driver to show all the legal documents. If (s)he doesn't have all the documents, one can always arrange directly with the policeman; either with the help of God, or with an undetermined amount of money, to continue the journey until the next transit policeman stops the truck. To reach the SWS, an average of 3 policeman-stops can be expected.

The legal procedure was done for the first shipments to the SWS in Guayaquil. But because of the transaction costs required to get the transportation-document, CAAM and FEPP gave up, and decided to make the trips without the legal-documentation. It helped to have a brand-new good looking 4 wheel drive pick-up, as well as taking an alternative road, crossing the fancy neighbourhoods of rich people, to get to the SWS. Once or twice the FFS facilitator was stopped by the transit-police; with God's help, he didn't have to go to the wholesale market compound.

The other governmental organization involved at meso-level in the marketing of vegetables is the national tax collection agency SRI. This Agency has to authorise CAAM to print numbered invoice documents, required for selling the vegetables to the SWS. To get this authorization, CAAM is obliged to regularly submit the tax-declaration-forms. The forms must be attached with economic reports endorsed by an officially credited external accountant. CAAM is able to keep up with this official-procedures thanks to the cooperation of Austrian volunteers in the administration office of the Organization.

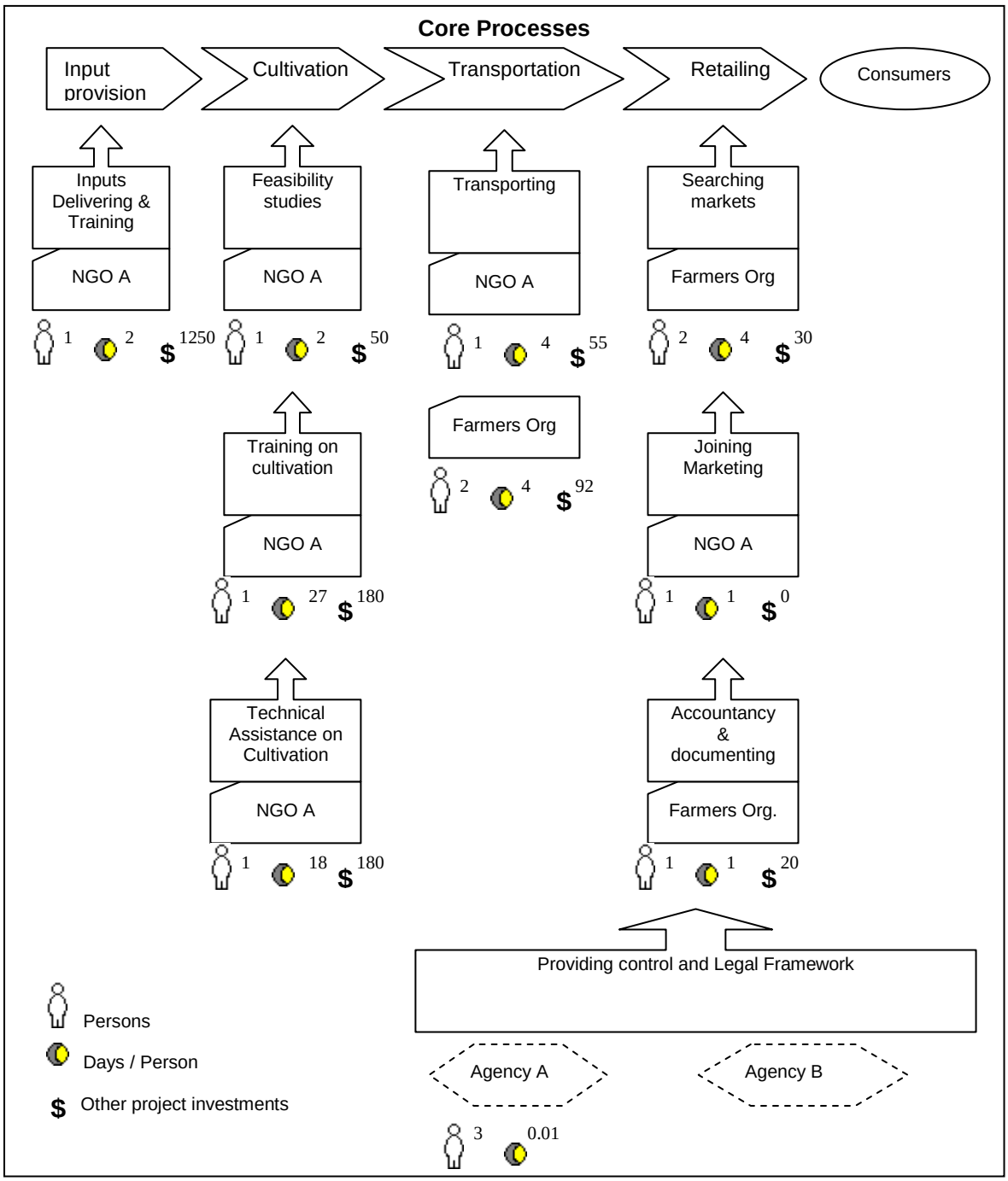
The intervention of FEPP and CAAM in the local value chain, lasted until November 2004, when the FFS ended. The next year, two farmers groups produced peppers in La Providencia, and sold them to traders who picked up the sacks of peppers in their fields.

[8] In the agreement, the farmer organization also compromised to payback with this income a previous loan from the NGO which was still not canceled.

[9] Guayaquil is the major city in Ecuador, it has a population of about 2 million inhabitants.

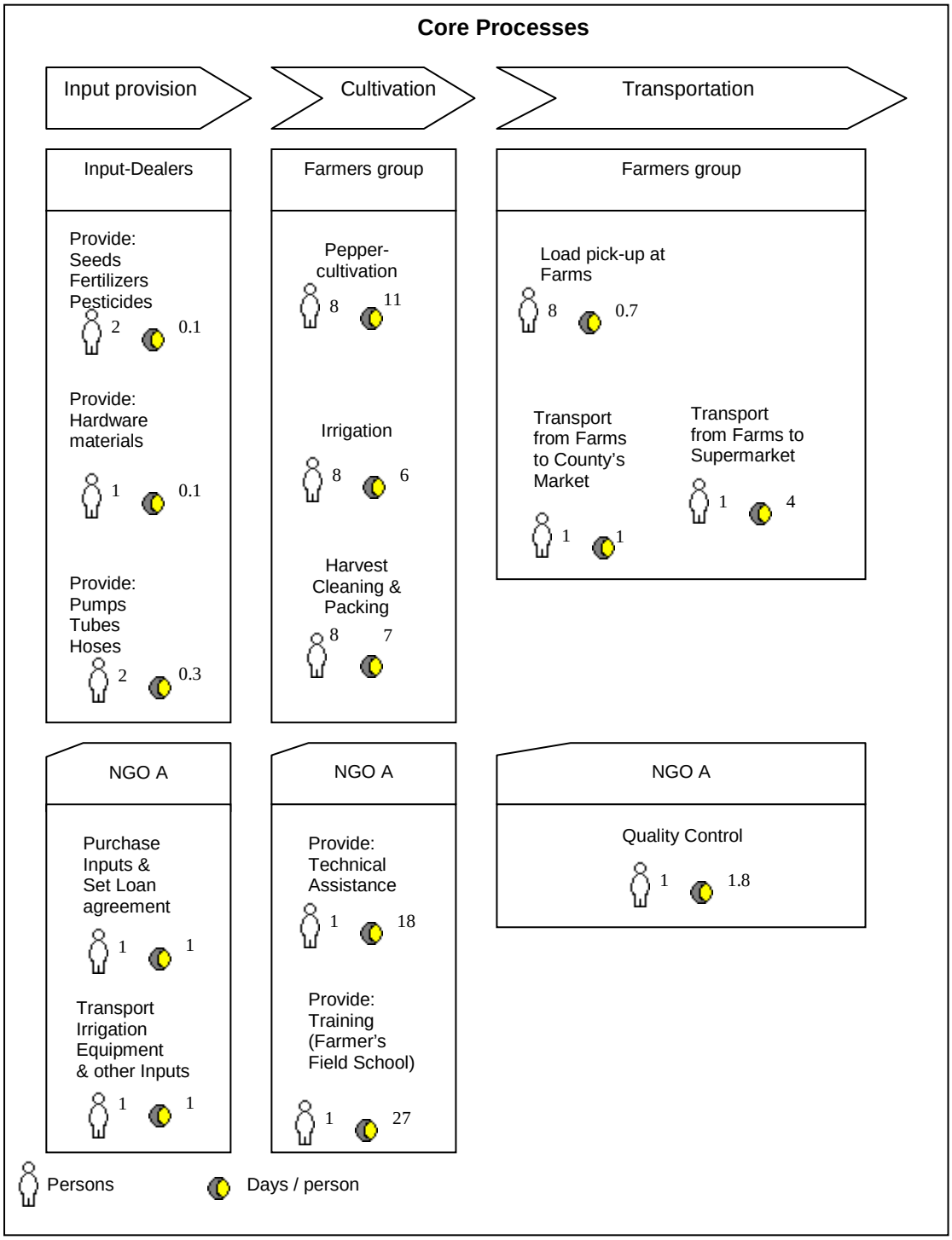
The following Map pictures the efforts of the organizations at meso-level, in terms of people and time involved, for promoting the collective production and marketing of peppers in la Providencia, during the year 2004.

Map 1. Meso-Level services, number of persons, days and estimated costs involved in the promotion of the local value chain of peppers from La Providencia, Ecuador, in the year 2004.



In the next two Maps the efforts of the actors at micro-level are presented, in terms of number of persons involved in the main activities of the local value chain. The number of days was calculated by dividing the total number of hours invested during the crop season by 8.

Map 2. Number of persons and working days involved in the main activities for the cultivation of half an hectare of peppers in La Providencia, in the year 2004.

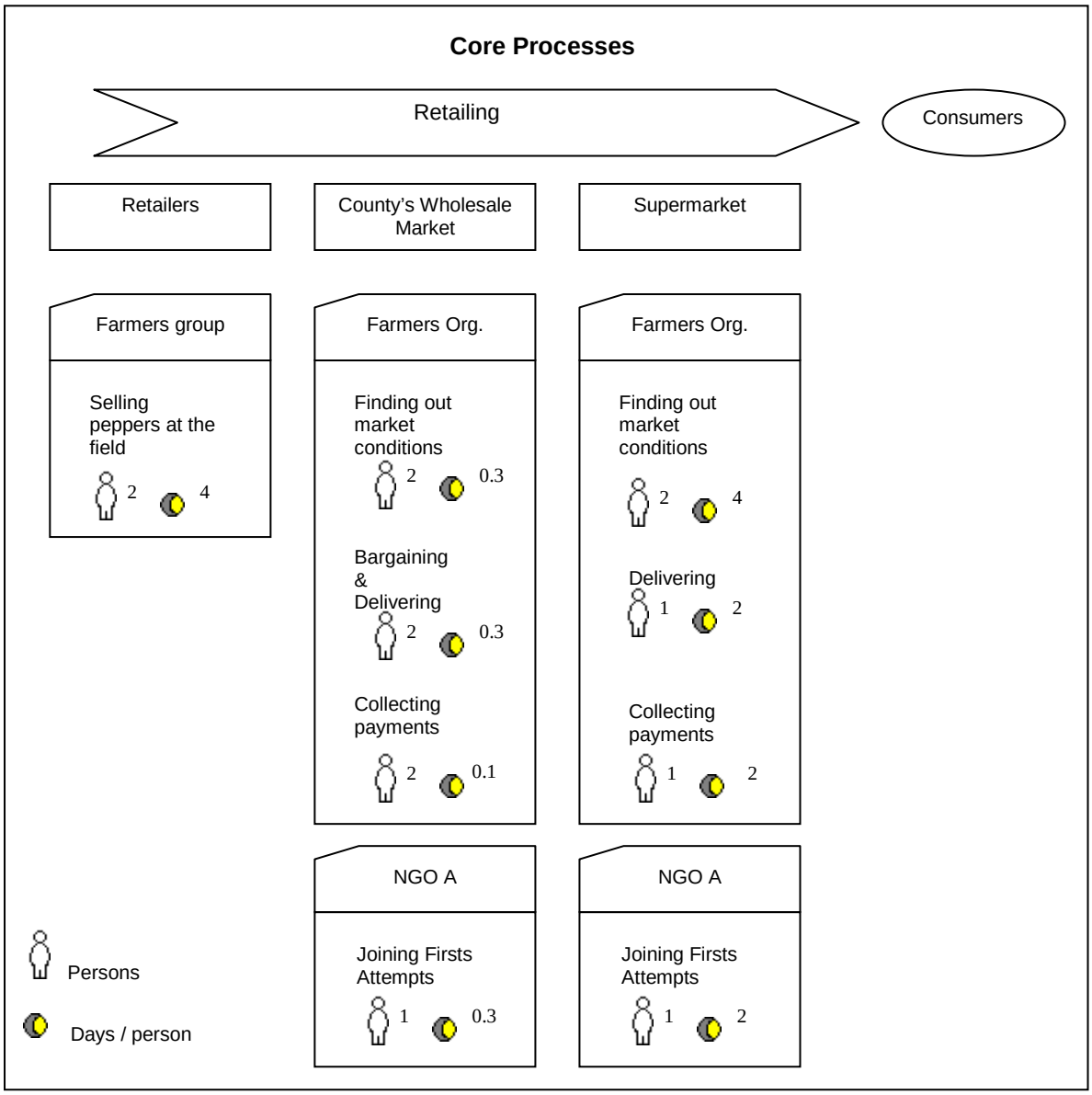


Next to the efforts of the Farmers organization, CAAM, in selling the peppers, the Farmers Group of La Providencia sold an important amount of peppers to retailers, without telling it to FEPP or CAAM. This has to do with the fact that CAAM was an organization with transparent communication with FEPP's local officers. The payments of the SWS to CAAM were first used to reimburse the loan of the agricultural-inputs provided by the project, as well as a previous debt (before 2004) the Farmers Group still had to reimburse to FEPP.

To sell to the Supermarket, a representative of CAAM had to go to the SWS in the morning, to find out if the Supermarket was willing to buy peppers and at what price. If there was an agreement, the delivery was done the same day, in the evening; and the payment was collected at the SWS few days later. To sell the peppers at the local market, one CAAM representative went to the wholesale market to find out how much pepper is required and bargain the price. If there was an agreement, the pepper was delivered few hours later. The payment was collected few days

after. The following Map shows the efforts of the actors at micro-level for the marketing of peppers produced in La Providencia.

Map 3. Number of persons and working days involved in the main activities for the marketing of peppers from La Providencia, in the year 2004.



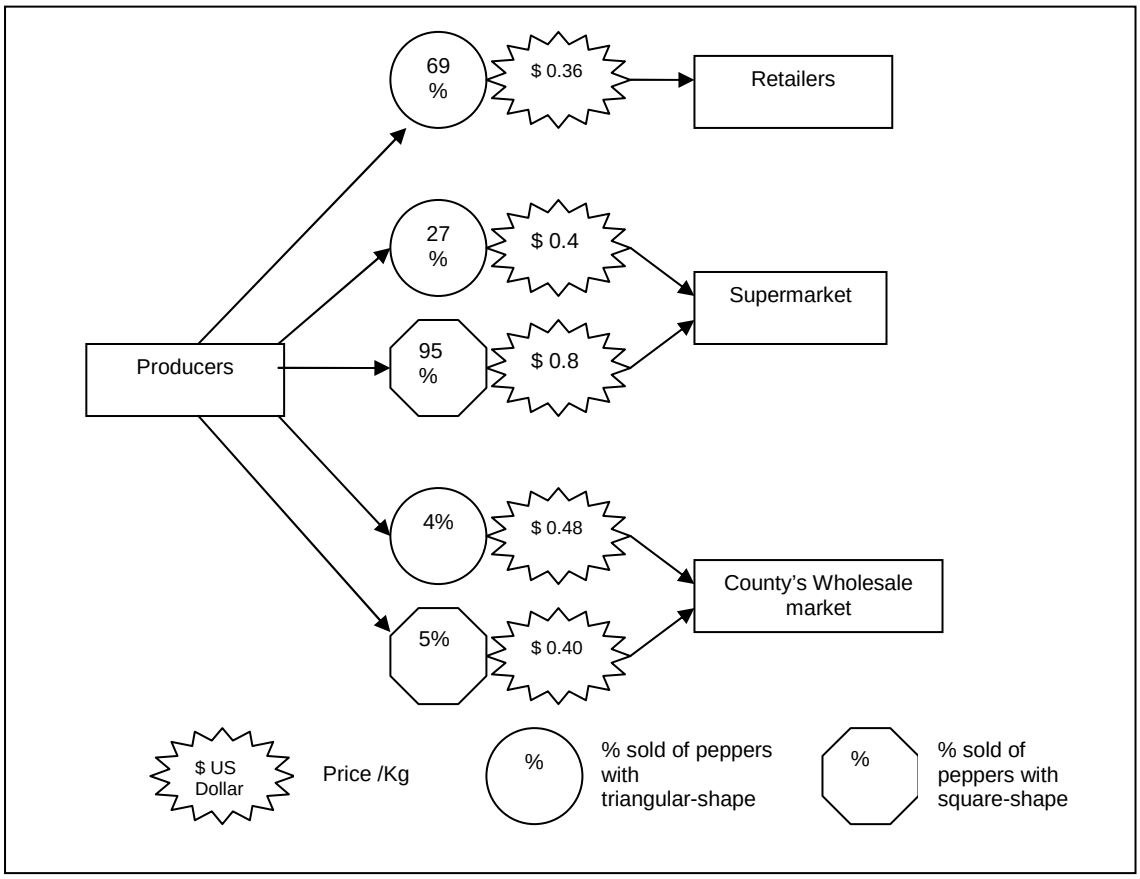
In the Farmer Field School of peppers at La Providencia, two different varieties of peppers were produced, one with a square-shape, and the other, with a triangular form. This last variety had a higher demand. About 8000 Kilograms of this variety were harvested from an irrigable field of 0.4 hectare. Most of these kilos were sold by the Farmers Group to retailers who load their trucks on the Field. They offered the lowest price, however, farmers preferred to sell the peppers to them, because they could freely decide on how to use this income, without any intervention from FEPP; who was asking to get out of debts first, and after this, use the income to start saving in the rural bank the project was helping to set in La Providencia. The local market offered the best prices but demanded few kilograms per week. The supermarket offered the current wholesaler price, with the advantage, in comparison with the wholesale-market in Guayaquil, of keeping the price offered to the suppliers on the day and weighing exactly with electronic-scales. CAAM had no bargaining power in Guayaquil.

About 700 Kilograms of the square-peppers were produced in an irrigable-field of 0.1 hectare. The Supermarket Wholesale-store (SWS)[10].paid the double price, in comparison with the other variety. The peppers not complying with

[10] The Supermarket Wholesale Store belonged to the same owners of the Supermarket. This wholesale store sold the vegetables to the Supermarket.

the quality-standards, in terms of size and appearance, were sold at the local wholesale market at half of this price. The following Map shows how the two varieties of peppers were distributed in the last core process of the local value chain.

Map 4. Distribution of the peppers from La Providencia in 2004



After the project ended, farmers continued producing peppers in groups, selling the vegetables to retailers who purchased the peppers in La Providencia. The Farmers Organization did not get involved in the marketing of those peppers.

The Theory-based evaluation of the project in Ecuador

In this section, I'll first present the operative theories of change of the project in Ecuador; and then, I'll present the "tested" operative theories of change, derived from the evaluation of the project after its implementation.

Operative theories of change of the project in Ecuador

As I mentioned before, the project in Ecuador used the low-cost irrigation available in the existing supply chain, rather than investing in the development of a new supply chain of low cost irrigation technologies. The project neither promoted an agricultural Input Supply chain, as it was the case in the SIMI Project, in Nepal.

The project assumes farmers need to be sure of the profitability of new irrigable-vegetable production and marketing, taking into account, the investments in agricultural-inputs, labour and marketing. The project promoters believe Farmer's Field Schools method, if it is well done, can be effective in developing the skills and knowledge for producing new vegetables with Integrated Pest management, as well as, useful to show the new irrigators the real costs related with irrigation.

The project in Ecuador, addresses the production and marketing of peppers, as high value irrigable-vegetable, produced by groups of farmers participating on a Farmer Field Schools. The operative theories of change of the project are presented bellow:

High-value irrigable-vegetable production

The project promoters started with a survey of high-value crops which may grow well in the area, using irrigation. From the study, pepper became a promising one, the project promoters started the first trials using Farmer's Field Schools (FFS) to train farmers.

The following operative theory of change of the project was defined:

1. By investing on Farmer's Field schools training, farmers can effectively develop the knowledge and skills to successfully start producing irrigable-peppers. If this is done collectively, farmers can get high profits, and accordingly, get motivated to continue doing it year after year.

Linking Farmers to Markets

The project promoters believed small-scale farmers can reach markets requiring higher volumes and constant supply; as well as improve their bargaining position in markets if they do it collectively, through Farmer's organizations. They also consider vegetable traders in major cities as necessary for the marketing of high volumes. Among those retailers, supermarkets were expected to offer better prices, and be fair with providers. Accordingly, the project came up with the following operative theory of change:

2. By investing on training and follow-up for marketing irrigable vegetables, together with, starting commercial relations with supermarkets, farmers can reach better markets for their vegetables, and become highly motivated for continuing year after year.

Tested operative theories of change after the implementation of the project

The following "tested" operative theories of change came from the evaluation of the project implemented in La Providencia, Pedro Carbo county, Ecuador.

High-value irrigable-vegetable production

In La Providencia, the evaluation of the project regarding the production of high-value irrigable vegetables, lead to the following operative theories of change:

1. Project's investments on Farmer's Field Schools training, can be effective on building the knowledge and skills of farmers to successfully prevent and manage pest on vegetables[11]; if the FFS is complemented with training on nursery, irrigation, crop-fertilization, crop-propping, harvest and post-harvest with a learning by doing approach; if farmers are able of organize collective vegetable-production on irrigable-plots of half hectare or larger, they could get high vegetable-yields, which may encourage them to continue producing high-value vegetables year after year[12].

Linking Farmers to Markets

The project evaluation regarding the linkage of farmers to markets led to the outcomes presented in the following operative theories of change:

[11] Pepper, in this case.

[12] On the next dry season, after the project, the farmers who produce and sold the peppers formed smaller groups, between relatives, and continued producing peppers in groups, selling the pepper to traders. Those groups continued producing peppers, year after year

2. Project's interventions on training and follow-up oriented to Farmers Groups connected with a Farmer Organization for marketing irrigable vegetables, with a learning-by-doing approach, can be effective in linking farmers with new markets, particularly, the wholesalers on major cities, for marketing high quantities of vegetables, among them, the Supermarkets, which have the advantage of offering better prices[13] and exact weighing[14], but are more demanding on quality[15], than other wholesalers; If Farmers Organizations manage to comply with the rules and regulations for marketing vegetables at Supermarkets, involving important transaction cost[16] and administrative-efforts[17]; and are capable to reach a long-lasting supply chain of vegetables, with volumes, big enough, to cover the embedded transaction costs, they might be able to sell vegetables to Supermarkets year by year.

Additional information in relation to the project performance

After the project finished, groups of pepper-producers in La Providencia continued producing peppers, but didn't keep on supplying the supermarket, because of the high transaction costs; such as creating and keeping a formal administration with edited accounting, keeping up-dated with the national tax agency, comply official-documentation for transporting commodities into the city, acquire supermarket-requisitions.

In the year 2008, FEPP and CAAM promoted the cultivation of Chilli-peppers, linking farmers to a private company specialized in exporting Chilli powder. A mill from the company was installed in CAAM's building. The private company brought the seed to the participants. The Chilli pepper was more resistant to droughts, pest and diseases than the peppers produced in 2004. Therefore, farmers cultivate the Chilli-peppers during the raining season, those with access to irrigation produce 3 times more than those who didn't. Farmers came regularly to CAAM and milled their Chilli-peppers, as in the case of Nepal, farmers appreciated to get little amounts of money in regular basis by bringing few kilograms to the collection center. The project run well until retailers came to the area offering a better price and bringing their own workers to harvest the Chilli peppers.

From la Providencia, only one couple joined the second initiative of FEPP, they became active members of CAAM and received a loan for doing agriculture. At the end of 2008 they hardly brought Chilli peppers to the collection center. They still have a debt with CAAM's , waiting to be cancelled, and the are not attending regularly to CAAM's activities.

[13] Prices are determined by the Supermarket day by day, there is no bargaining when the vegetables are brought at the wholesaler store. New providers offering low volumes and not constant supply don't have any bargaining power.

[14] Wholesalers in Guayaquil, the major city about 70 Km from la Providencia, normally estimate the weight by looking at the sacks of vegetables, taking advantage of this way of determine quantities to make some discount on the price at the moment of receiving the vegetables.

[15] Quality is determined in terms of size and appearance, such as, clean, no insect or plant-disease damage and form.

[16] Transaction costs, for creating and keeping a formal administration with edited accounting, open bank accounts, comply official-documentation for transporting commodities into the city, acquire supermarket-requisitions

[17] To fulfill with the rules and regulations set by the governmental agencies controlling the formal marketing of vegetables in the major cities of Ecuador.

9. The Nepal SIMI project

The Nepal Smallholder Irrigation Market Initiative project (Nepal SIMI Project) is part of a global network[18] promoting small scale irrigation for farmers with limited economic resources. The project promotes micro irrigation and agricultural inputs supply chains and linking farmers to high-value vegetable markets to increase the income of rural poor households. Only in Nepal, the project targets 80.000 poor families.

The SIMI project in Nepal started it's first phase in the year 2003. The third phase of the project lasts from 2006 to 2009. The project promoters are Winrock International, International Development Enterprises (IDE), the Center for Environmental and Agricultural Policy Research and Development (CEAPRED), Support Activities for Poor Producers (SAPPROS) and the Center for Agro-enterprise (AEC). The three phases of SIMI project were funded by the United States Agency for International Development (USAID).

In the year 2008, I met the director of IDE-Myanmar, I became very much interested in IDE's market-oriented development model "Poverty Reduction through Irrigation and Smallholder Markets" (PRISM), because it was in the same line of the project in Ecuador promoting low-cost irrigation and linking farmers to high-value vegetable markets.

Wageningen University, used to work with the office of IDE-Zambia, IDE-Nepal and lately with IDE-Ethiopia. The SIMI project implemented in Nepal was one of the most successful ones, according to the information available in internet. The contact with Wageningen University, and particularly, the advisors of this study; together with, the good reputation of Nepal-SIMI project, make me decide to contact them to propose the research. The research proposal was welcome in Katmandu, Nepal.

The first day in IDE-Nepal office I presented the research proposal to IDE and Winrock officers in Katmandu and led them define the place and local value chain for the field-research. On the second day a commission selected Dhikurpokhari and the off-season tomato local value chain for the study. They were interested in finding out how this local value chain was working. The commission considered Dhikurpokhari because in this area the cooperation between the organizations involved in the project was evident.

Dhikurpokhari is a mountainous area with about 1700 households, most of them with terraces between 1200 and 1700 meters over see level. About 20 Km of asphalt-road connect this area with the main city, Pokhara, of about 0,3 million inhabitants.

In the month of May, the field-research took place, focusing in the local value chain of tomatoes produced under greenhouses in Dhikurpokhari. Interviews, observations and workshops with the different actors of the local value chain were conducted in this rural site and Pokhara city, in the Kaski district, Nepal.

The project linked the Assembler of Micro-irrigation technologies and dealers of agricultural inputs placed in Pokhara city with a local dealer in Dhikurpokhari. The farmers organizations, local NGOs and governmental offices located at this site were involved in the development of such supply chain, as well as the cultivation and marketing of off-season vegetables. For the marketing the Managers of the vegetable collection center in Dhikurpokhari and local traders were linked with vegetable traders in Pokhara city.
The following Map shows the geographical location of Dhikurpokhari and Pokhara.

[18] www.siminet.org

Map B. Location of Dhikurpokhari, in the Kaski district, Nepal

The Nepal SIMI Project aims to develop the supply chain of low cost irrigation technologies, together with the production of high-value cash crops and better markets for those crops. SIMI project enhanced the common-vision of farmers, leader farmers, farmer's organizations; private-enterprises, private and public development-organizations at local-level (one or several villages), district-level and national level; unifying their ideas, discoveries and efforts with a value chain approach.

In this study I look at the theory of Nepal-SIMI project in relation to the promotion of low-cost irrigation technologies and linking farmers to high value vegetable markets. This theory has a value chain approach: "by the development of a supply chain of low-cost irrigation technologies and agricultural inputs, together with the formation farmers organization and enhancement of their capacity to produce high value vegetables and marketing through local collection centers linked with vegetable traders; local value chains of high-value vegetables can be up-graded, increasing the income of farmers, agricultural-supply dealers and vegetable traders year after year".

The following are the activities of the project:

The development of a supply chain by building the capacity of micro-irrigation technology manufacturers, dealers and installers; as well as the development of a Supply Chain of agricultural inputs with embedded technical assistance.

The formation of Farmers Organizations, together with training and technical assistance for off-season vegetables cultivation.

The development of market channels, particularly, by the collective marketing assisted by collection centers and local Marketing & Planning Committees (MPC).

The construction of Multiple water-use systems (MUS) and the hand-over to "water committees" trained in operation and maintenance of the systems, as well as their management.

The involvement of the government by building the capacity of the Agricultural Development agency in public-private partnerships for the development of local value chains.

The promotion of revolving fund groups to help women and people from socially-disadvantage groups to access the technology to produce off-season vegetables.

In the research area, social discrimination exist, based on Social Caste Systems with its origins in Hindu and Buddhist cultures. The different castes used to have their own traditional occupation, the highest Caste were the priests, and the lowest were sweepers. The Nepal SIMI project identify the `Dalits` and the Janajati as `Disadvantage groups`. Dalits and Janajatis suffer from social discrimination. According to the religious believes, those who came from a Dalit or Janajati family, did not behave well in their past life, if they accomplish their role in life, they may reach the next Caste in the next life.

Mapping the off-season tomato local value chain

One of the objectives of this research is to test the effectiveness of value chain mapping tools to show the efforts of multiple stakeholders on local value chains. In the case of Nepal, the tomato (*Licopersicum esculentum*) production in Dhikurpokhari under very small greenhouses (between 40 and 60 m^2, using micro-irrigation technologies) was mapped. Rather than squeezing the tomato value chain into one single map, it is presented in pieces, for readability purposes.

For each part of the local value chain, two maps will be shown: one for the last off-season tomato production in Dhikurpokhari, from April 2006 to March 2007, corresponding to the beginning of the last intervention of the SIMI Project[19]; and the other, for the tomatoes produced from April 2008 to March 2009, the last year of the project.

On the next pages, you will find the maps showing the efforts of the main actors at the different core processes of the local value chain chosen for this case study. The local value chain is divided into three parts: The supply chain for the off-season tomato production in Dhikurpokhari, the tomato cultivation and the marketing.

First the efforts of the actors at the meso-level will be shown, as they contribute in different ways to the development of the local value chain. The main actors at the meso-level are: the Local NGO "Dhikurpokhari Community Development Organization" (DCDO), the District Agriculture Development Office (DADO), and the staff of the "Smallholder Irrigation Market Initiative Project" (SIMI-project). DCDO staff promotes the project and the creation of framers groups in the area, providing trainings, technical assistance and follow-up to the farmers groups involved in the different activities. DADO provides additional trainings and technical assistance, either by means of their technician at the local Agricultural Service Centre (ASC), which serves as a local office in Dhikurpokhari, or by sending (specialist) technicians from their head office in Pokhara. The trainings and technical assistance concern specific topics, such as Integrated Pest Management and off-season tomato production under Plastic Greenhouses. DADO also provides highly subsidized materials to farmers, as Micro Irrigation Kits (MITs), plastics for covering the greenhouses and plastic membrane for rainwater storage. DADO has been assigned to be the coordinator of the project in the area. It concerns the staff of the SIMI project to promote the value chain approach and to build the capacities of DADO and local NGOs, such as DCDO, in order to assure the implementation of the project. In the following Maps their efforts will be presented, in terms of number of people involved and indicating the estimated time dedicated to the promotion of the local value chain selected for this study.

In Dhikurpokhari, other organizations as well contribute to the local value chain of vegetables, and particularly the off-season tomato chain. There are three particular organizations which contributed in different ways. The Village Development Committee (VDC), which is the most direct branch of the local government; they subsidize some MIT. The Machhapuchhre Development Organization (MDO), who started sharing activities with DCDO[20]. And the Local Development Fund of the United Nations (LDF) subsidized some MIT for promotional purposes in the beginning of the project.

For developing the MIT Supply chain in Dhikurpokhari the project involved many actors on the promotion of the technology, setting up demonstrative plots and then inviting farmers to visit successful farmers. This has been one of the most effective ways to motivate other farmers to participate in the project. The project offered training on off-season vegetable production together with technical assistance. Often farmers could get subsidized MITs and plastic sheet to start off-season tomato production under greenhouses. The "easy[21]" marketing contributed as well to the motivation of many farmers to participate in the project. To start participating in the project, the purchase of MIT was compulsory.

The project provides trainings and technical assistance for the capacity building of one MIT Assembler and 14 local dealers in Kaski district; the local dealer in Dhikurpokhari was one of them. The first dealer migrated to sell his working labour abroad and the project staff quickly involved a young entrepreneur, who had set up a shop in Dhikurpokhari a few years earlier for the sale of school and kitchen supplies, so he could start selling MITs and agricultural inputs supplies.

The main actors promoting MIT not only joined efforts for setting up a supply chain of MITs, but also invested in developing the supply chain of agricultural inputs, involving dealers, technicians and leader farmers. They tested

[19] The last funding of the Nepal SIMI project last from 2006 to 2009.
[20] After the first year of the project, SIMI project continue only with DCDO as local implementer.
[21] Farmers could sell their vegetables two times per week to the local collection center

different seeds, fertilizers and pesticides to find out the most effective ones and they trained dealers for a better understanding of agricultural input management.

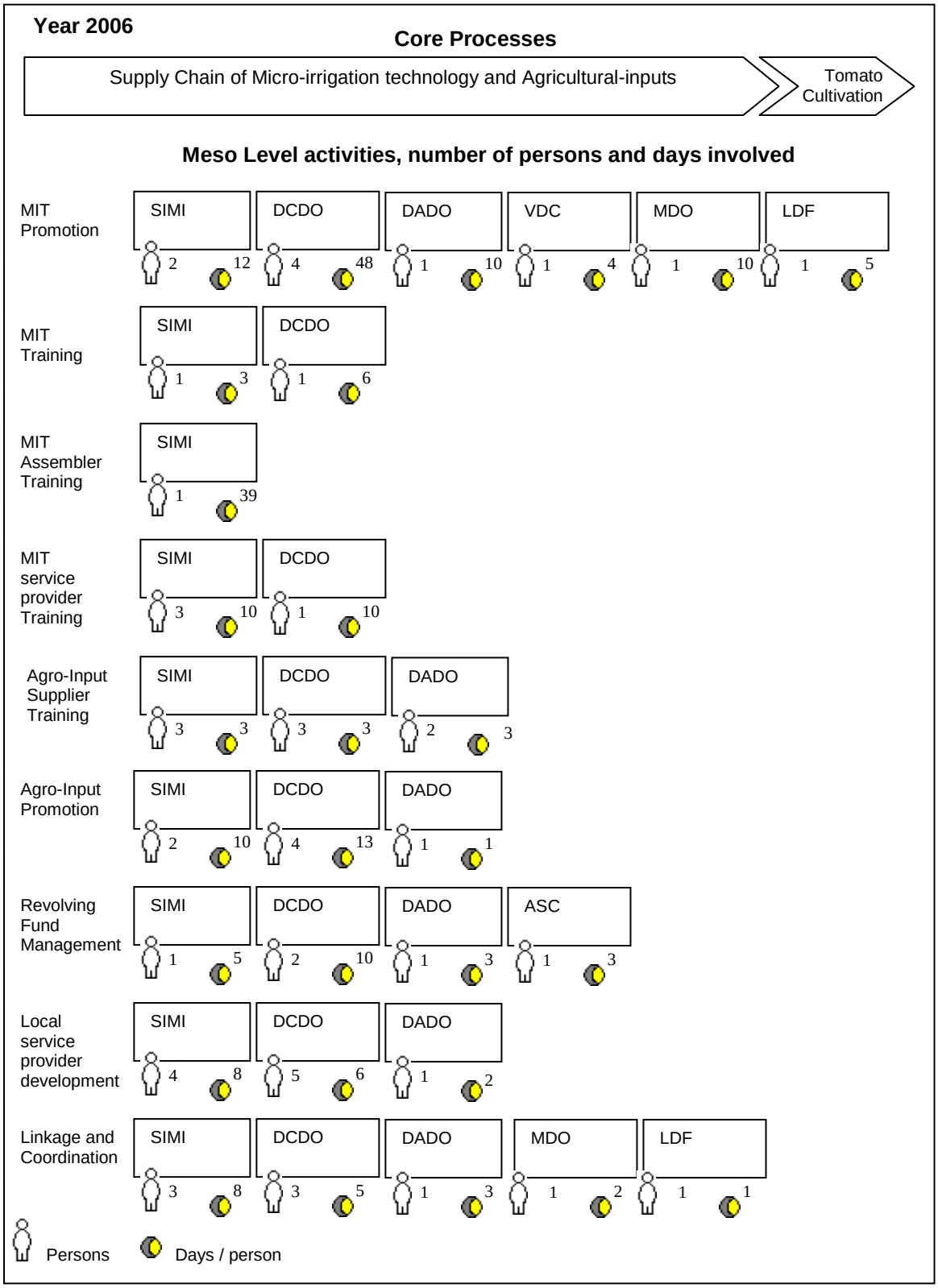
Besides the trainings and technical assistance to build the capacity of local MIT and agricultural dealers, SIMI staff worked on the capacity building of leader farmers as local providers in different specializations, like off-season vegetable production, greenhouse construction or the construction of water storage tanks and Multiple-water-Use-Systems (MUS). Leader farmers provide technical assistance in off-season vegetable production to their group members without charging. The other local providers (trained in construction) were mostly hired by the project.

The main actors also invested in setting up revolving fund groups in order to make the technology accessible, especially for women and people from socially disadvantaged groups (castes). In Dhikurpokhari, the local NGO, DCDO, had some previous experience in working with such groups, because of a project financed by Caritas Nepal. The Women Saving and Credit Cooperative will be included in this part, because of their relevance on financing the supplies for off-season tomato production in Dhikurpokhari; the number of people corresponds to each member of the cooperative who received a loan for greenhouse tomato cultivation.

The Nepal SIMI project aims to develop local value chains. The linkage and coordination between key actors at the different core processes were the most important activities for the main actors at meso-level. This was done by facilitating meetings, tours and visits at village, district and national levels. MIT and agricultural input dealers took advantages of these meetings to promote their commodities and agree upon more efficient and effective ways of delivering supplies.

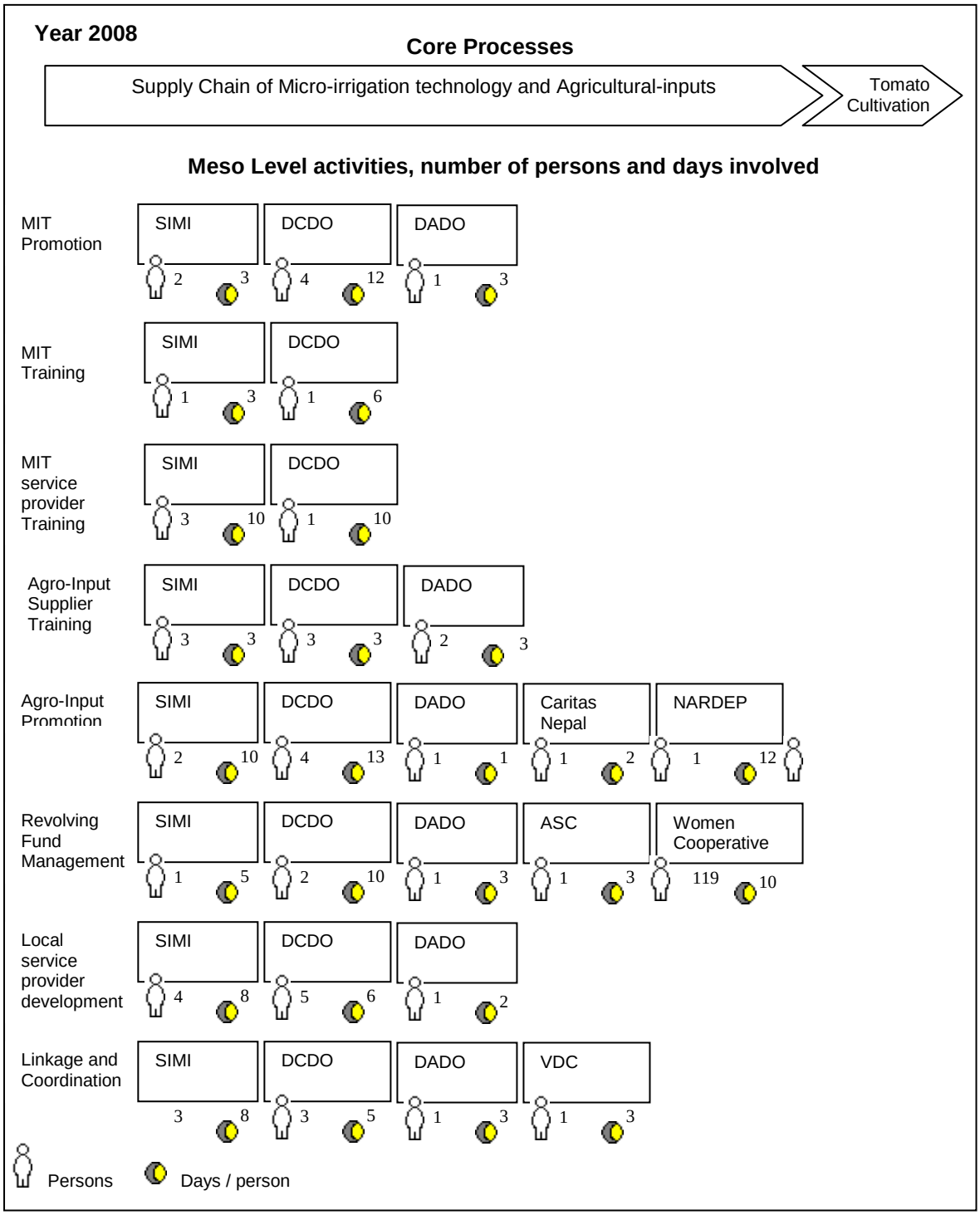
The efforts on the supply chain of MITs and agricultural inputs for off-season tomato production in the study area in 2006, in terms of people and time involved on the main activities to set such a supply chain, are summarized in the following Map.

Map 5A. Main activities of the organizations promoting the Supply Chain for the off-season tomato production in Dhikurpokhari.



At the end of the project, the activities, people and time of the main actors at the meso-level dedicated to the promotion of the Supply chain of MIT and agricultural inputs decreases; the Women Cooperative, created before the project, financed 119 out of 159 greenhouses for tomato production in Dhikurpokhari. Caritas Nepal and the Governmental agency NARDEP subsidized materials for testing new tomato production under green houses. The following Map shows the changes.

Map 5B. Main activities of the organizations promoting the Supply Chain for the off-season tomato production in Dhikurpokhari, at the end of the project.



It is important to mention that the efforts of the project in promoting revolving fund groups were paralleling the Women Cooperative's process. The Women Cooperative, formed by 890 women from Dhikurpokhari and financing about 75% of the off-season tomato producers involved in SIMI project, was not visualized in any of the project's documents. Lately, DCDO managed to institutionalize the separate process into the "Future in our Hands" Savings and Credit Cooperative. Many of the women participate in both. Some of them opt for only one of them, because they don't have the time to attend the meetings of both organizations.

Regardless the efforts of the promoters of the MIT Supply Chain, the number of MIT sold by the Supply Chain decreased year after year. In Dhikurpokhari, during the years 2005-2006, 155 MIT were sold by the Local Dealer. At that time farmers purchased them at a price of NRP 950 (USD 13 approx). Between 2006- and 2007 230 MIT were sold by the local dealer, of which 130 were paid by DADO, while the other 120 were purchased by farmers at NRP 1250

(USD 18 approx.). In the period of 2007-2008 only 60 MIT were sold by the local dealer and all of them were paid by the Governmental Office DADO, at the official customer price of NRP1600 (USD 22 approx.). In the Kaski district, the number of MIT sold by the Assembler, gradually decreased in the last 4 years, from 2996 to 2193, then to 1734 and the last year to 800. This trend questions the sustainability of the Supply chain throughout time.

The next core process is the off-season tomato cultivation in Dhikurpokhari. The very first activity of the meso-level actors was the formation of Farmers Groups. The local NGO, DCDO was the main promoter, as they started a couple of years before 2006, sometimes with the support and interaction of previous projects, such as the previous SIMI-project (2004-2006) and the "Integrated Community Development" programme financed, from Caritas Nepal; other times with the Local Development program of the United Nations. During the implementation of the last SIMI project (2006 to 2009), DADO got involved, assigning this task to the local officer at the Agricultural Service Centre (ASC).

The DCDO, DADO and experts from the SIMI project were the main actors promoting the cultivation of greenhouse tomatoes, among others, in Dhikurpokhari. The training was oriented rather to off-season vegetable production in general, than to off-season tomato in particular. The same happened with other activities, such as the technical follow-up, crop production planning and the farmers exchange visits. Often, DADO contributed to the trainings with their technician of the local ASC in Dhikurpokhari.

The agricultural technicians from DCDO offered a step by step training on off-season tomato cultivation to those farmers who were willing to start the production of greenhouse tomatoes and they provided the follow-up of the greenhouse production during the first year. The next year, the technicians started doing the same with new groups of farmers. Consequently, the technical assistance from DCDO to previous farmers groups reduced drastically. To overcome this, the project encouraged leader farmers from existing groups to provide technical assistance to their group members.

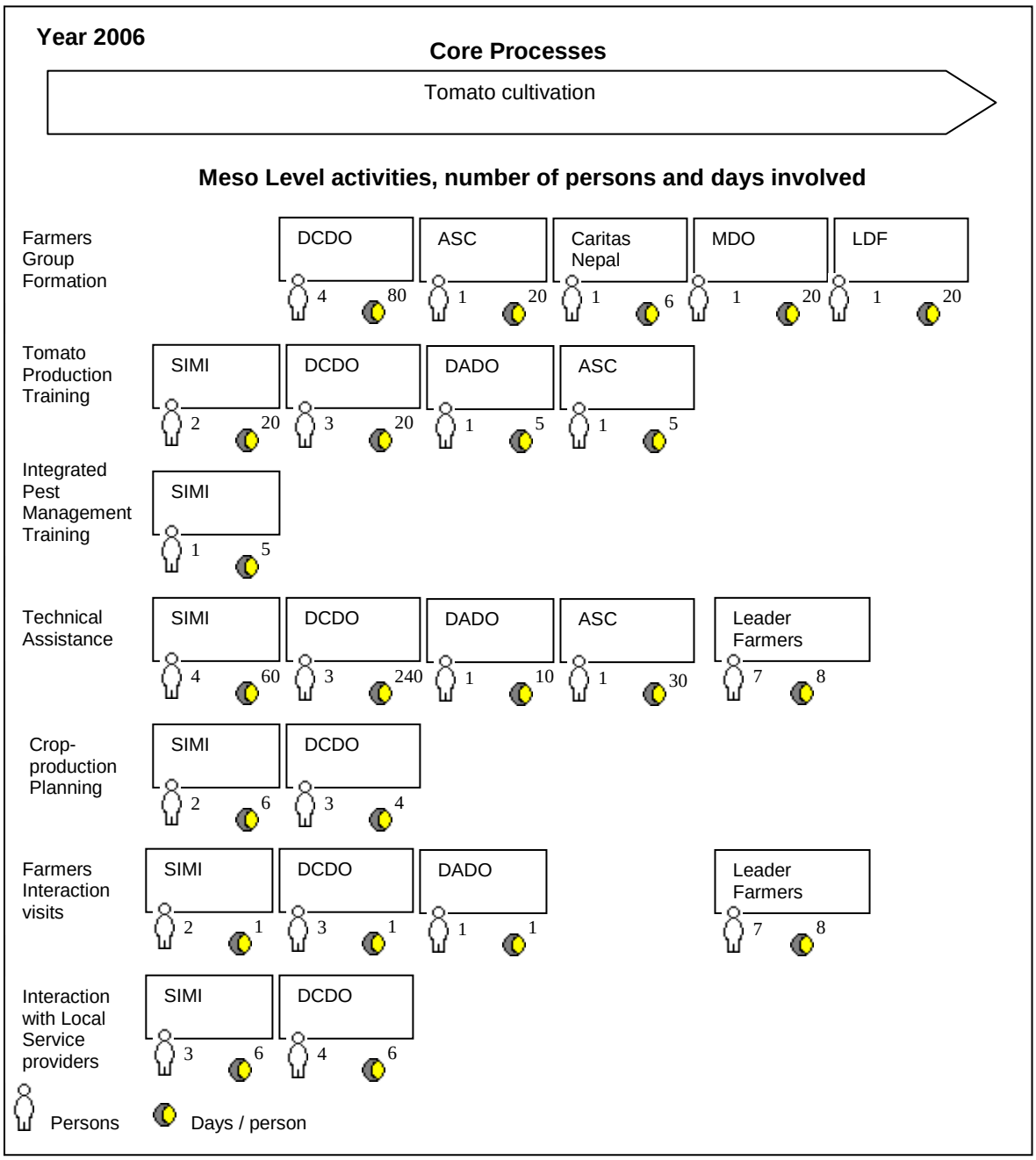
On off-season vegetable production, the management of pest and plant diseases is very important, as it can make a difference between having good yields and low yields. In the case of tomatoes, some pests and plant diseases may cause the collapse of the entire crop. The main actors of the SIMI project offered a training (5 days in total) on Integrated Pest Management (IPM). Furthermore, five farmer groups received training on IPM by Farmer Field Schools promoted by Caritas Nepal.

The technicians from DCDO and the SIMI experts also gave training and technical assistance to farmers in setting up crop production plans. Local dealers and the collection centre used these plans to estimate respectively the demand of agricultural inputs and the local vegetable production.

The project sponsored exchange visits between farmers, so as to share their experiences on off-season vegetable production. These visits were useful to motivate some farmers to start producing tomatoes under greenhouses and others to implement crop-management techniques.
The project offered exchange meetings between leader farmers and agricultural technicians from the different organizations involved in the project; agricultural input dealers also participated. During these events leader farmers, agricultural technicians and dealers could share their experiences. Often the participants came back from these meetings with new ideas and commitments on promoting the most promising technologies[22].
The following Map shows the efforts of the different actors at meso-level, promoting the off-season tomato production in Dhikurpokhari at the beginning of the last SIMI project.

[22] More often based on the use of agricultural-inputs.

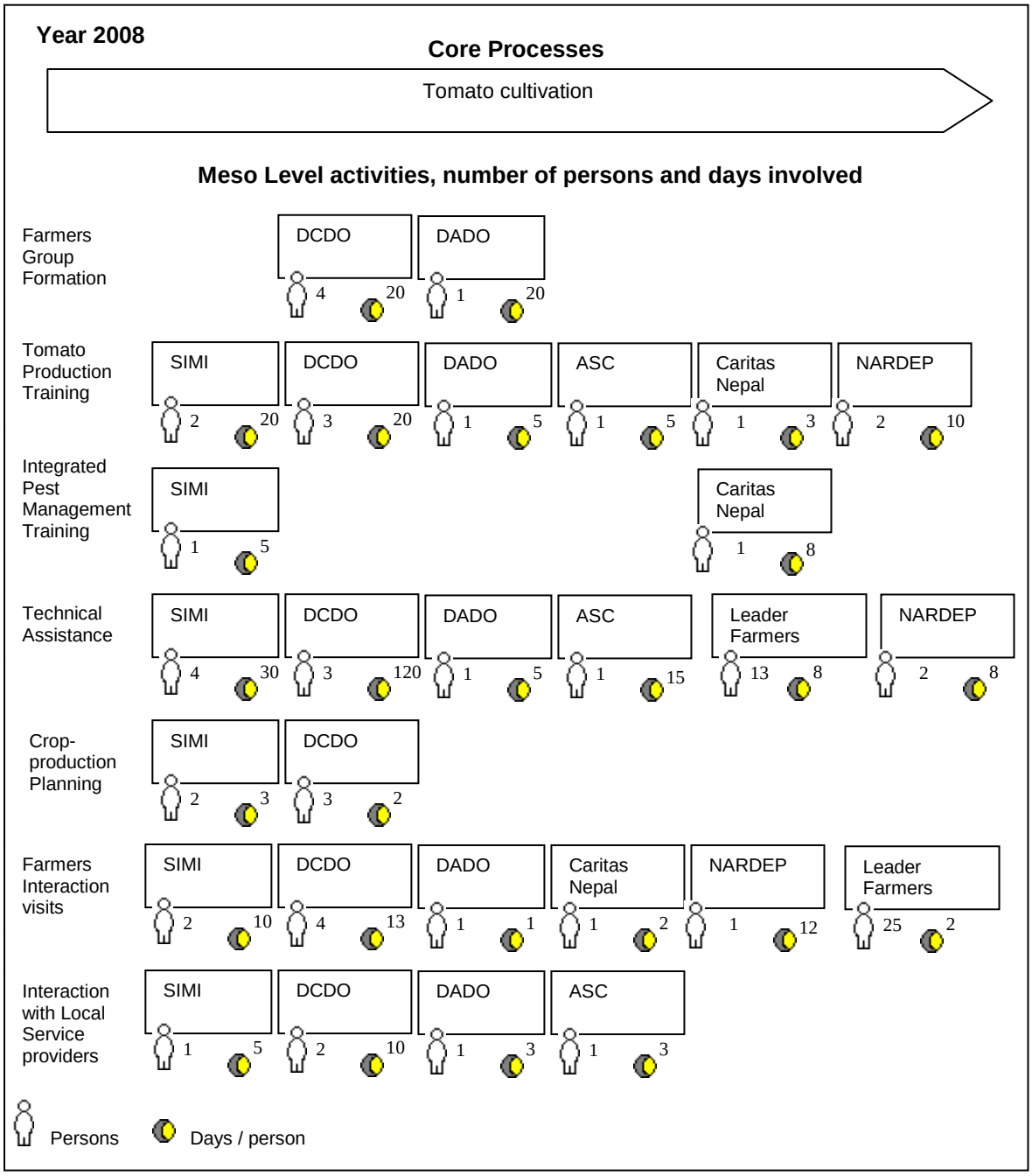
Map 6A. Main activities of the organizations promoting the tomato cultivation in Dhikurpokhari, between April 2006 and March 2007.



At the end of the project, the activities, people and time of the main organizations at meso-level, supporting the tomato cultivation under greenhouses in Dhikurpokhari, decreased. Caritas Nepal and the National Agency for Agricultural Research (NARDEP) invested in two different projects in Dhikurpokhari: the first one promoting Integrated Pest Management by using Farmer Field Schools and the second one testing the production of hybrid seeds of tomato and new designs of plastic greenhouses.

The following Map shows the changes in organizational efforts at the meso-level for this core process of the local value chain selected for the study.

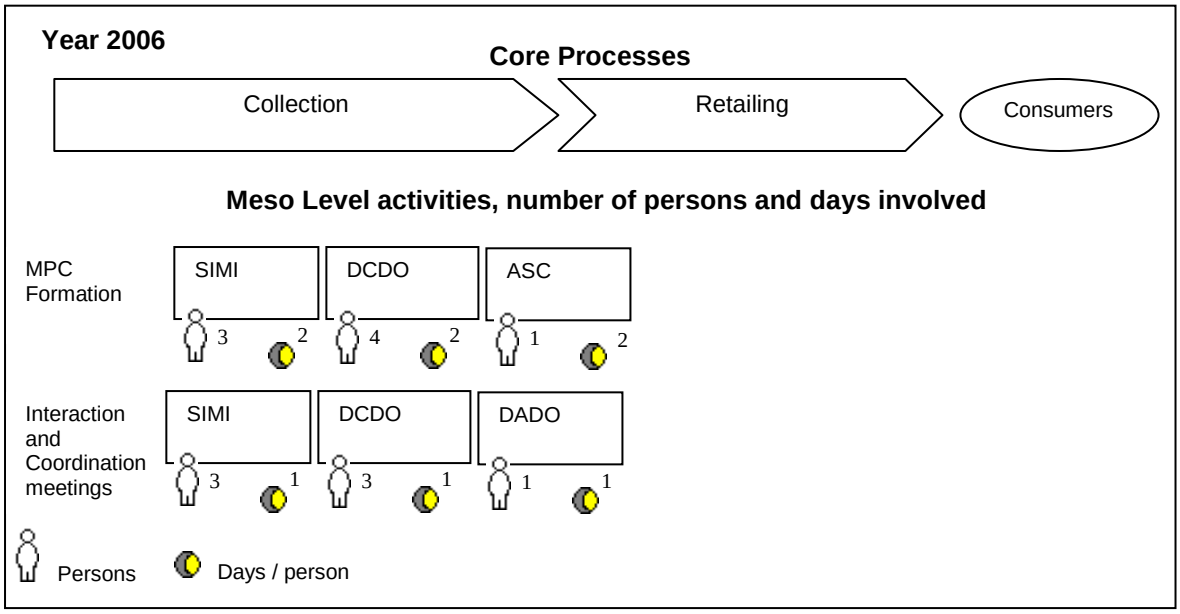
Map 6B. Main activities of the organizations promoting the tomato cultivation in Dhikurpokhari, between April 2008 and March 2009.



The directors of the SIMI project in Nepal contacted NARDEP to start the project in Dhikurpokhari. If the results turn out to be promising, IDE will spread the technology. The IPM project promoted by Caritas aims to offer farmers groups, that have been promoted in a previous project, the opportunity of developing knowledge on how agro-ecosystems work, by means of Farmers Field Schools.

The last core process of the local value chain selected for the study is the marketing of tomatoes produced under greenhouses in Dhikurpokhari. In the beginning, the project efforts were oriented towards the formation of a Marketing and Planning Committee with representatives of different farmers groups, willing to gather their vegetables on a local collection centre. The following Map shows the efforts in terms of people and time involved in this act:

Map 7A. Main activities of the organizations promoting better markets for the off-season tomato producers in Dhikurpokhari.



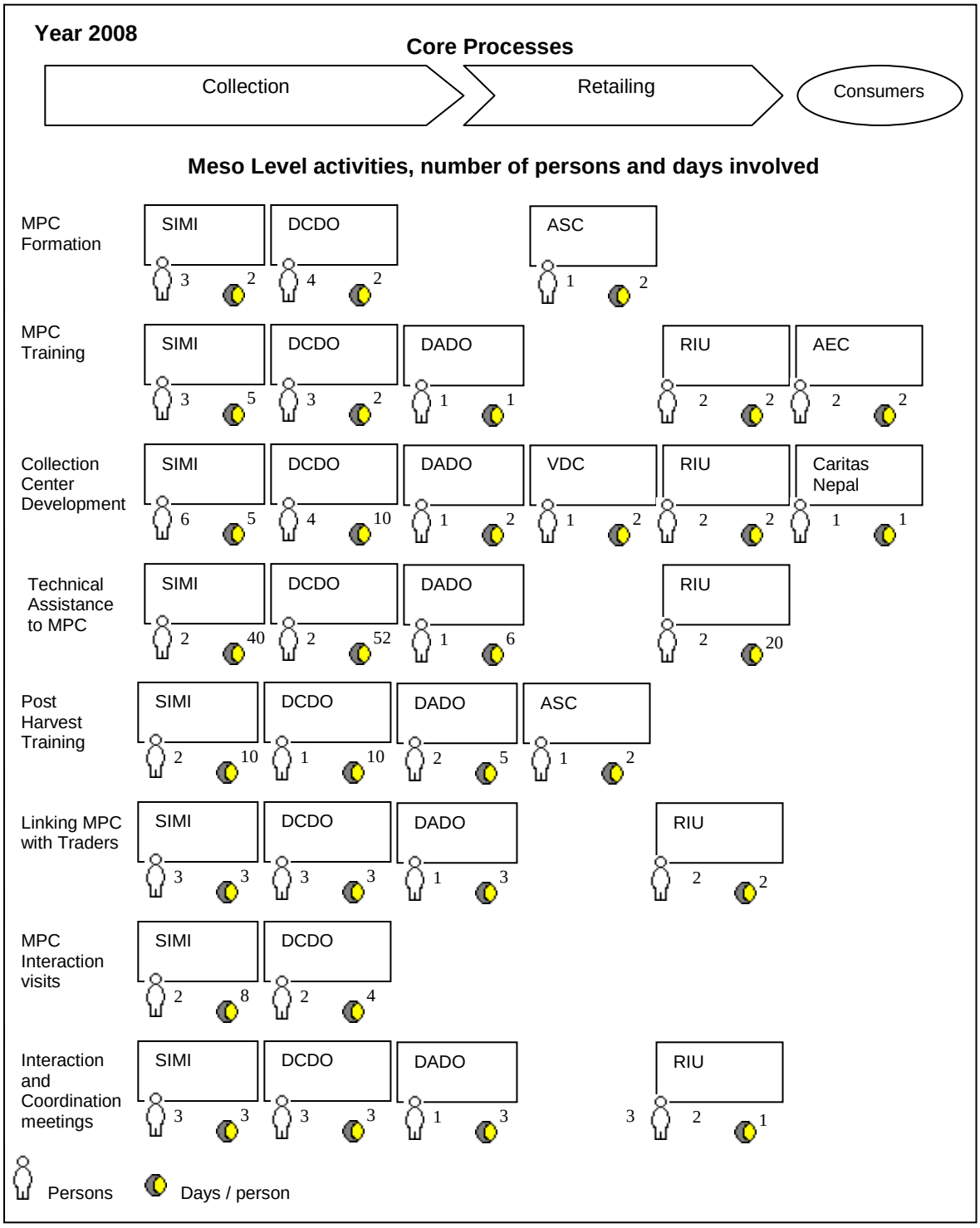
At the end of the project, the marketing of tomatoes in Dhikurpokhari receives strong support from the main actors at meso-level.; the Research Into Use (RIU) project, promoted by IDE, came to reinforce the process.

The formation of the Marketing and Planning Committee (MPC) was enforced by providing training to farmers groups on organizational management, participatory planning processes, economic governance, off-season crop production and post-harvest technologies.

The Marketing and Planning Committee members received training on economic governance, lobbying and advocacy, participatory planning, post-harvest technology and marketing. RIU marketing specialists and the experts from the Agro Enterprise Centre (AEC) joined the SIMI experts, DCDO and DADO at parts of these training events, particularly on market information and communication support.

Multiple actors at meso-level supported the development of the "Makuri Sanjal Vegetable Collection Center" in Dhikurpokhari with basic knowledge, tools, one scale and one calculator, in order to start collecting, buying and selling the vegetables locally. Further on, a small storehouse was constructed with contributions of construction materials by the Village Development Committee (VDC), Caritas Nepal, DADO and RIU. The SIMI staff and RIU specialists, together with DCDO, provide technical assistance and follow up to the MPC members on the collection days.

Map 7B. Main activities of the organizations promoting better markets for the off-season vegetable producers in Dhikurpokhari, at the end of the project.



The project offered training events for the MPC members and traders, in cooperative and account keeping, post-harvest technologies and market management. They organized as well exchange meetings among farmers, MPC members, traders, governmental and non-governmental stakeholders. The previous Map shows the increase of activities, people and time involved at meso-level to make markets work better for the off-season vegetable growers in Dhikurpokhari. These efforts are practically the same, despite the number of marketed vegetables.

On the next three maps the efforts of the actors at micro-level will be presented, in running the MIT and Agricultural Input Supply Chains, the off-season tomato cultivation in Dhikurpokhari and their marketing.

At micro-level some of the activities, number of people involved and total number of days invested are related to the trainings and events offered by the organizations at meso-level, which were previously described; other activities are related to standard procedures, such as purchases of goods or acquisitions, delivering, demonstrating, selling, and so on.

The MIT supply chain in Dhikurpokhari works through a local dealer, who also sells the agricultural-inputs. Normally, the local dealer sells the MIT to farmers groups who request a number of them on specific dates. These groups are engaged in the project. The Local dealer request the MIT to the Assembler, based in Pokhara, the major city about 20 Km distance. If the Assembler doesn't have the parts, he orders them from the MIT manufacturer in Kathmandu, and/or the Plastic tank manufacturer[23]. The MIT manufacturer is a micro-enterprise run by a family, who received training and technical assistance from IDE before the last phase of SIMI project, which started in the year 2006. Small volumes are delivered by bus, a truck is hired when 100 MIT or more need to be transported. Normally, deliveries are made after purchasing; however, occasionally, the assembler or dealers have few days to pay for the MIT or the parts. The same procedure takes place with the spare parts, since the local dealer hardly keep any spare parts in his store.

Every year, when the raining season is over, the MIT local dealer gives demonstrations of MIT installation and operation in 4 different farms (in average). Normally, those demonstrations are arranged by DCDO and SIMI staff. The local dealer provides technical-advice to farmers, on the operation and maintenance of MIT, when it is required. Before the raining season start, SIMI staff organizes demonstrations on MIT maintenance and storage, the local dealer participates on those events.

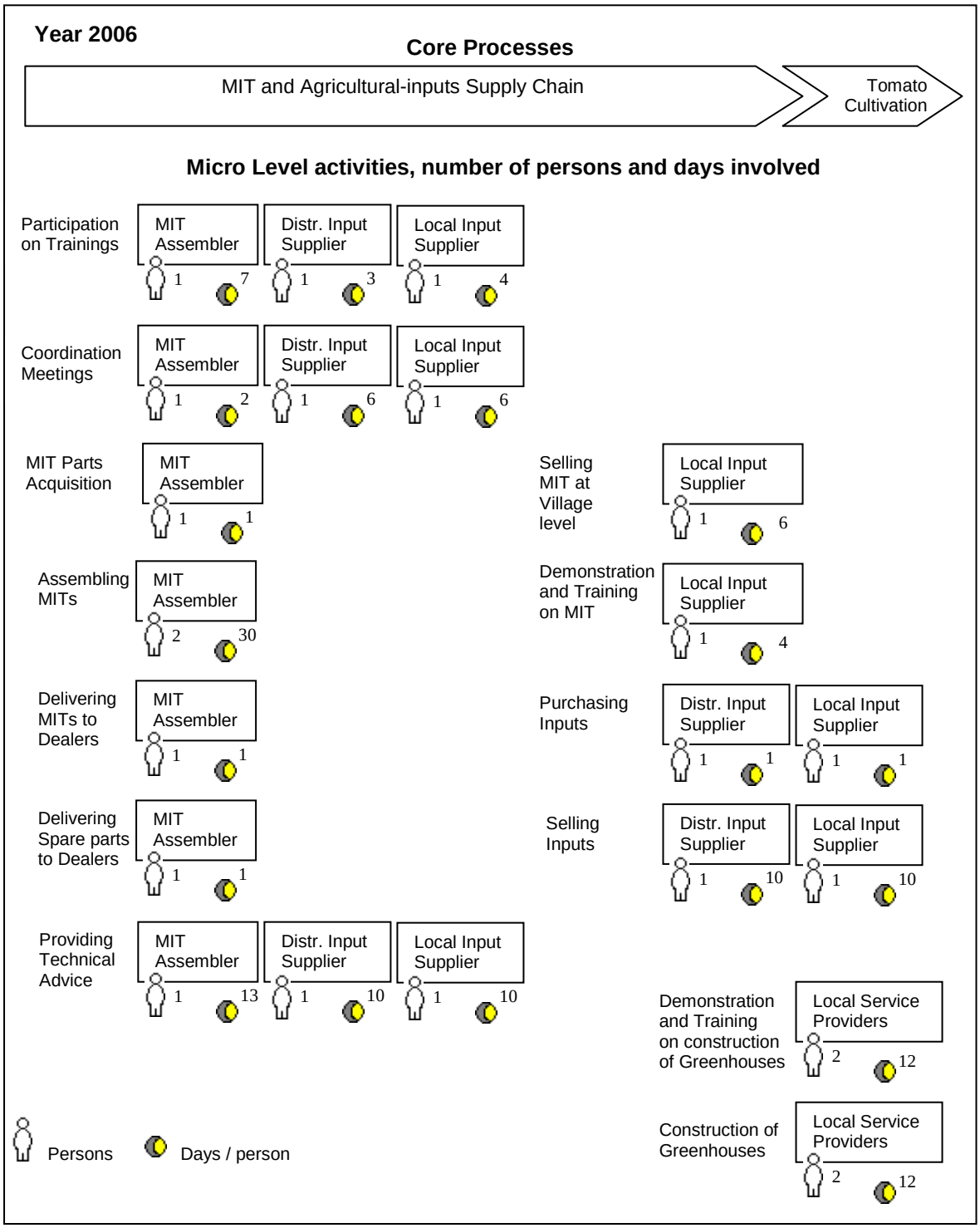
Together with MIT, the local dealer supplies farmers with agricultural-inputs. The project technicians inform the local dealer on what inputs are needed at different times. The local dealer tries to have them in stock. The local dealer purchases agricultural-inputs from the MIT Assembler, whose main economic activity is based on agricultural-input supply, or other dealers in Pokhara. The dealers in Pokhara and the local dealer in Dhikurpokhari provide technical advice to farmers to control pest and plant-diseases with the agrochemical available at their shops.

In Dhikurpokhari, two leader farmers, who were trained on greenhouse construction, are available for providing skilled services on greenhouse construction to farmers. In practice, about 5% of the plastic greenhouses are built by these local service providers, most of them financed by projects for demonstrative plots.

Maps 8A and 8B, describe the efforts of the actors at micro-level for running the Supply chain of MIT and agricultural-inputs.

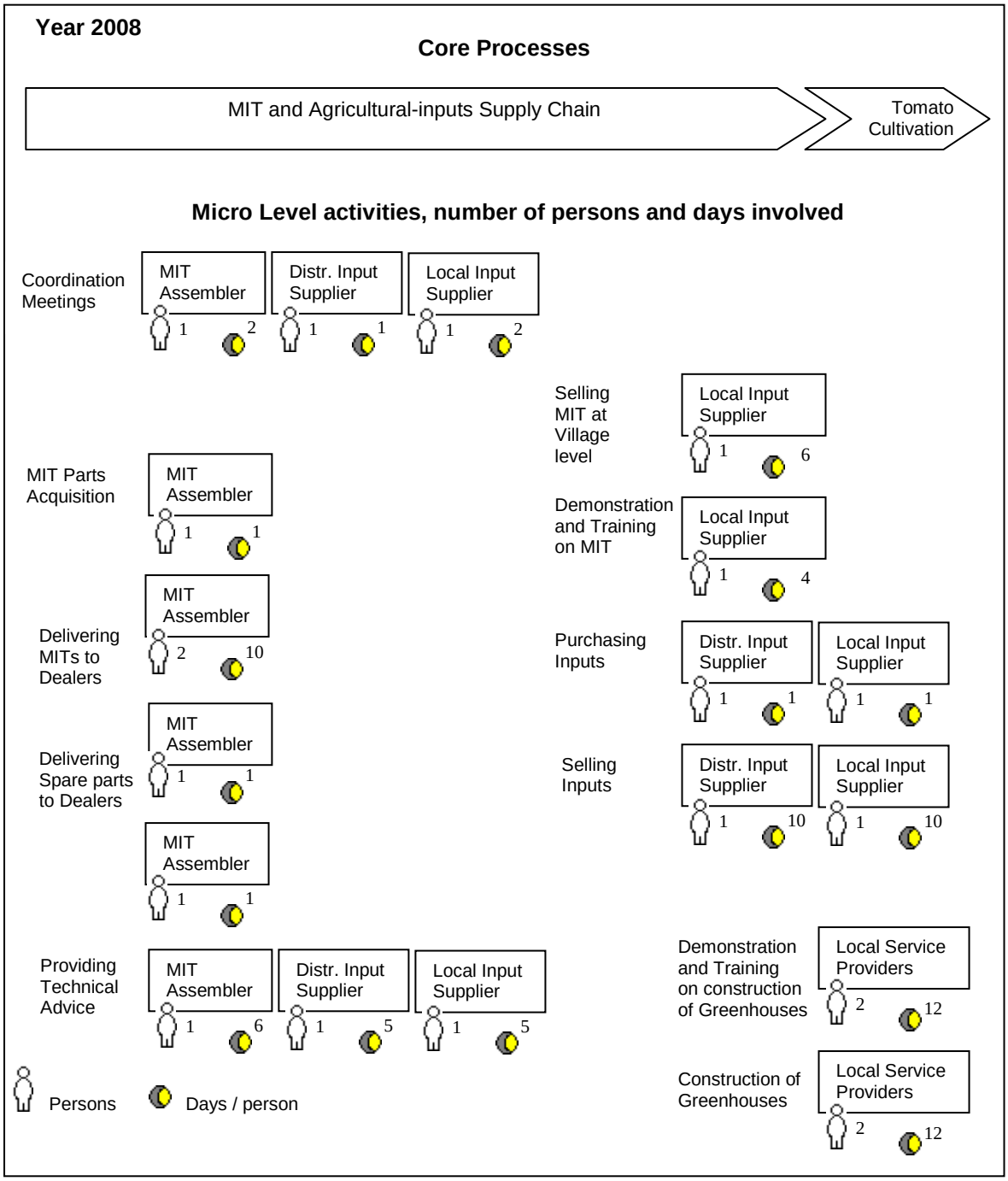
[23] The plastic tank is the only part of the MIT which is not produced by the MIT manufacturer in Kathmandu.

Map 8A. Main activities and actors involved in the Input Supply for off-season tomato production in Dhikurpokhari in 2006.



At the end of the project, the actors continued without much project intervention. The structure of the supply chain stayed the same, though the amount of MIT sold decreased; the efforts in terms of people, and time involved on the supply chain of MIT and agricultural-inputs at the end of the project is presented in the following Map.

Map 8B. Main activities and actors involved in the Input Supply for off-season tomato production in Dhikurpokhari at the end of the project.



It is important to mention the last year of the project the number of MIT sold by the Assembler in Pokhara was low enough to make him think to discontinue assembling and purchase Assembled MIT from the manufacturer in Kathmandu or other local dealer. He attributed the drop of sells to the fact that the SIMI project stopped investing in MIT promotion. Interviewed farmers attribute this to the increment of the price of the MIT from 950 NRP, between 2006 and 2007, to 1600 NRP, which is the current price.

During the visits to the greenhouses in Dhikurpokhari, frequently I found women irrigating the tomatoes with watering cans, while the drip lines of the MIT were stored and the other part of the MIT was placed close to the house to shower. In almost all the cases, the women irrigating were not the direct owners of the greenhouse[24].

[24] Traditionally, in Nepal, when a woman got married, she goes to live to the house of the parents of her husband, she is expected to serve her parents in law, her husband, brothers in law and older sisters in law. It can perfectly happen that any of them ask her

The next core process is the off-season production of tomatoes under greenhouses in Dhikurpokhari. The Maps show; not only, the agriculture-related activities, but also the time farmers and leader farmers spent on activities related with the participation of farmers in group meetings and trainings.

In Dhikurpokhari, at the year 2006, about 146 farmers were involved on the production and marketing of tomatoes under greenhouses. The number is not very different than the number of farmers at the last of the project. This suggests some farmers stopped producing tomatoes under greenhouses, while others started joining the project in the last two years.

The tomato producers spent, during the first year, about 20 days[25] in total for trainings on vegetable production and organizational issues, and another 4 in total for attending group meetings without trainings. Those participating in revolving fund groups spent between 12 and 15 days in total during the year, see Maps 5A and 5B.

In Dhikurpokhari, the project trained Leader farmers, to provide technical assistance to their group members. In one year, they spent about 4 days in specialized training events, and around 8 days providing technical assistance to their fellows. Every year, another 2 days were dedicated to share experiences with leader farmers from other geographical areas.

The cultivation of tomatoes under green houses takes about 11 months. To build a green house with bamboo poles and plastic sheet covering 60 m^2, takes about 6 days, if 2 farmers work together. In Dhikurpokhari, there are 2 local service providers specialized on greenhouse construction, they spend 3 days in average on the construction of one greenhouse covering 60 m^2. To save on greenhouse construction family members build the greenhouses by themselves, some times copying the ones made by the local service providers.

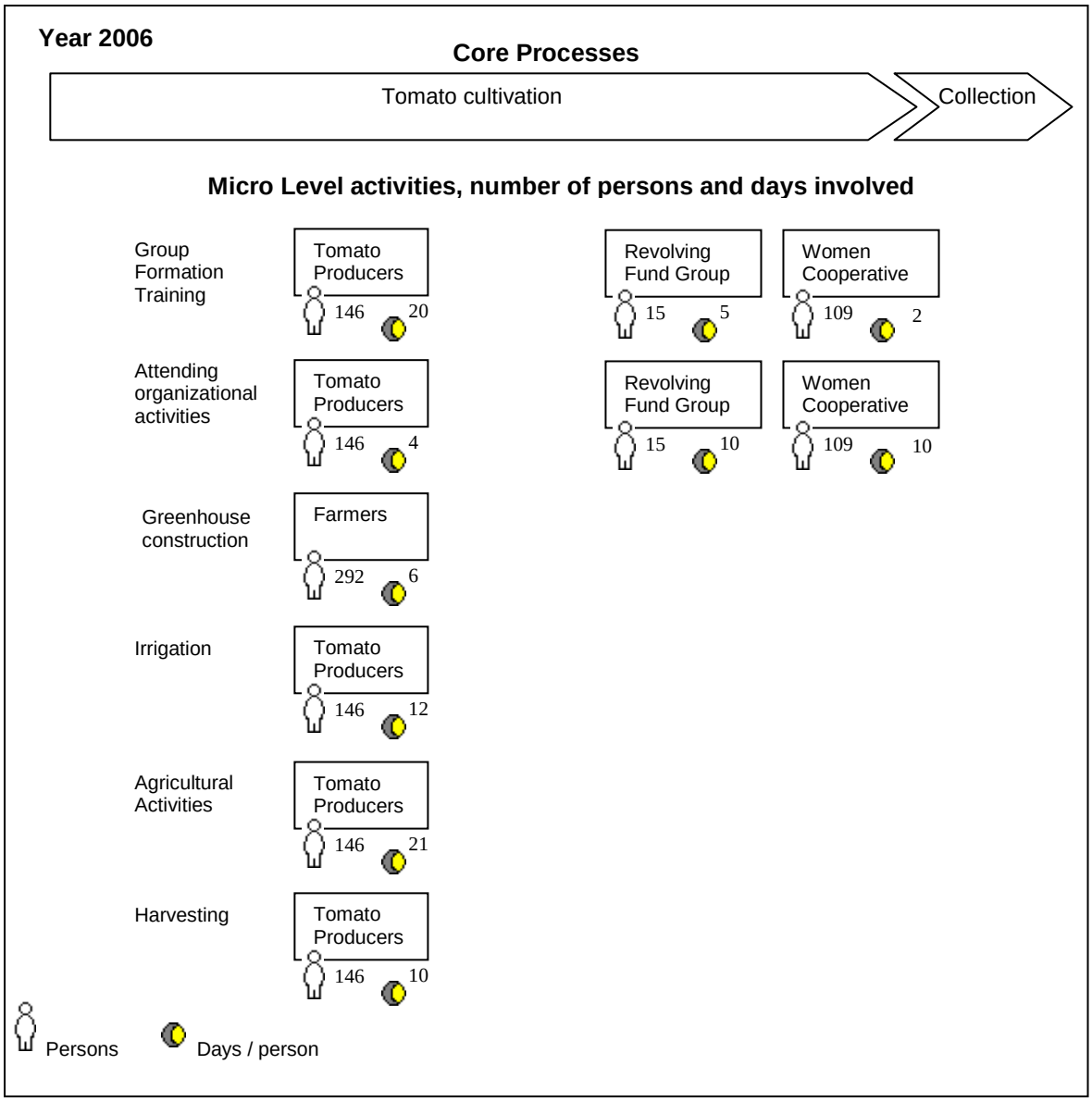
Farmers spend about 12 days in total irrigating 60 m^2 of tomatoes under greenhouses if they use MITs, it easily takes 4 to 5 times more, if they irrigate with watering cans. One tomato producer spends about 31 days in total cultivating 80 tomato plants under a greenhouse of 60 m^2, 10 of them are dedicated to harvest the tomatoes.

On the following Maps, 9A & 9B, the total efforts of tomato producers and other farmers, in terms of number of persons and time involved is presented for the years 2006 and 2008.

to irrigate their tomatoes, and no one would see it as a strange request. This can explain why women were irrigating by hand while the MIT was stored.

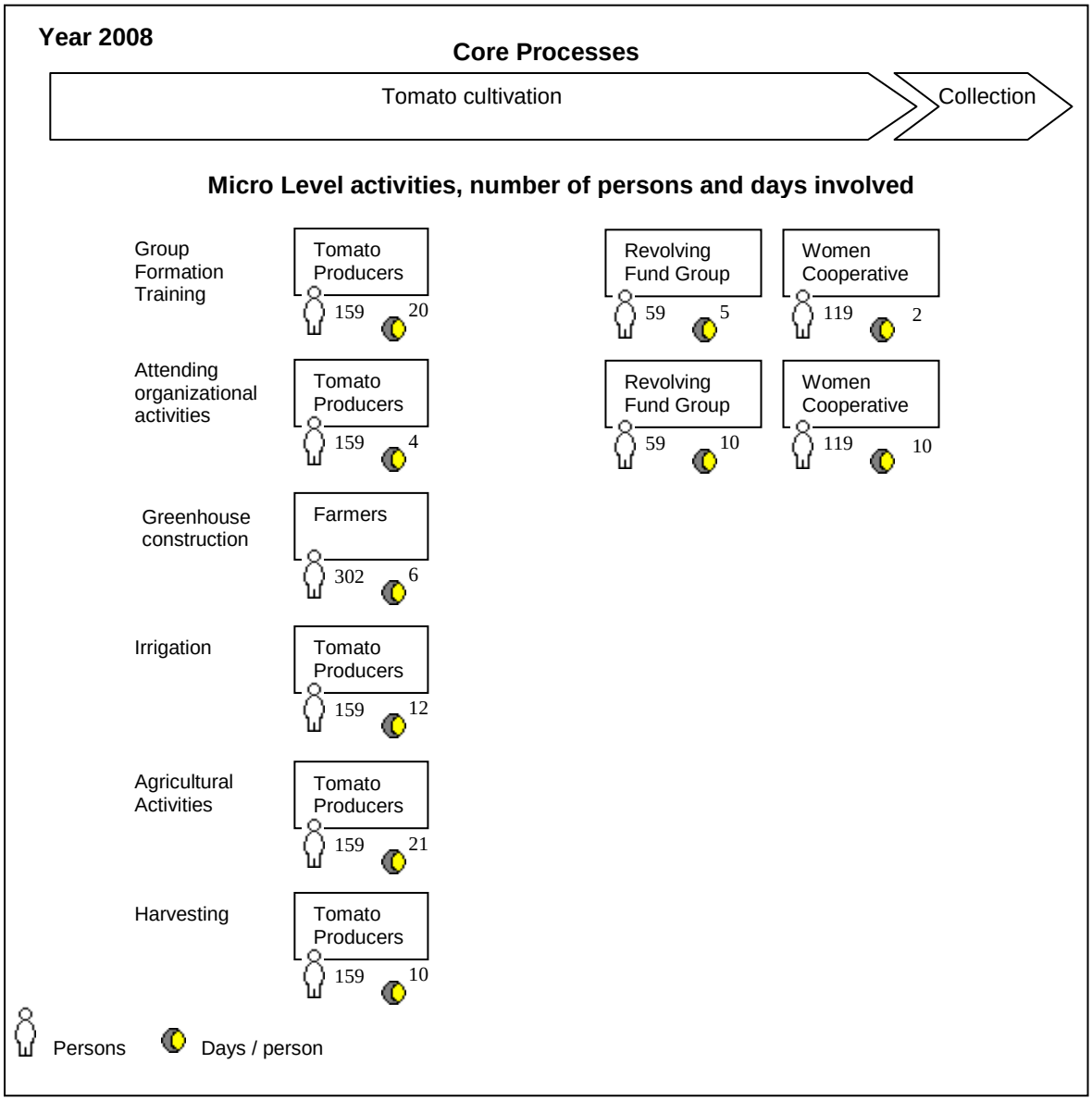
[25] In this research, 8 hours make 1 day. Therefore, the estimated number of hours for each activity is divided by 8 to come up with the total number of days.

Map 9A. Main activities and actors involved in the off-season tomato production in Dhikurpokhari, in the year 2006.



At the end of the project the structure of the supply chain remains, as the following Map shows.

Map 9B. Main activities and actors involved in the off-season tomato production in Dhikurpokhari, at the end of the project.



At the end of the project, about 26% more greenhouses were built to produce off-season tomatoes. In Dhikurpokhari, 11 to 13% of the project participants stop producing tomatoes under greenhouses[26].

The last core process mapped in this study was the marketing of tomatoes from Dhikurpokhari. At the beginning of the project, most farmers were used to sell their tomatoes to their neighbors, some of them sold their tomatoes to traders or to restaurants and hostels in Khare, a popular hosting place for tourists about 4 Km distance.

In the year 2006, the project invited farmers groups to form the Marketing and Planning Committee (MPC) in Dhikurpokhari. One vegetable trader, at the wholesale market in Pokhara was invited, as well. The new marketing system was not yet implemented.

In 2008 a new marketing system takes place in Dhikurpokhari. Two days per week, the "Makuri Sanjal Vegetable Collection Center" buys vegetables in a small store-house, at the most commercial site of Dhikurpokhari. The collection center is managed by the board-members of the Marketing and Planning Committee (MPC) formed by 16 groups of vegetable producers in Dhikurpokhari.

[26] This difference has to do with the fact that in 3 of the villages, even though the number of greenhouses decrease, one bigger greenhouse was built, which may be the case of farmers who dismounted their previous greenhouse to construct a bigger one.

On each collection day, one board-member of the MPC, sets the price to pay for each type of vegetable, based on the prices at the wholesale market in Pokhara. This MPC manager does this by calling the wholesaler participating in the project. After this, the MPC manager bargains with the 3 local traders, who are part of the network, to sell the vegetables. The local traders are seen as partners of the local value chain, by the MPC members. The MPC pays to the farmers the selling price, charging 0,25 NRP[27] per Kilogram of vegetable sold, as a commission for the service. The MPC use this income to cover communication and transportation costs.

The members of the farmers groups which are stakeholders of the collection center bring the vegetables they want to sell in the morning, weigh them and sort them on different qualities, according to the request of the trader. They can sell any amount, even 1 Kilogram of vegetables, and receive the payment immediately. In the afternoon, the trader goes to Pokhara, by bus, taxi or Van, depending on the volume of vegetables. Often, the MPC gives him the possibility of paying back the vegetables on the next collection day, and some times the MPC lends the money to the local trader needs to cover his costs of selling the vegetables.

The MPC board members got trainings on economic-governance, lobbying and advocacy, participatory planning, post-harvest technology and marketing. The MPC board-members, together with the traders received trainings on cooperative and account keeping, post-harvest technologies, and market management. The farmers groups participated on trainings on organization-management, economic-governance, participatory planning processes, off-season crop production and post-harvest technologies.

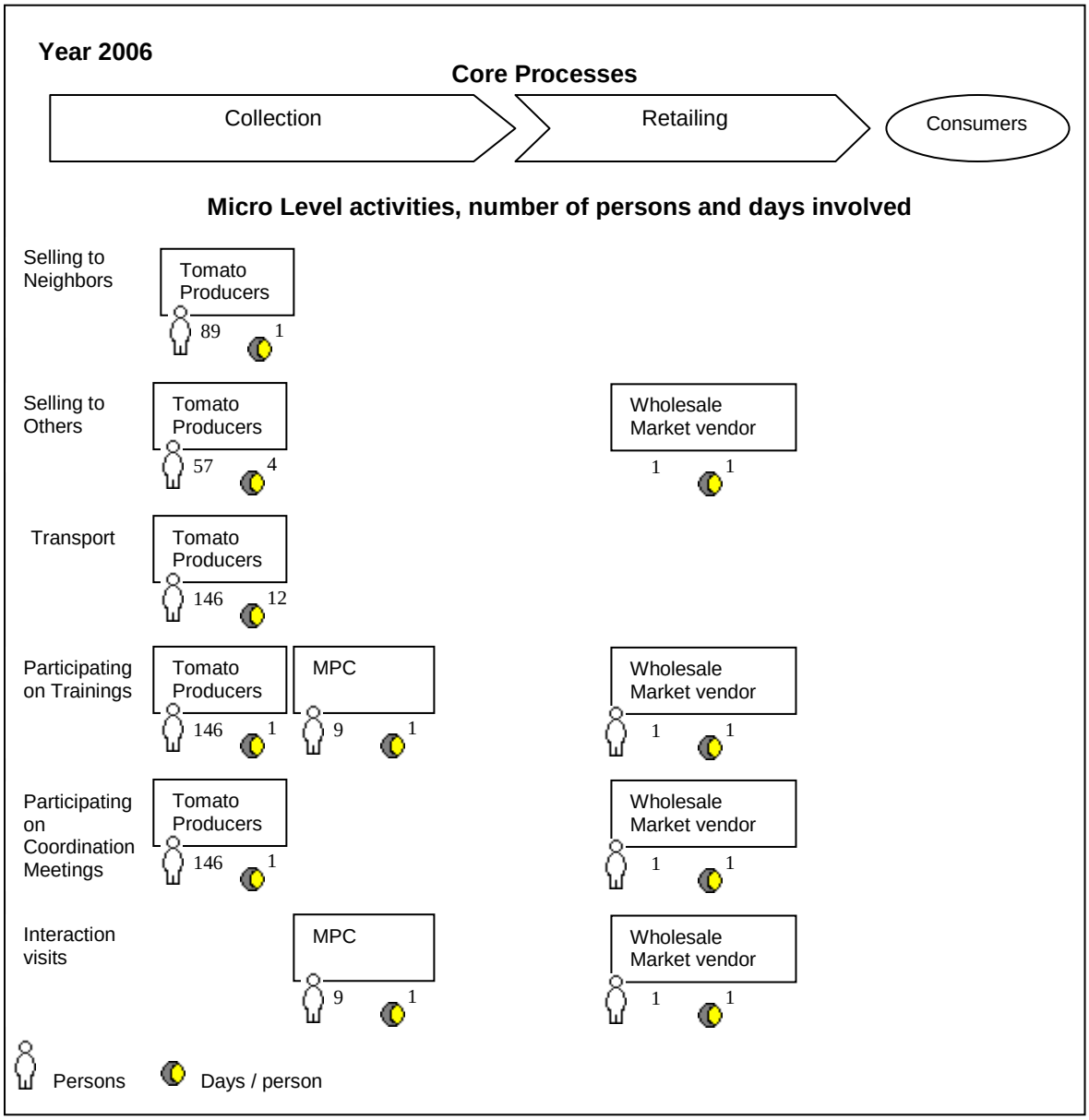
The project promotes interaction meetings among farmers, MPC members, traders, governmental and non-governmental stakeholders; together with, market information and communication support. These interaction meetings were useful to identify the problems of the different actors in this core process of the local value chain and suggestions from the different stakeholders on how to overcome those problems. Interaction visits have been very important, as well, traders used these moments to instruct farmers and MPC managers on harvest, post-harvest and sorting of vegetables. The MPC started delivering vegetables separately, by different qualities, according to the traders indications.

In Dhikurpokhari, off-season tomatoes had an important demand from restaurants and hostels from Khare, a popular site for tourists. Khare often offered a higher price than Pokhara[28]. The Collection Center, with their price based on the wholesale price of Pokhara, had a disadvantage in the price. Because of this, off-season tomato producers preferred to sell their vegetables in Khare, or to their neighbours, based on the Khare prices.

The following Map shows the efforts of the different actors on the last core process of the local value chain at the beginning of the last phase of the project.

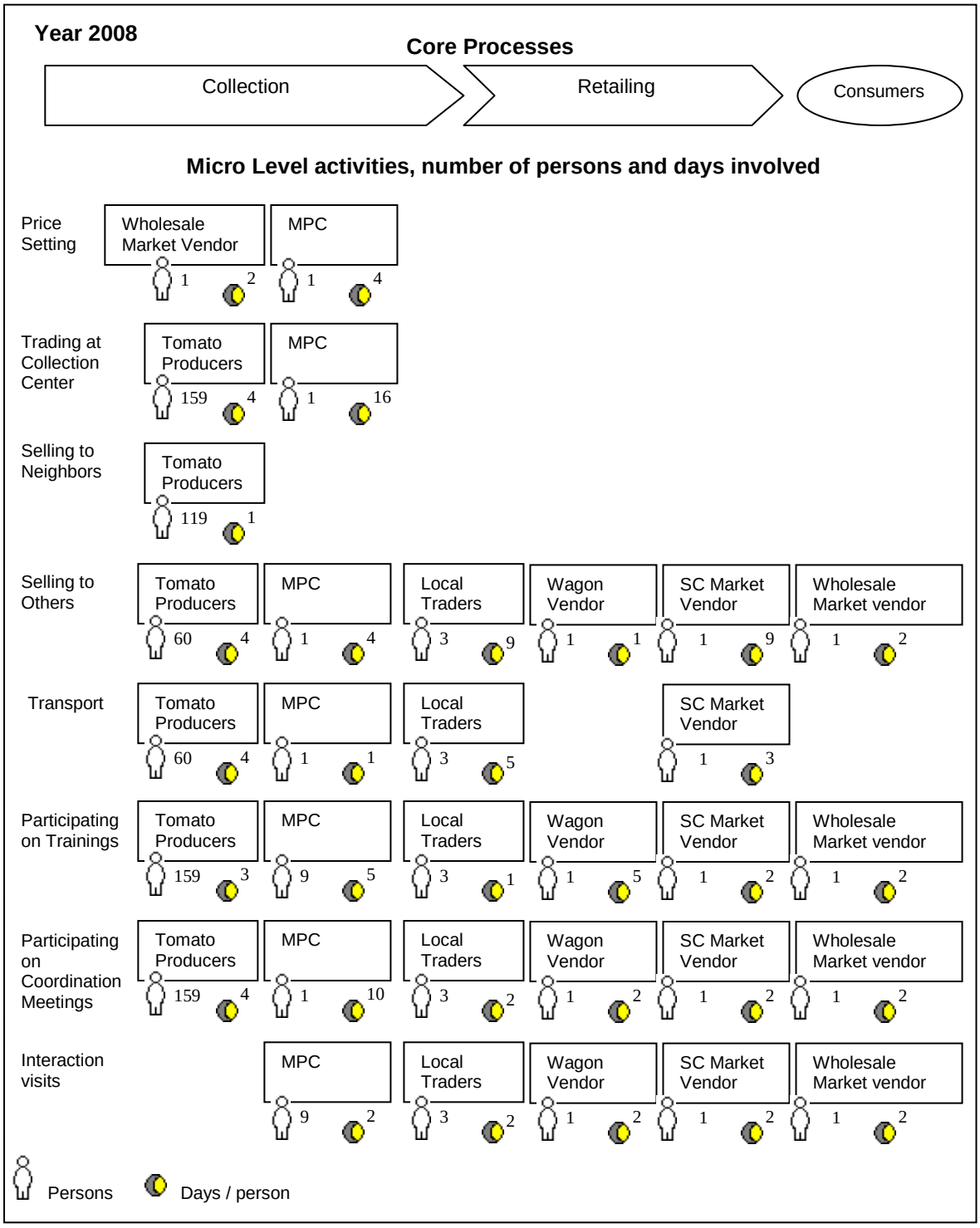
[27] One Nepalese Rupee (NRP) has been equivalent to 1 Euro cent in the years 2006 and 2008.
[28] The off-season tomato price in Khare was normally fixed as 30 NRP per Kilo, between February and April, and 40 NRP the rest of the months; 38 NRP average.

Map 10A. Main activities and actors involved on the off-season tomato marketing from Dhikurpokhari in the year 2006.



At the end of the project, the marketing process gets a different shape, once the Collection Center start functioning in Dhikurpokhari. The current trading system was developed by the actors at the micro-level. The following Map shows the efforts of the different actors in the year 2008.

Map 10B. Main activities and actors involved on the marketing of off-season tomato from Dhikurpokhari, at the end of the project.



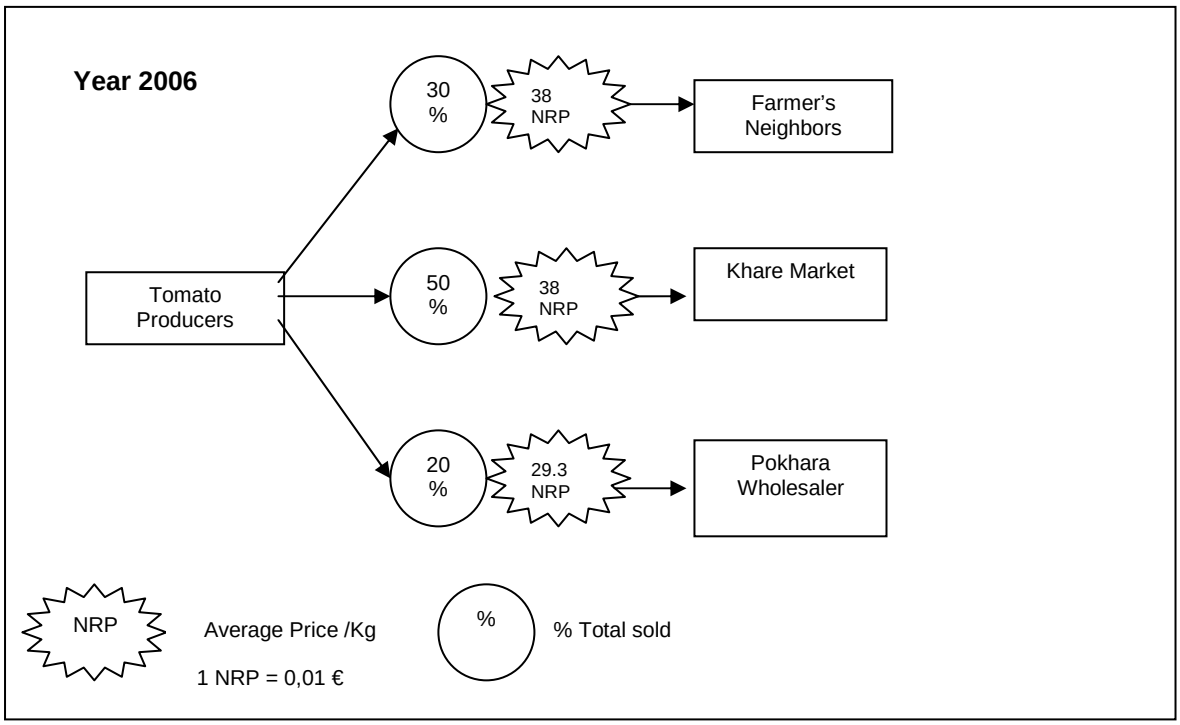
The short distance to the collection center was very valuable for farmers. Currently a second Collection Center, is under construction, at 2 Km distance, to serve farmers who were far away from the first one. The promoters of the new collection center are DCDO and the farmers organizations around it, their idea is to complement the vegetable collection in Dhikurpokhari.

Other off-season vegetables than tomato, were more difficult to sell in Dhikurpokhari. In these cases, the Collection Center was the best option for vegetable growers, because they could sell even 1 Kilogram of vegetables at wholesalers price. Under this situation, the MPC set as a rule that members willing to sell their vegetables in the collection center must sell their tomatoes also. In 2008, about 40% of the off-season tomatoes were sold to the collection center.

In the beginning of the project, SIMI participants harvested about 23.000 Kg of tomatoes, from 145 greenhouses of different sizes, see Annex 3. The project linked a wholesaler in Pokhara with the off-season tomato producers from Dhikurpokhari. The different groups of tomato producers brought their off-season tomatoes to the wholesaler in Pokhara, using this linkage.

The following Map shows the percentages of tomatoes sold to Neighbours, Khare market and to the wholesaler in Pokhara. The price is the average price per kilogram of tomatoes, based on the monthly price between June 2006 and April 2007, corresponding to the off-season tomato production from Dhikurpokhari.

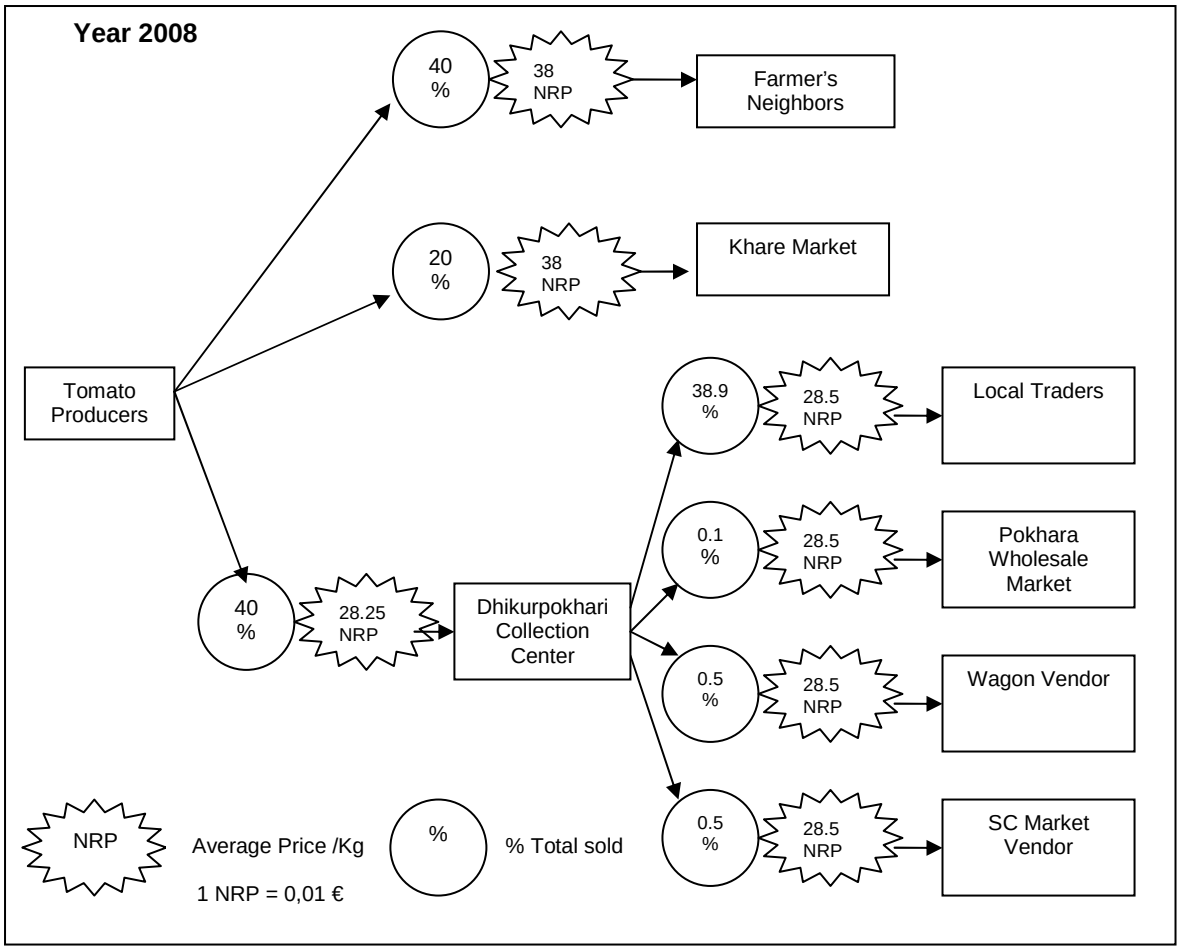
Map 11A. Percentage of tomato volumes sold by the farmers from Dhikurpokhari in the year 2006.



At the end of the project about 28.000 Kg of tomatoes were sold, from 159 greenhouses of different dimensions, as presented in Annex 3, the bigger ones, of about 60 m^2 , yield between 700 and 900 Kg in one season. The collection center, trades regularly 2 days per week. Farmers who were used to bring their tomatoes to the wholesaler in Pokhara appreciated very much they could sell them near by. However most of the off-season tomato is sold out of the collection center. Farmers attribute this to the prices; together with the fact the collection center in Dhikurpokhari opens only 2 days per week.

The following Map shows the percentage of tomatoes sold to the different actors of the local value chain, at the end of the project. The Collect Center in Dhikurpokhari charges only 0.25 NRP per Kilogram of tomato sold.

Map 11B. Percentage of tomato volumes sold by the farmers from Dhikurpokhari, at the end of the project



The record keeping of the Collection Center in Dhikurpokhari was very poor. Therefore, for this research I could only use the average price per kilogram of tomatoes at the wholesaler in Pokhara, based on the monthly price between June 2008 and April 2009, corresponding to the off-season tomato production in Dhikurpokhari. Interestingly, the price paid by the restaurants and hostels in Khare, was the same as two years ago. The average exchange rate between the Euro and Nepalese Rupee in 2006 and 2008 was basically the same.

The last map shows most of the off-season tomatoes produced between 2008 and 2009 were sold out of the Collection center. In addition to the reasons mentioned before, the relative low volumes of tomatoes harvested by the farmers are also an important factor. Low volumes can be easily sold to neighbours. The volumes of tomatoes produced in Dhikurpokhari did not exceed the demand of tomatoes in Khare market.

The Theory-based evaluation of the project in Nepal

This theory-based evaluation looks at the supply chain of Micro-irrigation Technologies (MIT) and Agricultural Inputs for the production of high-value vegetables (in this case study, off-season tomatoes), together with the marketing-chain of those crops in Dhikurpokhari. This theory-based evaluation refers to the implementation of the project in Dhikurpokhari, in the Kaski district, between the years 2006 and 2008.

The theory of action of the project in Nepal

The work plan of SIMI project includes more than 300 activities. The following operational theories of change (OTC) of the project, oriented to promote micro-irrigation technology together with the off-season tomato production and marketing in Dhikurpokhari, involves those activities.

Supply Chain and High-value vegetable cultivation

Low-cost micro-irrigation technologies (MIT) can be important means to overcome poverty in rural areas. The project promoters, sharing this statement, designed the following operative theories of change:

1. Project interventions oriented to the development of a supply chain of MIT, enable farmers with limited access to water and economic resources to purchase the Micro-irrigation technology at local dealers.

2. Investments on pressurized multiple-water-use systems (MUS), encourage the expansion of MITs.

3. Project investments in low-cost micro-irrigation technology development, the selection and training of local manufacturer and assemblers on: production processes with embedded quality control, business-planning and business-promotion; together with, constant external quality control and workshops to create synergies between manufacturer, assemblers and dealers;
   lead to the *creation of sustainable supply chains* oriented to rural poor households, responding to their expectations in terms of affordability, local availability, easy installation, operation and maintenance.

4. MIT promotion activities, such as, advertisement (banners, painted-walls, boards, printed-T-shirts), publications, demonstration-plots (MIT on high-value crop production systems); together with, pre-use training to farmers, and user's training in operation, repair and maintenance; as well as, interaction workshops with MIT users and their suppliers, *can make the supply chains reach the size* required to be economic rewarded and sustainable in time.

5. Project investments on revolving fund groups of women and people from disadvantage castes, can be effective to make MIT accessible to them.

High-value irrigable vegetable cultivation

6. By training local dealers on business-promotion, quality seed selection and management, pesticides selection and handling; together with, interaction meetings between farmers and agricultural-input suppliers; useful local service of agricultural-inputs, joined with technical advice , can be offered to farmers for *producing high vegetable yields*.

7. By training farmers on off-season vegetable production, with a problem-based approach; together with, interaction meetings between farmers and agricultural-input dealers, effective crop management can be done, making possible to *get high yields at the time prices for vegetables are high*.

8. Training leader-farmers on different key services for farmers, such as, off-season vegetable production, greenhouse construction, or water-tanks construction; together with, training on local service provision, and interaction meetings between farmers, leader farmers, technicians, and dealers, can help the *supply chain of agricultural-inputs to be sustainable in time*.

Linking Farmers to Markets

9. Project investments in the promotion and strengthening of Farmers groups for collective marketing of vegetables, with training on organization-management, participatory planning processes, off-season crop production and post-harvest technologies; as well as, economic governance; together with, the formation of Marketing and Planning Committees (MPCs) and collection centres for buying vegetables locally, can be effective in *gathering volumes and reach a better position on the vegetable-markets*.

10. By training the managers of the collection centre on economic-governance, lobbying and advocacy, participatory planning, post-harvest technology and marketing; together with, market information and communication support, their *bargaining power on markets can be increased*.

11. Investments in training MPC members and traders on cooperatives and account keeping, post-harvest technologies, and market management; together with, interaction meetings among farmers, MPC members, traders, governmental and non-governmental stakeholders, can lead to *effective synergies between farmers and the different market-actors*.

Tested theory of action of the project in Nepal

The following Operative theories of change (OTC) were created after looking a the OTCs designed and implemented between 2006 and 2008.

Low-cost Irrigation Technologies

In Dhikurpokhari, between 2006 and 2008, the implementation of the project lead to the following operative theories of change:

1. The project interventions oriented to the development of an MIT supply chain, together with, the ones for to the production and marketing of high value vegetables, encourage farmers with limited access, but not severely, to land, water, labor-force[29] and economic resources to *purchase MIT at the local dealer*; specially, if the price is perceived as low[30], and micro-credits to buy the MIT[31], and/or subsidies[32] are present.

2. In the case of the hills, investments in pressurized-multiple-water-use systems (MUS), using gravity, help farmers to get water for domestic use and increase the land for irrigable-vegetable production; MITs might be considered, specially, when there is no plenty water available, and the MUS-tap is not located very close to the irrigable-field[33].

3. The efforts of the project in low-cost technology development; together with, the selection and training of local manufacturers and assemblers on production processes with embedded quality control, business-planning and business-promotion; together with, constant external quality control, are effective in making low-cost irrigation technology that is locally available for farmers, easy to install, operate and maintain; nevertheless, from different options of MIT[34], it becomes more easy for poor farmers to purchase the smaller ones[35], when they perceive the need of saving water and saving time to irrigate their vegetables, and specially, if the purchase is linked with other benefits embedded in the project[36].

4. Project investments on MIT promotion activities; such as, advertisement (banners, painted-walls, boards, printed-T-shirts), publications, demonstration-plots (MIT on high-value crop production systems); together with, pre-use training to farmers, and user's training in operation, repair and maintenance; as well as, interaction workshops to MIT users and their suppliers, and to manufacturer, assemblers and dealers[37], can contribute to increase *the sales of the MIT supply chain*; yet, not alone, but together with access to micro-credits, the availability of water (low, but enough), irrigable-land (sufficient), labor-force (low but sufficient), as well as, with the local availability, easy installation, operation and maintenance of the MIT, and importantly, the affordability of the technology; additionally, the embedded complementary services for high-value vegetable production and marketing offered by the project are very much influent on the decision of purchasing MIT[38].

[29] In the study area, on about 80% of the households, men migrate to sell their labor-force.

[30] The number of MIT purchased by farmers drop down-drastically on the last years of the project, see. Similar trend was register at district level. Farmers attribute the decline of MIT to the increments on the MIT-prices (see Annex 1), while dealers to the reduction of project-interventions on MIT promotion.

[31] The revolving fund groups of women and people from disadvantage castes, promoted by the project to make MIT accessible to them are part of the many local possibilities for obtaining micro-credits.

[32] In Dikhurpokhari, DADO became the best client of the MIT local dealer on 2007 and the only one on 2008.

[33] Those farmers with plenty water and a MUS-Tap close to their irrigable-field may prefer to expand their irrigable-land by furrow-irrigation fed by a hosepipe connected to the MUS-tap, since it requires less investment.

[34] Drip irrigation kits for irrigating 50, 75, 250, 500 and 1000 m^2; their current price is about 13, 31, 51, 96 and 190 US Dollars, respectively; micro-sprinkler irrigation systems were also developed, however, the number of those sold in the area is not relevant.

[35] The smaller MIT cost 13 US dollars and irrigate about 50m^2; such small land-plots, can be irrigated by hand using watering cans.

[36] To participate in SIMI project, the purchase of MIT is compulsory. The project provides trainings, which often include demonstrative plots, the participants could get seeds or plants, as part of the training to start their own vegetable-garden, first trainings include technical assistance to grow vegetables at the farmer's plot, farmers participating in the project could sell their vegetables at the local collection center promoted by the project.

[37] The supply chain uses the financial capacity of dealers, in the case of spare-parts, local dealers don't have stock, they just request to the MIT assembler in Pokhara and give it to farmers 2 days later

[38] In the last year of the project DADO was the only client of the MIT local dealer in Dhikurpokhari.

Additional information in relation to the project performance

In this case study I looked particularly at the off-season tomato production under greenhouses in Dhikurpokhari. The multiple-water-use systems (MUS) didn't have any evident effect on the expansion of greenhouses with MIT. This may be related with the fact that a large part of the production-period coincides with the rainy-season, allowing farmers to use harvested-rainwater to irrigate their tomatoes under greenhouses. Additionally, and probably more importantly, other vegetables like cucumbers and cauliflower have high value on markets and require less investments in agricultural-inputs.

The current MIT works fine the first two years. From the third year onwards, farmers will have to spend time to unclog the pipes gradually more year after year. At some point farmers prefer to irrigate plant by plant using watering cans, rather than dealing with old-MIT.

The supply chain uses the financial capacity of dealers, in the case of spare-parts, local dealers don't have stock, they just request to the MIT assembler in Pokhara and give it to farmers 2 days later.
At the time the field research was conducted, the MIT assembler in Pokhara was delivering two hundred MITs to one of the 14 local dealers in Kaski district. However, the total number of MIT sold by this Assembler, as well as the ones sold by the Local Dealer in Dhikurpokhari, gradually decline in the last 3 years.

The engineers involved in the promotion of the MIT are enthusiastic with a new design, micro-tube irrigation kit, with less problems with clogging and more suitable for larger fields.

At the end of the SIMI project, the production of the parts for the MIT Supply Chain at national level represents about 30% of the total sells of the factory in Kathmandu, where most plastic-parts of the MIT are produced (the water-storage tank is produced in another factory). The factory is a micro-enterprise, producing other articles, such as gas-valves, electric-wire isolators, and others. Because their major income doesn't depend on the MIT parts, they may continue producing even if the demand is low. This is not the case of the Assembler in Pokhara, who is actually considering to stop assembling the parts if sales don't increase up to 2000 MIT per year. In that case he will purchase the MIT from another assembler or the factory in Kathmandu, which is actually assembling for other districts in Nepal.

The major business of the MIT assembler and dealer at district level is on agricultural-supplies, such as seeds, fungicides, pesticides, tools, plastic sheets for greenhouses and rainwater harvesting. He also sells sprinklers imported from India. If the national production of MIT stops, he may import equivalent systems from India, if there is still a demand for those systems. SIMI project help him to build a network with 14 Local Dealers, he delivers to them MIT and often agricultural-inputs, also, when requested.
The local dealer at Dhikurpokhari has 3 businesses in one shop: school-supplies, kitchen-supplies and agricultural-supplies (including the MIT). The last one helps him to cover all the cost related with running the 3 businesses. Looking at the way his business is structured, it is likely that he'll continue selling MIT locally even if the demand is very low.

Inequalities in access to economic opportunities, affecting women and disadvantage groups, can be addressed by involving them in revolving fund groups to access loans for purchasing MIT. This was the final aim of the project-interventions in this direction. However, previous projects, promoted by Caritas Nepal and the United Nations were oriented to increase opportunities for women and disadvantage groups in the local society. Until some extend, the project implementers (DCDO), levered up on the achievements of those previous projects.

In the case of Nepal, interestingly, the Women Cooperative, financing about 75% of the tomato-greenhouses involved in SIMI project, were not visualized in any document of the SIMI project. The local NGO, DCDO, promoted a parallel process, which ended up in the formation of "Future in our Hands" savings and credit Cooperative. The main difference between the two cooperatives has to do with the participation of women and men, in the Women Cooperative, men could not participate, while in "Future in our Hands", they did. This fact, together with the strong unbalance between men and women working on the organizations at the meso-level, bring as to question whether or not the gender reasoning of the actors affects the interaction and cooperation between the organizations and individuals in the project.

The majority of the farmers start producing tomatoes under greenhouses with micro-credits from different sources, SIMI revolving fund was one of them but not the most important one. About 119 women producing off-season tomatoes got loans for this activity from the "Sustainable Women Development Savings and Credit Cooperative". This

year, a new cooperative, "Future in Our Hands", promoted by the local NGO started giving loans for off-season tomato production.

The revolving fund groups were promoted by the local NGO in Dhikurpokhari even before the SIMI project. The fund was meant for allowing disadvantage groups, as the Dalits[39] and/or women, to access MITs and plastic-sheet for building greenhouses. Currently, there are 59 members divided in 3 groups, each group started using the fund after the previous one reimburses the loan, the third group still waiting for their turn. Because most Dalits are illiterate they receive economic-literacy classes to be able to do book-keeping.

Besides these revolving fund groups, Dalits meet once a month to discuss on their problems and gather ideas on how to solve them; on every meeting they bring 5 to 10 Nepalese Rupees for savings, some times they use this fund to help someone in great need, such as a lonely woman who gave birth recently. This is a Dalits initiative, rather than SIMI project initiative.

High-value irrigable vegetable cultivation

Off-season vegetables normally have a higher price and local demand. Farmers need to learn how to manage irrigation, pests and plant-diseases to be able to produce off-season vegetables. Project promoters believe*, if farmers have better access to agricultural-inputs at local dealers, effective pest-management can be done*, making possible to produce at times were local vegetables are in short supply. According to this the following theory of actions show the outcomes of the incentive-mechanisms applied in the context of the project from 2006 to 2008:

5. Project investments on setting a Supply chain of agricultural-inputs, by training local dealers on business-promotion, quality seed selection and management, pesticides selection and handling; *enhance the dealers knowledge* on this issues, originate interactions among dealers, often turning on improvements on the commercial relations among dealers[40], as well as, the local availability of new seeds, artificial-fertilizers and pesticides in the area; the project's technicians become important catalyst between farmers and local agricultural-input suppliers, they detect pest problems, orient the farmers to purchase specific agricultural-inputs and inform the local dealer in relation to the inputs required; however, if farmers have to be in the city at the time they need agricultural-inputs and have the money to spend on agro-inputs, they will prefer to buy there, because it is cheaper; nevertheless, with a local dealer of agricultural-inputs, vegetable producers with pest problems, can get quicker, if they can afford it, the chemical pesticides they need, together with technical advice[41]; this local service can support farmers to produce off-season vegetables, with effective pest control, and profitability, specially if, farmers vegetable management is based on low-external inputs [42] rather than on high external-inputs[43].

6. By providing training to farmers on off-season vegetable production, with a problem-based approach, farmers with no experience on such production can *get the basic knowledge to start producing off-season vegetables*; If this training is done step by step, from the land preparation to the harvest, and next to that, implemented accordingly by farmers, and enforced regularly by technical assistance, farmers can better overcome the pest problems with their vegetables, while develop the knowledge and the skills necessary to produce off-season vegetables[44]; If farmers succeed on producing and marketing the off-season vegetables, they may be willing to continue year after year.

7. Project's efforts on training leader-farmers in different key services for farmers, such as, off-season vegetable production, greenhouse construction, or water-tank construction; together with, training on local service

[39] Dalits are on of the lowest ranking of the social castes in the area, See page 35 for more information about the castes in Nepal

[40] Such as opening trading channels on new supplies, bargaining margins to cover transportation costs and diversifying deliveries.

[41] However it works as a pharmacy, where clients tell the seller their symptoms and they get the medicine right away.

[42] Using the resources available on the farm, producing organic-fertilizers, preventing or reducing the occurrence of pests and crop-diseases by implementing different crop management techniques.

[43] Pest management based on chemical-control may be cost effective in the beginning ; however continued misuse of chemical-inputs, such as, artificial-fertilizers and chemical-pesticides derives into alterations in the soil-biota, the development of resistance on pest and plant-diseases, leading to a continue increase on the expenses for chemical-inputs year by year.

[44] In the study area, two type of trainings on Integrated Pest Management were provided; one by the project, applied for vegetables in general, lasting about 5 days in total; the other, by Caritas Nepal, using the methodology of farmer's field schools (FFS), applied on one crop, once a week along the entire crops-live. Farmers who participated on the FFS depend much less on agro-chemicals than the rest.

provision, and interaction meetings between farmers, leader-farmers, technicians, and dealers, can be effective in *building local capacities on key services for farmers*[45]; these local services are very welcome by farmers when provided free of charge[46].

Additional information in relation to the project performance

Vegetable pests may appear and/or develop time after time, farmers who have not learned appropriately the basics of integrated-pest-management would have more difficulties than those who do have such knowledge. Unsuccessful pest management might lead to crop failure and discourage farmers to continue producing off-season vegetables.

The off-season tomato cultivation is very much based on the use of hybrid seeds, artificial fertilizers, and chemical control of insects and plant-diseases. The local dealers, together with agricultural technicians test different seeds, chemical and organic inputs on the greenhouses of some leader farmers. From the results of these trials, they conclude which inputs are "the best". The message spreads around very quickly and the local and district dealers purchase the agricultural-inputs to supply the farmers.

Artificial fertilizers and agro-chemical inputs became a "need" with the introduction of high-value irrigable vegetable cultivation starting with hybrid seeds. All the actors in the Supply chain believed that, except, until some extend, those participants on integrated pest management training programs with Farmers Field Schools.

The first year, with systematized training and follow up, most farmers successfully produced off-season tomato. The next year, this service dropped-down because technicians had to promote more MITs and train the new farmers in the same systematic way as the previous ones. Paradoxically, the drop in technical assistance coincides with increasing risk of pest problems, driving to a poor –harvest, if is not well managed. After two or three years producing tomatoes under greenhouses (located on the same spot) , about one fourth of the farmers couldn't manage the pest and diseases and stopped producing tomatoes. Some groups of farmers participated on IPM training using the methodology of Farmers Field Schools; most of those tomato producers built their greenhouses higher, could recognize between friendly insects and pests, used more organic-fertilizers, and manage the pests without purchasing external inputs every time.

Currently, the project provides funds for the local NGO to hire the agricultural technicians. Leader-farmers, in other hand, get some benefit from the project by receiving materials and inputs for the trials on their fields. I asked the farmers every time if they would be willing to pay for the technical assistance, once the project is over, most of them gave a negative answer, but some of them said they would do that if the service comes with the input they need for controlling the pest they couldn't manage, as veterinarians do with the livestock. Some other farmers have the vision to become commercial tomato growers and are willing to pay technical assistance from the beginning to the end of the off-season tomato cultivation.

Linking Farmers to Markets

High-value vegetables can pay back the investments in micro-irrigation technology easier than other types of crops. Often, irrigable vegetable production and marketing is a new economic activity for farmers starting with micro-irrigation technologies. Therefore, developing linkages between farmers and the actors involved in marketing vegetables can be of great benefit for these farmers. Project's interventions oriented to the marketing of high value crops lead to the following operative theories of change:

8. Project's efforts in the promotion and strengthening of Farmers Groups for collective marketing of vegetables, with training on organizational management, participatory planning processes, off-season crop production and post-harvest technologies, as well as, economic governance; together with, the formation of a Marketing and Planning Committee and a collection centre for buying vegetables locally, can be effective on gathering volumes,

[45] About 50% of the leader-farmers are capable of providing technical assistance to other farmers on off-season vegetable cultivation, and all the leader-farmers trained on building greenhouse and water-tank construction.

[46] The farmers who specialize on greenhouse construction were hired to built about 5% of the total greenhouses in Dhikurpokhari. The farmers specialized on water-storage tank construction are lately busy on the construction of Multiple-water-use Systems (MUS). Very few farmers declare to be willing to pay for the technical assistance on off-season vegetable production, once the project is over.

sorted in different qualities to reach markets. This is likely when farmers are satisfied with the prices, and/or have no other better alternatives for selling their vegetables, the time required to set the business deal and receive the payment is short; as well as, if they perceive advantages in terms of transaction costs, such as, the effort required for bringing the vegetables from the farm to the collection-place[47], and importantly, if they can easily sell their vegetables, on the days they need to, and in the volumes and qualities they can offer.

9. Training the managers of the collection centre on economic-governance, lobbying and advocacy, participatory planning, post-harvest technology and marketing; can positively contribute to *developing their management capabilities*, depending on the content of such training; However, technical assistance along the marketing activity, may contribute even more, because it can influence the learning in practice and the development of skills on marketing vegetables; such process can be enforced by market information and communication support, if the procedures can be easy to implement by the actors involved; these efforts may increase the bargaining power of the farmers organization with the traders, but, this mostly depends on the capacity of the collection centre to supply the volumes required by the traders regularly [48].

10. Project's investments in training MPC members and vegetable traders on cooperation, account keeping, and post-harvest technologies, can be useful, not only, for enhancing their knowledge, but also, for involving these key-actors on the development of local value chains; these efforts, complemented by interaction meetings among farmers, MPC members, traders, governmental and non-governmental stakeholders, can be useful to *create synergies between farmers and the different market-actors*, if the organizations and individuals involved are committed to work together on the development of the local value chains.

Additional information in relation to the project performance

The off-season vegetable producers in Dhikurpokhari appreciate very much the easy marketing, in terms of time and volumes; they like to spend as little time as possible on marketing, as well as, been able to sell what they have, even if its just a bag of 1Kg of tomatoes. The walking distance to the collection centre and the possibility of selling low volumes is relevant for the vegetable producers. The main local actors are currently building another collection centre about 2 km distance from the first one, according to the key informants, the purpose is to reduce the walking distance of those farmers living far away of the first collection center.

Currently, the demand for off-season tomatoes in Pokhara, which is about 20 Km distance, is not satisfied. Only 5% of the demand of the wholesaler involved in the project is covered by tomatoes coming from all the collection centres promoted by the project in the district. About 80% of the demand of the wholesale market in Pokhara is covered by vegetables coming from other districts of Nepal and India.

Last year, the off-season tomato producers harvested about 26.000 Kg in total, only 40% was sold to the collection centre. There are several reasons for that: farmers could get a better price selling to the market in Khare, a popular hosting-place for trekkers, or to their neighbours. The greenhouses are very small (30 to 60 m^2), if farmers harvest every day, they get 1 to 3 Kg which can be easily sold to neighbours. The Collection centre in Dhikurpokhari opens 2 days in the week, often farmers prefer to sell their tomatoes on daily basis, to cover daily expenditures. Selling off-season tomatoes in Dhikurpokhari is quite easy for farmers, but for selling other vegetables they may need the collection centre; therefore, the local market and planning committee (MPC) set as a rule: farmers willing to sell their vegetables at the collection centre must bring tomatoes also.

In the beginning of the project there was an important effort to provide market information to farmers. The project set mechanisms for broadcasting by radio the prices of 34 vegetable Items on daily basis. It worked for 1 year, with an investment of about 75 USD from the project and 225 USD from the chamber of Commerce and Industries of Kaski district. Some other efforts were made; such as, linking the value chain actors with the governmental office that publishes the prices of vegetables of the main wholesale-markets of Nepal. Currently none of these procedures are used by the local actors; however, new procedures evolve from the interaction of the different actors, derived from the meetings and the value chain approach promoted by the project.

[47] The distance, is increasingly relevant as volumes are higher; the time, the hour, and number of deliveries per week are also important.

[48] The wholesaler gives the same price, to the collection center than other providers. This has to do with the supplied-volume of vegetables and the periodicity of delivering, if they could become an important provider, supplying high volumes on daily basis, it would be more likely to ask for better prices (Interview WV01).

Despite the low volumes and few trading-days, the bargaining power of the Marketing and Planning Committee (MPC) in Dhikurpokhari is evident. To illustrate this, I will briefly describe how pricing at that collection center works: the MPC member in charge of the collection of the day, takes her mobile phone and calls one local trader to ask what price he offers; after this, she calls the wholesaler to ask about the prices in Pokhara; then, she calls local trader if it is necessary to rise the price, if there is no agreement with the trader, she just calls other trader. If the volume is higher than 300 Kg, the MPC member asks the trader to rise the price 2 or 3 Nepalese Rupees; this premium-price is given to farmers on the next collection day.

The MPC members, transporters and vegetable-traders are very much aware of their contribution to their local value chain. The level of trust between the wholesaler, the transporters and the MPC member in charge of the collection centre is high; sometimes the wholesaler calls to the MPC requesting vegetables, and they send the vegetables by bus; other times, they just call, telling the number of bus in which they are sending the vegetables, he receives whatever they send, trusting on the quality, paying the vegetables whit the wholesale market price at that moment.

The wholesaler and other traders visited the MPC and gave trainings on harvest, post-harvest and sorting of different qualities. The MPC separates the different qualities and sells them accordingly.

The MPC members perceive local traders as “community members working for them”, sometimes the MPC member in charge of the collection not only gives the vegetables to the local trader, accepting he’ll pay on the next collection day (3 to 4 days after), but also lends some money to him, so he can cover the expenses of marketing those vegetables in Pokhara. The local trader pays this money back on the next collection day.

For traders, linkages between traders are as important as the ones with farmers. They sell to each other the volumes of vegetables they can not sell directly to the final consumers. These linkages were created during the trainings on business record keeping and business promotion facilitated by the project.
SIMI project managed to transmit the value chain approach to the Agricultural Development Office of the government, DADO. They are running several projects in the district with this approach. The high level of cooperation between the different actors promoting the local value chain on Kaski district was evident. According to several informants this was not always the case in other districts, when I asked why?, all the answers coincide, it has to do with the individuals.

Part III Discussion and Conclusions

10. Discussion of the mayor findings

The discussion is in line with the objectives of the study: to get some insights in relation to what works in projects promoting low-cost irrigation and linking farmers to high-value vegetable markets, and, to test the use of value chain mapping tools and realist evaluation to identify what works in the context of projects promoting small scale irrigation and linking farmers to markets.

Insights from the projects in Ecuador and Nepal

The insights from the two projects is presented in relation to the main core-process of the local value chains: the supply chain of Low –cost irrigation technologies, the production of high-value vegetables and linking farmers to high-value vegetable markets. Some findings from the literature review confirming the insights from the two case studies are included.

The Supply Chain of Low-cost irrigation technologies and agricultural-inputs

The NEPAL SIMI project included the promotion of the supply chain of low-cost irrigation technologies as a mean for poverty alleviation in rural areas. In the study area, the technology promoted was the Micro Irrigation Technology (MIT) for delivering water into small fields, particularly low-cost drip irrigation Kits to irrigate about 60 square meters. In the case of the project in Ecuador, farmers used the traditional low-cost water irrigation technology in the area. The water delivery technology in La Providencia consisted of a furrow irrigation system assisted by pvc-pipes and small ditches, inside the furrow, placed every 3 meters. Project promoters did not put any special effort to set up a supply chain of this kind of technology in the area.

Both projects assumed low-cost irrigation technologies can help farmers to get more income if they succeed in reaching markets that would allow them to pay back the investment in short time. Both projects believe high-value vegetable production can pay back investments in short time, depending on the irrigable-area, price obtained for different qualities, the production-costs, post-harvest & trading-cost. The two projects take for granted that investments in irrigation are necessary to assure good vegetable-quality and yields.

The Nepal SIMI project promotes low-cost drip irrigation technologies to irrigate very small pieces of land (60 to 1000 m^2). This project, in contrast, goes for furrow irrigation, with ditches every 3 meters, filled up by a pipeline of pvc-tubes, to irrigate plots of 5000m^2 or larger pieces of irrigable-land. The project assumes an irrigable-area of 5000 m^2 or larger can make the collective pepper production economic rewarded.

The Nepal SIMI project worked on the promotion of a supply chain of low-cost Micro Irrigation technology, whereas the project in Ecuador used the most popular low-cost irrigation in the area; the second project indeed contribute to the last part of this “revised” Operative theory of change, in relation to the development of a Supply chain of Micro-irrigation technologies, which is shown below:

- Project investments oriented to the promotion of a supply chain of low-cost irrigation technologies; such as, demonstration-plots with high-value vegetables; together with users training in operation, repair and maintenance; the selection and training of local manufacturers with embedded quality control, business-planning and business-promotion; including constant external quality control; as well as, interaction workshops with users, dealers and manufacturers, can be effective in making low-cost irrigation technology locally available for farmers, easy to install, operate and maintain; and affordable enough to be purchased by farmers using their current income, savings or access to micro-credits. These efforts, together with the ones oriented to the production and marketing of high value vegetables, can encourage farmers, with limited access to land, water, labor-force and economic resources, to purchase such low-cost irrigation technology; particularly, if farmers need to use restricted quantities of water, and the availability of labor-force is a constrain; but overall, if farmers could assure more profits using such irrigation technology, rather than their own low-cost irrigation technologies.

The MITs sold in Dhikurpokhari irrigate tiny pieces of land, so small that can be irrigated by hand in half an hour. As it was mentioned in the OTC, farmers will be willing to purchase MIT if it would bring more profits than their own way of irrigating. In the case of Dhikurpokhari, the alternative-technology is to irrigate by hand using watering cans. When

there is someone in the household who is able to irrigate by hand, and it doesn't compete with the opportunity of bringing income to the household, by selling his or her working labor, such MIT can not bring additional benefits. In Dhikurpokhari, there is a cultural factor making it more difficult to the supply chain of the MIT, which is the family tradition of expecting the women to serve the members with higher status in the hierarchy of the family. During the visits at the farms in Dhikurpokhari, such women were frequently found irrigating the tomatoes using watering cans while the MIT were stored in the house for taking showers. Constraints, such as restricted quantities of water, scarce labor-force, or opportunities, such as trainings, technical assistance, access to credits and markets can make farmers to decide on purchasing MITs.

When there is no SIMI project, and water is abundant, and the labor-force in the household is not a constrain, it is unlikely farmers will purchase MIT for irrigating small pieces of land. In Kaski, the project ended with low MIT-sells in areas under the project-influence, and a minimum fraction of those[49] in areas were the project has not taking place, making the sustainability of the MIT supply chain questionable.

The importance of micro-credits to access low cost irrigation technologies was evident in the two projects. In Dhikurpokhari, almost all the farmers used micro-credits to produce off-season tomatoes. In the case of the project in Ecuador, a sort of micro-credit allowed the Farmers Group to access the technology for producing peppers. This suggests that more farmers will be willing to participate in projects promoting low-cost irrigation if there are also linkages with micro-credits. The production and marketing of high-value vegetables could payback the micro-credits in short time.

Nepal SIMI project involved the District Agricultural Development Office (DADO) in the last phase. This organization was considered a strategic actor at meso-level for continuing with trainings, technical assistance and coordination meetings after the project ended. SIMI-staff trained DADO-officers on value chain development; however, did not succeed on "selling" the project's theory claiming the Supply Chains of Low-cost irrigation technologies must be sustained by the market. DADO-staff members strongly believe the poorest farmers in the District could not purchase the MIT without some subsidy. At the end of the project, in Dhikurpokhari, DADO became the major client of the MIT dealer. With the interviews conducted in Dhikurpokhari it was not possible to identify whether the farmers in Dhikurpokhari stopped buying the MIT because the new price was "not-reasonable", or because they found it more "reasonable" to request MITs from DADO, hoping to get them for a small fraction of the "official price".

The OTC previously presented, shows a Supply Chain supported by trainings, meetings, demonstrations, and other activities subsidized by the project. The inclusion of DADO was done with the idea that some of this activities may continue with DADO support. The inclusion of actors at meso-level, may bring organizational-theories conflicting with the project's theories in relation to what works on projects promoting small-scale irrigation and linking farmers to high-value vegetable markets, which may lead to get other outcomes than expected.

The field research in Nepal was conducted in May 2009, while the end of Nepal SIMI project was planned for June 2009. The Value Chain Maps showed the efforts of the project promoters, at meso-level, were reduced in the last year of the project. This was taken into account on the "revised" theory of action in relation to the promotion of the MIT Supply Chain. However, the scenario in the study-area will be different, once the project is over. The ideal scenario for checking the original theory of Nepal SIMI project, claiming for the sustainability of a MIT Supply Chain based on the market, will be the one without project subsidies; this scenario could be used as "new evidence" to test the OTC presented above, and consequently, make a new Operative theory of change, or even better, a new Context-mechanism-outcome configuration (CMOC), as meant by realist evaluation, addressing the sustainability of a Supply Chain of Micro-irrigation technologies.

High value vegetable production

In November 2008, I conducted a research in the central coast of Ecuador, where La Providencia is located, looking at the feasibility of setting a supply chain of low-cost irrigation technologies in the area. One of the major findings was that High value vegetables could pay back investments in low-cost irrigation technologies, while the current staple crops in the area couldn't. Weinberger and Lumpkin (2005), in their research in South East and South Asia, also frequently found higher average net farm incomes per household member among vegetable growers, in comparison with cereal producers. The production of vegetables had a comparative advantage particularly under conditions where arable land was scarce, labor abundant and markets accessible.

[49] In the case of Kaski district, about 10% of the MIT-sells are done out of the SIMI Project area

According to some studies (Hallman *et al.*, 2003, Meinzen-Dick *et al.*, 2004), the adoption of High value vegetable production by small and poor farmers depends very much on: the impact on the vulnerability of the poor (to loss of income, bad health, natural disasters, and other factors), the availability of assets required for technology adoption, and whether institutions (such as agricultural extension services, government policies, nongovernmental organizations, the private sector, markets for inputs and outputs) encourage or discourage adoption and represent the interests of poor people.
It has also been reported that long-term commitment is required from all stakeholders to facilitate access to financial services, markets and the promotion of an enabling institutional environment, in order to reduce transaction cost of small and poor farmers and entrepreneurs (IFAD, 2003, Reardon and Barrett, 2000). Weinberger and Lumpkin (2005) argue vegetables have a lower comparative advantage than staple foods when labour and access to inputs are the limiting factors.

The promoters of the two projects considered the supply of agricultural-inputs as vital for producing vegetables with high price on markets. The following "revised" theory of action - originated from applying the realist evaluation in the two projects - provides additional elements to take into account in the promotion of high-value vegetable production:

- Project's efforts oriented to set up a supply chain of agricultural-inputs can support the cultivation of high-value vegetables, specially, if it is strategically oriented to supply farmers with seeds and plants more resistant to pests; fertilizers without harmful effects on the soil-biota, complementing farm-made organic fertilizers; and, the less-harmful insecticides and fungicides to the agro-ecosystems. Such supply chain can work if dealers are able to make a living with other sources of income, and are truly committed to contribute to the healthier production of high value vegetables in the area, as well as the participants of the Farmers Field Schools. If dealers become aware of the hazardous effects of agrochemical inputs, and cherish the environmental-friendly production of vegetables, and at the same time, dealers are satisfied with the profitability of such production system, as a result of synergies with the Farmers Field Schools. If such environmental-friendly supply chain, is complemented with markets willing to pay a premium-price for healthier-vegetables, farmers might continue producing in such a way year after year.

This Operative theory of change, claiming for an environmental-friendly supply chain of agricultural-inputs, suggests the use of such inputs must be economically rewarding for farmers. It takes into account that such option may not necessarily be the cheapest. Because of this, farmers and dealers would need to be aware of the hazardous effects of low-cost agrochemical and have an "environmental-friendly reasoning" and "long term view", to decide for such alternative supply chain. The existence of markets encouraging these decisions by paying a premium price for environmentally friendly farming may be a crucial factor to motivate farmers to go into this direction.

Vegetables reach the best prices in markets when they are offered out of season. Appropriate irrigation and pest management are crucial for enabling this (Belder et al, 2007; Shah & Keller 2002; Enfors & Gordon 2008; Kulecho & Weatherhead 2006; Namara et al, 2005 & 2007; Polak & Yoder, 2006). In my research, particularly Farmers Field Schools appear to be effective for building the basic knowledge for integrated pest management. The following "revised" operative theory of change (OTC) elaborates on this:

- Project's investments in Farmers Field Schools, if well done, can be successful in building the knowledge and skills of farmers to prevent and manage pest on high value-vegetables; if the FFS is complemented with training on nursery, irrigation, crop-fertilization, harvest and post-harvest, farmers with no experience on such crops can effectively learn to produce high-value vegetables, particularly, if they cultivate their vegetables at the same period, and discuss at the FFS, their experiences with the new crops. If farmers produce high-value vegetables on irrigable-fields large enough to be profitable, it can be expected that they will continue producing high–value vegetables year after year.

Farmers Field Schools can be a successful methodology to learn the essentials of Integrated Pest Management (van den Berg & Jiggins, 2007). Well done FFS uses "interactive learning" and well-established principles of adult education, such as discovery-based learning oriented to understanding how agro-ecosystems work and participatory methods for organizational work. (Sherwood, 2009). This theory of action suggests a combination of FFS aimed at learning pest management, together with specific agricultural-activities to grow vegetables with a learning-by-doing approach, the immediate replication at the farm and sharing of experiences within the FFS group. If farmers find the activity economically rewarding they may continue year after year. Water management, pest management, and marketing are key factors affecting, not only, the productivity of high-value vegetables, but also, the cultivation costs and final profitability of the activity. In both projects, those farmers making profits from producing peppers and off-season

tomatoes, respectively, continue producing those crops the year after; while those who didn't[50] mainly because of problems with pest, did not continue.

Bringing people together to share and learn from their experiences led to problem solving, agreements and compromises in favour of the local value chain studied in Nepal. MIT and agricultural-input dealers took advantages of these meetings to promote their products and agree on more efficient and effective ways of delivering products. Agricultural technicians from DCDO and DADO, together with leader farmers could share their experiences. Often, the participants came back from these meetings with ideas and commitments to apply on their work. Interactive visits were useful to motivate some farmers to start producing tomatoes under greenhouses and some others to implement new crop-management techniques, such as, the use of home made fertilizers, pruning, etc.

In the case of the project in Ecuador, FFS methodology used interactive learning, based on small-experiments and observations of the agro-ecosystems. The group of participants learned to get to group decisions for the crop management (including pest-management) at the end of each FFS session, gathering the findings and opinions of the participants. The FFS participants also learned to share experiences and communicate and participate in organizations.

Linking Farmers to High-value Vegetable Markets

The two case studies showed that project investments on the marketing of high-value vegetables can be appreciated by farmers, depending on the produced-volumes and price obtained for different qualities; to payback the production-costs, post-harvest & trading-costs.

Farmers can reach markets requiring higher volumes and constant supply, if they do it collectively, through Farmer's organizations. Farmer's organizations can be essential for quality management and distribution to higher value segments to obtain additional loans, contributing, in this way to increase farmer's margins in the value chains. (Ruben et al, 2007)

The two projects worked on promoting farmers to reach markets collectively. The following Operative theory of change (OTC) derives from the two projects:

- Project's efforts in the promotion and strengthening of Farmers Groups for collective marketing of vegetables, with training on organization-management, participatory planning processes, off-season crop production and post-harvest technologies; as well as, economic governance, with a learning by doing approach; together with the formation of a Marketing and Planning Committee and a collection center for buying vegetables locally; can be effective on gathering volumes, sorted in different qualities to reach markets, if farmers are satisfied with the prices, and/or have no other better alternatives for selling their vegetables, if the time required to set the business deal and receive the payment is short; as well as, if they perceive advantages in terms of transaction costs, such as, the effort required for bringing the vegetables from the farm to the collection-place; and importantly, if they can easily sell their vegetables, on the days they need to, and in the volumes and qualities they can offer.

This OTC suggests trainings are important to enhance the knowledge of farmers willing to sell their vegetables collectively, especially if this is done during a marketing process from which the participants can learn. However, farmers care for prices and easy marketing, in terms of way of payment and transaction costs. The two study cases showed how experienced traders, offering better prices, and easier marketing could get ahead of the Farmers organizations for the collective marketing of vegetables.

In this research it was possible to see how the different scenarios of the two projects led to different ways of implementing collective marketing. While in Nepal the collection center gathered small amounts of vegetables and delivered to wholesalers in Pokhara with small transaction costs, the Farmers Organization in Ecuador had to deal with high transaction costs delivering vegetables to the Supermarket-wholesaler in Guayaquil. While the wholesalers in Pokhara were open to cooperate with the collection center informing the current prices, the quality required and even been transparent with their expected margins, in Guayaquil the wholesaler abused occasional suppliers, taking advantages of the current governmental rules and regulations.

[50] In Dhikurpokhari, about 13% of the project participants did not succeed in producing tomatoes under greenhouses.

Studies conducted by Ruben et al. (2007) argue the bargaining position of farmers in markets can be increased if they sell their vegetables collectively. The two project promoters believed on that, and orient their interventions accordingly. The following "revised" theory of action originates from the two projects:

- Project's investments in training the managers of the collection center on economic-governance, participatory planning; together with, additional trainings involving vegetable's traders on cooperation, account keeping, and post-harvest technologies; complemented with training and follow-up for marketing high-value vegetables, with a learning by doing approach; together with interaction meetings among vegetable producers and traders; such process can be enforced by market information and communication support; if the procedures can be easily implemented by the actors involved. Project's interventions on this direction may increase the bargaining power of the farmers organization with the traders; but, it largely depends on the capacity of the collection center to fulfil the volumes and qualities required by the traders on a regular basis.

This operative theory of change suggests Farmers Organizations require managers with some basic knowledge of business management, participatory planning, cooperation and marketing to lead collection centers. Often, vegetable traders lack some of this knowledge. The project in Nepal worked on linking the traders and vegetable producers, the trainings were useful for making visible to the actors the costs of marketing vegetables including different kind of losses occurring along the local value chain.

The collection center in Dhikurpokhari was managed by 9 members elected by the 16 farmers organizations gathered for marketing vegetables collectively. The operation of the collection center was covered by charging 0.25 Nepalese Rupees per Kilogram of vegetable sold and the volunteer work of the managers. Some of the managers received every month a small salary from DCDO as "Social promoters", funded by Nepal SIMI project. This scenario does not provide enough evidence in relation to the sustainability of the collection center along the time. The moment the collection center operates without project's subsidies, realist evaluation could bring new CMOCs providing more insights in relation to the sustainability of such collection centers.

In the case study of Nepal, the trainings and interaction meetings improved the communication between the managers of the collection centers and the traders, they worked together to reduce the costs and losses along the local value chain, and came up with a marketing system, using mobile-phones to exchange information and trade vegetables not only between the collection center and traders, but also, among vegetable traders.
In spite of the improvements in the local value chains of vegetables sold by the collection center in Dhikurpokhari, the real bargaining position of the farmers organizations depended on the capacity of supplying the vegetables in the volumes, and qualities required by the wholesalers. The marketing system developed, used local traders to link the collection center with the consumers. The manager of the collection center had some bargaining power with the local trader, based on the prices of the wholesale market in Pokhara, until some extend. In this system, the local dealer was a sort of marketing-service provider, he could manage to sell even small amounts of vegetables. The collection center had difficulties in getting important volumes of vegetables; the collections were done on 2 days of the week, while the wholesaler demand was on daily basis.

In the case of the project in Ecuador, the moment the project started, the Farmers organization already had a legal status, bank accounts, a well structured accounting system, and a highly qualified manager with experience in marketing under the formal rules and regulations set by the governmental agencies controlling the tax collection and economic transactions in Ecuador. Based on his strengths, the project could reach the second biggest chain of Supermarkets in Ecuador. The following OTC has been derived from the experience of the project on linking farmers to Supermarkets.

- To supply Supermarkets, project's interventions on training and follow-up to farmers groups linked with a Farmer Organization for marketing irrigable vegetables, with a learning by doing approach, can be effective in linking farmers with this Wholesaler; If farmers are satisfied with the prices, and/or have no other better alternatives for selling their vegetables, the time for the payment is short; as well as, if they perceive advantages in terms of transaction costs, like the effort required for bringing the vegetables to the collection-place, and importantly, if they can easily sell their vegetables, on the days they need to, and in the volumes and qualities they can offer, and unavoidably, if the Farmers Organization manages to comply with the rules and regulations for marketing vegetables at Supermarkets, and are capable to reach a long-lasting supply of vegetables, with volumes, big enough to cover the embedded transaction costs.

Even though the Supermarket was the most reliable wholesaler in Guayaquil, in terms of price settings, and weighing, selling to this market channel required high organizational efforts and transaction costs, as it was mentioned in the

previous OTC; the two case studies showed the farmers participating in both projects react very much to the prices and easy marketing. This easily clash with the fact that the Supermarket operates with the current wholesaler prices and demands delivering of high quality vegetables on regular basis. It can be easily expected that the moment the wholesale price in the city is very low, farmers may prefer to let go their vegetables with retailers purchasing the vegetables at the field to supply other markets offering higher prices. This is an important aspect to take into account in projects linking vegetable producers with Supermarkets.

Literature in the value chain of vegetables claim for public-private interventions aimed to enhance the vertical coordination among the actors in the supply chains, Birthal *et al.* (2005). Based on their studies with vegetable value chains in India, they argue that this can be done by linking supply chain actors through contracts, strategic alliances and other government modes to substantially reduce transaction costs and reduce risk. It has also been reported that long-term commitment is required from all stakeholders to facilitate access to financial services, markets and the promotion of an enabling institutional environment, in order to reduce transaction cost of small and poor farmers and entrepreneurs (IFAD, 2003, Reardon and Barrett, 2000). The theory of action created in this study, in relation to what works in projects linking farmers to high value vegetable markets, suggest many other factors must be taken into account to link farmers to markets in long term basis.

The high level of cooperation between the different actors promoting the local value chain in Kaski district was evident. According to several informants this was not always the case in other districts, when I asked why?, all the answers coincide, it has to do with the individuals. This claims for getting deeper with realist evaluation, in order to come up with context-mechanisms-outcome-configurations (CMOCs), looking at the theories of the actors at the micro-level in relation to what works in projects promoting small-scale irrigation and linking farmers to high value vegetable markets.

The performance of value chain mapping tools and realist evaluation

Value Chain Mapping

Chain mapping is the core of value chain analysis, it is meant to reduce the complexity of economic reality with its diverse functions, multiple stakeholders, interdependencies and relationships to a comprehensible visual model (GTZ, 2007). This tool lead to a broad picture of the project's mechanisms to promote small-scale irrigation and link farmers to high-value vegetable markets, since it looks at the contribution of all the actors involved in a local value chain. However, for a better understanding of the state of projects, the value chain maps needed some additional text providing more explanations on how the value chain operates, as well as, on the interactions among the actors, and the behaviour of some actors.

Some background-information about the projects was necessary for a better understanding of the projects, such as, the projects origins, their main goals, their main elements, who were the project promoters and participants and how long the projects last; as well as, background information about the main characteristics of the study-areas; in relation to land, water, forest, agricultural-systems; family formation, migration, social-discrimination, religion, sources of income, access to micro-credits, and costs of living.

Besides the value chain Maps presented in this document, I worked on mapping the constraints on each of the core processes the local value chain of peppers from la Providencia, in terms of technology, knowledge, rules, enforcement and support services; as well as, the actions considered to overcome those constraints, see Annex 4. This exercise is essential for those workshops oriented to analyze, discuss and plan, the up-grading of local value chains, with the participation of the different actors involved on those local value chains. However, in this document the information was converted into text and complemented with additional information to give more clarity to the readers on these important aspects.

The value chain mapping tools used in this research were useful for showing the efforts of the different actors in the local value chain in terms of people and time involved; some of these efforts can be also considered project's outcomes, if we look at them as formal and informal employment. In the case of the project in Ecuador, with much less actors involved, it was even possible to show the efforts of the project promoters in terms of budgets. The maps presenting the distribution of the vegetables among the different traders are useful to identify the main traders and the importance of their participation in the local value chains.

Realist evaluation

Realist evaluation aims to increase the specificity of our understanding of the mechanisms through which a project accomplishes change, as well as, the contextual conditions necessary for triggering such mechanisms, and, the outcomes of the intervention.

The conceptualization of the context-mechanism-outcome configurations (CMOCs) used in the case-studies, was in line of what the evaluation team of the GTZ (2001) defines as "Operative theories of change" (OTC), rather than the CMOCs as Pawson and Tilley really meant; However, I'd like to give the reader a notion of my last understanding on how a CMOC become visible, by using one example, looking at Nepal SIMI's theory in relation to the sustainability of the supply chain of low-cost irrigation technology. The theory says that in the long term such supply chain will be sustained by the market. In this example I'd like to particularly address the following question: What is it about the supply chain of micro-irrigation technology (MIT) that can make a Poor-farmer to decide on purchase such technology to irrigate a land-plot of 60m^2, instead of irrigating with watering cans?

According to the creators of the "realist evaluation" (Pawson & Tilley 1997), realist begins by attempting to trade talked panaceas for Context-Mechanisms-Outcomes-Configurations (CMOCs); contrasting CMOCs may be correct but for different individuals in different circumstances. Therefore, one of the first steps is to identify a group of individuals with similar background and similar behaviour, in order to find out what particular mechanisms have been triggered in particular contexts.

The following contrasting CMOCs are made from open-interviews with 6 Officers from Winrock and IDE, 4 from the Governmental agencies DADO(3) and VDC(1), 5 from DCDO, 15 Farmers (users and no-users, from Dhikurpokhari), and 2 Dealers.

The groups used for this example are those women, head of their household, living in a mountainous-area, where farmers organizations have been able to establish a marketing system of vegetables, with a well managed collection center, well communicated to a City of hundred of thousand inhabitants by a permanent road. Those women have very limited economic resources (but enough to cover the minimum living allowances), scarce labor-force, own very small farms, with terraces for doing agriculture of about 200 m^2, on which they produce off-season tomatoes, with limited amounts of water accessible (max. 100 liter per day), from water-points located at 1 to 2 hundred meters distance to their greenhouses.

In relation to the question of this example, the interviewed Winrock and IDE promoters have different opinions, some point out to change the drip-lines for cheaper ones and less prompt for clogging (micro-tube lines), while some others suggest to attach micro-credit systems to the supply chain of MIT. Governmental Officers from DCDO and VDC are convinced that subsidies are necessary to motivate poor farmers to purchase MIT. At DCDO, some officers agree on subsidizing the MIT but no more than 50%, some others to link farmers to micro-credits, while others point-out farmers may be willing to purchase the MIT if it comes together with training and technical assistance for producing and marketing vegetables. Farmers claim the current price, even of the smallest MIT was too high. The dealers suggest with field-demonstrations, more farmers will be convinced on the benefits of the Micro-irrigation technology (MIT) and purchase the technology.

The following Context-Mechanism-Outcome configurations are for the groups of farmers mentioned above, been part (or not) of a Savings and Credit scheme, makes a difference in relation to the access to micro-credits.

Table 1. Contrasting CMOCs within the supply chain of Micro-irrigation Technologies

Context	+ Mechanism	= Outcome
Female farmers, head of households, with limited access to land, water, labor-force, and income, producing tomatoes under greenhouses, been active members of revolving fund groups.	+ The access to Micro-credit avoid struggling with the allocation of savings and current income for covering the monthly costs of living to buy a Micro-irrigation technology perceived as useful to increase yields at the same time it saves labor and water.	= Purchasing of Micro-irrigation technologies to irrigate 60 square meters of land.
Female farmers, head of households, with limited access to land, water, labor-force, and income, producing tomatoes under greenhouses, with no access to micro-credits.	+ Subsidies to Micro-irrigation technology perceived as useful to increase yields at the same time it saves labor and water, trigger opportunistic behavior	= Purchasing of Micro-irrigation technologies to irrigate 60 square meters of land.

The previous CMOC-Table looks simple; However, to build a consistent CMOC requires much more effort, because in each of the two groups are many subgroups with different reasoning and circumstances to purchase the MIT. The essential difficulty of using realist evaluation has to do with the data analysis, which according to Duguid, Hawkey and Knights (1997, cited by Pawson & Tilley 1997), who used realist evaluation to evaluate prison education programs, involves looking at, not two, but tens, and even "hundreds of subgroups in an attempt to build a whole mosaic of outcome patterns".

In this research, I tried to determine until what extend value chain mapping tools could be complemented with "realist evaluation" to identify what works, for whom, in the context of projects promoting small scale irrigation and linking farmers to high-value vegetable markets. While value chain mapping showed the efforts of the different actors involved in the different core processes of the local value chain, and the outcomes of their efforts in terms of employment, and volumes of vegetables produced and sold at different prices to different market channels; realist evaluation showed how the mechanisms triggered by the project's interventions lead to specific outcomes influenced by the context and the reasoning of the actors, to approach what "works", in changing the current situation.

In my attempt of creating CMOCs, I looked at the activities set on the project's budgets, assuming there is a strategic reasoning behind, in the minds of project-designers, oriented to produce some expected changes on the current situation, and remain after the project's intervention. This led me to construct "Operative theories of change", as defined by the evaluation team of GTZ (2001), and not to the CMOCs as meat by Realist evaluation. Looking specifically at the promotion of small-scale irrigation and linking farmers to high-value vegetable markets, I converted more than 300 activities of the Nepal SIMI project into 11 theories, and 8 activities of the project in Ecuador into 2 theories. Taking into account the number of activities in the budget of the first project, it can be easy to imagine, different researchers may come up with different numbers of theories, and accordingly, different levels of deepness. Indeed, I found much space to manoeuvre even between the meso-level and micro-level of the selected local value chains. I decide for setting the theories at meso-level, by looking at the project promoters, mainly because of time-constraints for doing field research[51].

The "Operative theories of change" created in the case-studies were useful to gather and evaluate the activities linked to the theories of the projects in "strategic order", and led to important aspects to take into account by organizations and individuals willing to promote small-scale irrigation and linking farmers to high-value vegetable markets. However, the last attempt of building the Context-mechanism-outcome configurations (CMOCs), as presented in the

[51] In Nepal, I spend four weeks, only.

beginning of this discussion, suggests that CMOCs can provide much more deeper indications in relation to what is about projects that "works", for whom and in which context, than the OTC elaborated in the case-studies.

During the field research in Nepal, it became evident that the theories and/or reasoning of the actors at meso level affected the implementation of the planned project-theories. Even unintentionally, the interviews revealed it was not only about the theories of the organizations, but also, the individual's theories behind their interventions, this has been confirmed by Pawson,(2002, 2003), Tilley (2000, 2002). This suggest, the closer you get to the reasoning of the actors, the closer you can get to the realist evaluation. One project can be implemented differently even in the same area, just because of different "theories" in the minds of the individuals, in relation to what "works" in the projects they are intervening. When this is the case of the actors at the meso level, it is very reasonable to expect the same at micro level. The theories of the actors al micro level, such as farmers, leader farmers, dealers, transporters, traders; influence the way they act in the projects. Because of this, the better you get in understanding people's theories in relation to what works in projects promoting small-scale irrigation and marketing of high value vegetables, the "more gifted" "realist evaluation" can be.

To get closer in the understanding of the complexity of people's behaviour during the implementation of projects, the natural, social, and economic factors influencing the context in which projects are implemented have to be taken into account. The actions taken by the project's actors might not be the same under different contexts, even if the individuals have not change their theories in relation to what might work in projects. The contexts may change during the implementation of the project and beyond.

The complexity of "realism" limits how far you can get with "realist evaluation" in a limited period of time. The best "realist evaluation" can do is to come up with nothing more than "new theories" in relation to what might work in projects, based on the evidence yielded after implementing those theories in specific contexts. This is why the authors of "realist evaluation" suggest, the most handy use of this tool can be done in program or project's monitoring, taking into account the changes in the contexts, to continuously create "revised" theories, and accordingly, reshape the interventions along the life of the programs or projects.

To use the "realist evaluation", next to define the project's theories it is essential to understand, as much as possible, the contexts where the projects were implemented. In the case of the study conducted in Nepal, the short time available for the field-research limited the understanding of the context in which the project took place. Value chain tools helped to get a broad, and shallow, "picture" of the efforts of the multiple actors in the local value chain of tomatoes produced under greenhouses in Dhikurpokhari. However, I had to go beyond that tool to identify the external factors influencing the context in which the project was implemented. On the other hand, in the case of the project in Ecuador, because I have been working with those farmers for several years, I was more confident of understanding the context in which the project took place. However, the value chain mapping tools gave me a new picture, because they led me to look at the different stakeholders of the local value chain and how did they act in the project.

Realist evaluation, orients project's evaluators to look at the interventions that really worked in such projects, how and why; rather than, looking at what doesn't work, as it should, according to someone's theory. Realist evaluation does not ask project's evaluators and implementers to be up to dated on academic-information, which is often not freely available. The realist evaluation ask evaluators and interviewees to get into "interactive-learning", and dig on ""what might work", for whom in an specific context. If this is well done, can be of great value to identify the main question of this research. However, it requires to get to the "individuals level" which may require high efforts for interviewing the actors, and overall, for processing the data into Context-mechanisms-outcomes-configurations (CMOCs).

Because of the relevance of the contexts in affecting the outcomes, the ones in better position for applying realist evaluation are the actors involved in the project; However, the experience of applying RE in this research warns for special care in understanding deeply the concepts and the methodology. My background, as project designer, brought me to a misunderstanding the concept of "mechanism", as Pawson and Tilley really meant. Based on this, I can easily imagine that project staff used to work with "strategic planning" may get a bit far from realist evaluation, as well.

Realist evaluators must develop the skills in conceptualization, causal thinking and interviewing with interactive reflection for guiding the interviewee deeper in his/her own reasoning and understanding of the project mechanisms leading to specific outcomes, as well as how this are affected by the context. This is not an easy task, and specially,

when the evaluator can not communicate with the interviewee in the same language and the communication is interrupted by the translation.

The ideal scenario for checking the original theory of Nepal SIMI project, claiming for the sustainability of a MIT Supply Chain based on the market, will be the one without project subsidies; this scenario could provide the "evidence" required for creating context-mechanism-outcome configurations (CMOCs) addressing the sustainability of a Supply Chain of Micro-irrigation technologies. Similarly, the best moment to apply realist evaluation, looking forward to address the sustainability of collection centers managed by farmers, would be when the collection center operates without project's subsidies. The closer the evaluation is to these scenarios, the better "realist evaluation" can provide some indications in relation to the sustainability of low-cost irrigation promotion and collective marketing of high-value vegetables.

11. Conclusions

"The quality of the intervention depends on the interior quality of the actor". Bill O'Brien[52]

I think this line of text can give the reader "the clue" for understanding why similar projects, even if implemented under the same reasoning, with analogous resources, context and time, may lead to different outcomes. Realist evaluation tries to overcome this difficulty by exposing the context, the actors-reasoning and the resources used to produce changes; it even tries to come up with context-mechanisms-outcome-configurations (CMOCs) to overcome the "panacea" problem on the attempt of approaching the question "what works, for whom and on which circumstances"; such CMOCs can give valuable indications for evaluation purposes; but can not "predict" outcomes, the least they can do is to release a spiral of theories, which may be confirmed or not while projects are implemented, to suggest improved practices or at least important aspects to be aware of in future projects, or the same project on its next stage, in the best of the cases.

The use of Value chain mapping tools gave a broad picture in relation to the efforts of the organizations influencing each core process of the local value chains at the meso-level, and the actors working at the micro-level; as well as the outcomes of their efforts in terms of employment, and volumes of vegetables produced and sold at different prices to different market channels, and the added value along the chain. The Maps looking at the constraints in the local value chains and the activities of the actors at the meso-level were the most useful in informing "realist evaluation" in relation to the context and the actors. This maps invite the evaluator to look at the different stakeholders of the local value chain and how did they act in the project. However, The original theories of the projects were the most used for guiding the data collection of the case-studies, to understand the context on which the projects were implemented.

Value chain mapping can go beyond the maps used in this research; with more maps, showing different aspects of the actors involved in the different core processes of the local value chain. The type of information required to build the maps, as well as, the systematic frameworks to construct the maps and visual-aid intrinsic in the maps, makes value chain mapping a great tool to be used in workshops oriented to involve the different actors of the local value chain; not only, in the analysis of the value chains, but also, in planning their contributions to up-grade such value-chains.

Value chain mapping does not reach deep into the contextual factors influencing intermediate outcomes. The tool is not intended to look at project's theories of action. It looks at the processes along the value chain rather than the people. Value chain mapping can identify the "bottle necks" that can be deeply studied by realist evaluation.

The Realist Evaluation can reach further than what it did in this research, by setting the theories deeply, looking at the theories of the individuals involved in the implementation of the projects. However, it is better to apply the realist evaluation in specific "bottle necks" identified by the Value chain mapping, rather than trying to embrace all the projects theories. In the case of research with few weeks available for doing field research, this option must be careful considered.
Realist evaluation determines outcome patterns, specifies the scenarios by creating context-configurations; as well as, identifies specific key mechanisms leading to intermediate outcomes. Realist evaluation looks at what triggers people reasoning and actions, bringing information beyond what an evaluation looking at the project's activities can do.

Realist evaluation requires skills in conceptualization, causal configuration and interviewing with interactive reflection, such skills are hard to find in project's actors. This limits the use of realist evaluation in the hands of local actors. Realist evaluation demands plenty time for interviews and the analysis of data, to create context-mechanism-outcome configurations.

The theory-based evaluation, used in the case-studies, is in line of the GTZ impact model. This methodology is highly compatible with the strategic planning led by objectives, most commonly used in projects. The Operative Theories of change identify intermediate outcomes; as well as, key aspects in the context, such as external factors, circumstances and conditions affecting the outcomes. The method identifies key elements, as well as, the reasoning of the actors, leading to specific outcomes. This methodology indicates features and characteristics for project's activities to be more effective in reaching expected outcomes. The method can be implemented more rapidly than realist evaluation and matches easier with value chain mapping. However, it does not get as deep as realist evaluation, and is more vulnerable for generalizations.

[52] Bill O'Brien, founding member of the Society for Organizational Learning.

The implementation of the project's theories is influenced by the theories of the organizations and the individuals intervening in the local value chain at meso-level, in relation to what works in projects promoting small-scale irrigation and linking farmers to high-value vegetable markets. The context in which a project is implemented has a great influence not only in the circumstances affecting the resources available to the actors; but also, in their values and their reasoning in relation to their interventions in the project. The context is very complex and changes along the time.

The outcomes of projects promoting low-cost irrigation and linking farmers to markets are much more affected by: the context and the reasoning of the actors at meso and micro-level. Realist evaluation looking at the theories of the actors, may bring context-mechanisms-outcome-configurations highlighting important elements to take into account for improving project's interventions, the most often this is done the better. This suggests projects might take into account methodologies to influence the values and reasoning of the different actors. Accordingly, the involvement of organizations with theories conflicting with project's theories in relation to what works, for whom in different contexts must be addressed with special care.

Value chain mapping and realist evaluation were useful to identify what is about projects that "work", for whom and in which circumstances. The reader can find some of them in the case studies and the discussion part, confirming, though not totally, the impact hypothesis of the projects: "Projects efforts in promoting low-cost irrigation and the production of high-value vegetables, together with, linking farmers to markets, can lead to local value chains generating enough incomes for the different actors to keep them motivated in continue up-grading it year by year".

12. Bibliography

Altenburg, T. (2007) “Donor Approaches to supporting pro-poor value chains”. Prepared for The Donor Committee for Enterprise Development, Working Group on Linkages and Value Chains. German Development Institute.

Baur,H., Bosch, M., Krall, S., Kuby, T., Lobb-Rabe, A., Paul-Theodor Schütz, P.T., Springer-Heinze, A. (2001) “Establishing Plausability in Impact Assesment”. Eschborn: GTZ.

Belder, P., Rohrbach, D., Twomlow, S. and Senzanje, A. (2007). “Can drip irrigation improve The livelihoods of smallholders? Lessons learned from Zimbabwe”. Global Theme on Agroecosystems Report no. 33. PO Box 776, Bulawayo, Zimbabwe: International Crops Research Institute for the Semi-Arid Tropics. 32 pp.

Berg, M. van den, Boomsma, M., Cucco, I., Cuna, L., Janssen, N., Moustier, P., Prota, L., Purcell, T., Smith, D., and Wijk, S. van. (2007) "Making value chains work better for the Poor: A tool box for practitioners of Value Chain Analysis". Making Markets Work Better for the Poor, Working Group.

Biénabe, E., Boselie, D., Colion, M., Fox, T., Rondot, P., Kop, P van de, and Vorley, B. (2007). “The Internationalization of Food Retailing: Opportunities and Threats for Small-scale Producers”, In Vorley, B.,Fearne, A. and Ray, D. ed., *Regoverning Markets: A Place for Small-scalePproducers in Modern Agrifood Chains?* Hampshire: Gower Publishing Limited, pp. 3-17.

Birthal, P.S., Joshi, P. K., Roy, D., and Thorat A. (2007) “Diversification in Indian Agriculture towards High-Value Crops: The Role of Smallholders”, *International Food Policy Research Institute*, Paper 727.

Douthwaite, B., Kuby, T., van de Fliert.,Schulz, S. “Impact pathway evaluation: an approach for achieving and attributing impact in complex systems”. Agricultural Systems 78 (2003) 243–265

Enfors, E. and Gordon, L. J. (2008). "Dealing with drought: The challenge of using water system technologies to break dryland poverty traps." Global Environmental Change.

Friedman, V. J. (2001) "Designed Blindness: An Action Science Perspective on Program Theory evaluation". *American Journal of Evaluation* 2001; 22; 161

Funnell, S. C. (1997)“Developing and Using a Program Theory Matrix for Program Evaluation and Performance Monitoring”. I In Program Theory in Evaluation". New Directions for evaluation No. 87

Gabre-Madhin, E.Z. and Haggblade, S. (2003). “Successes in African Agriculture: Results of an Expert Survey”. “Successes in African Agriculture” Conference, December 1-3, 2003, Pretoria, International Food and Policy Research Institute, Paper 1.

Goletti, F. (1999). “Agricultural Diversification and Rural Industrialization as a Strategy for Rural Income Growth and Poverty Reduction in Indochina and Myanmar”. Symposium on "Food Policy in Indochina and Myanmar: The Effects of Globalization" , March 1-2, 1999, Hanoi, International Food and Policy Research Institute, Paper 30.

GTZ (2007) *ValueLinks Manual: The Methodology of Value Chain Promotion*, Division 45, Agriculture, Fisheries and Food, Division 41, Economic Development and Employment.

Kulecho, I. K. and Weatherhead, E. K. (2006). "Adoption and Experience of Low-cost Drip irrigation in Kenia." Irrigation and Drainage 55: 435-444.

Leeuw, F. L. (2003) "Reconstructing Program Theories: Methods Available and Problems to be Solved". *American Journal of Evaluation* 2003; 24; 5

Meyer_Stamer, J. and Wältring, F. (2007) "Linking Value Chain Analysis and the "Making Markets work better for the Poor" Concept". Paper prepared for the Pilot Project "Innovative Approaches to Private Sector Development". GTZ.

Namara, R. E., R. K. Nagar, et al. (2007). "Economics, adoption determinants, and impacts of micro-irrigation technologies: empirical results from India." Irrigation Science 25: 283-297.

Pawson, R (2002) "Evidence and Policy and Naming and Shaming" *Policy Studies, Vol. 23, No 3/4.*

Pawson, R (2002) "Evidence-based Policy: The Promise of'Realist Synthesis". *Evaluation* 2002; 8; 340.

Pawson, R (2003) "Nothing as Practical as a Good Theory". *Evaluation* 2003; 9; 471

Pawson, R., Greenhalgh, T., Harvey, G., Walshe, K. (2005) "Realist review a new method of systematic review designed for complex policy interventions" Journal of Health Services Research & Policy Vol 10 Suppl 1, 2005: 21–34.

Pawson, R. and Tilley, N. (1997). Realistic Evaluation. London: SAGE Publications Ltd.

Pawson, R. and Tilley, N. (2004). "Realist Evaluation". British Cabinet Office.

Polak, P. and Yoder, Rl (2006). "Creating wealth from groundwater for dollar-a-day farmers: Where the silent revolution and the four revolutions to end rural poverty meet." Hydrogeology Journal 14: 424–432.

Poste, S., P. Polak, et al. (2001). "Drip Irrigation for Small Farmers A New Initiative to Alleviate Hunger and Poverty." International Water Resources Association 23(1): 3-13.

Rogers, P.J., Petrsino, A., Hasci, T.A., Huebner, T. (2000) "Program Theory Evaluation: Practice, Promise, and Problems. In Program Theory in Evaluation". New Directions for evaluation No. 87.

Ruben, R. , Boekel, M. van, Tilburg, A. van and Trienekens, J. (2007) *Tropical food chains: governance regimes for quality management*. Wageningen: Wageningen Academic Publishers.

Shah, T. and Keller, J. (2002) Micro-Irrigation and the Poor: A Marketing Challenge in Small-holder Irrigation Development. IDE. 21 pp.

Sherwood, S. G. (2009) Learning From Carchi: Agricultural Modernisation and the Production of Decline. Wageningen.

Springer-Heinze, A., Hartwich, F., Simon Henderson, J., Hortond, D., Isaac Mindee, I. (2003) "Impact pathway analysis: an approach to strengthening the impact orientation of
agricultural research". Agricultural Systems 78 (2003) 267–285

Swinnen, J. F. M. and Maertens, M. (2007). "Global Supply Chains, Standards and the Poor: some Conclusions and Implications for Government Policy and International Organizations", In Swinnen, J.F.M. ed., *Global Supply Chains, Standards and the Poor*, London: CAB International, pp. 259-266.

Tilley, N. (2002) "Sherman vs Sherman: *Realism vs rhetoric*". *Criminology & Criminal Justice 9(2)*

Tilley, N. (2004) "Programme: The theories of the programme and of its evaluations Applying theory-driven evaluation to the British Crime Reduction". *Criminal Justice* 2004; 4; 255.

Weinberger, K. and Lumpkin, T. (2007). "Diversification into Horticulture and Poverty reduction: A Research Agenda"., *World Development*, 35 (8), pp. 1464-1480.

13. Annexes

Annex 1. Production Costs of Pepper

Costs for Pepper Production (1 Ha)

Crop life (months): 6
Sowing distance (m): 1x0.4
Plants/ha: 25,000
Yield/ha: 800 Sack
Price per Sack, at Farm level $ 10.00

Description	MANUAL LABOR				INPUTS					
	Unit	Amount #	Cost/Unit	*Subtotal 1*	Item	Amount #	Unit	Cost/Unit	*Subtotal 2*	Item
A. COSTOS VARIABLES										
1.- Nursery				**$ 12.50**					**$ 246.80**	
Seed					Seed (var.Morron)	1	Can 50gr	17.52	$ 17.52	
					Seed (var.Salvador)	10	1000 seed-bag	22.42	$ 224.20	
Nursery	Labor-days	2	5	$ 10.00	Fungicide (Mitigan)	0.05	Liter	29.5	$ 1.48	
										Trays
Pest control	Labor-days	0.5	5	$ 2.50	Insecticide (Semevín)	1	100 cc	3.6	$ 3.60	
2.- Land Preparation				**$ 0.00**					**$ 0.00**	
Land Plowing										Tractor (rent)
3.- Irrigation				**$ 140.00**					**$ 43.00**	
Irrigating	Labor-days	18	5	$ 90.00	Gasoline	25	Galon	1.48	$ 37.00	Pump 5 Hp
Furrow construction	Labor-days	10	5	$ 50.00	Oil	3	Liter	2	$ 6.00	PVC Tubes
4.- Agricultural activities				**$ 505.00**					**$ 568.57**	
Transplanting	Labor-days	8	5	$ 40.00						
Fertilizing	Labor-days	6	5	$ 30.00	NPK Fertilizer 8-20-20	2	Sack	44	$ 88.00	
					Urea	1	Sack	37	$ 37.00	
					Fertilizer (Muriato de Potasio)	3	Sack	39	$ 117.00	
Chemical Weed Control	Labor-days	2	5	$ 10.00	Herbicide (Glyfosato)	1	Liter	7.7	$ 7.70	Sprayer
Manual Weed Control	Labor-days	21	5	$ 105.00						
Pest Control	Labor-days	24	5	$ 120.00	Fungicide (cuprosan)	1	0.5 Kg	29.5	$ 29.50	Sprayer
					Insecticide (Piryclor)	1	250 cc	2.6	$ 2.60	
					Insecticide (Rescate)	1	0.1 Kg	18.8	$ 18.80	
					Insecticide (Karate)	2	250cc	9.2	$ 18.40	
					Insecticide (Neem X)	1	1 Liter	18	$ 18.00	
					Fungicide (Amistar)	1	0.1 Kg	17.8	$ 17.80	
					Fertilizer (Kristalón)	8	Kg	2.5	$ 20.00	
					Fungicide (Avalancha)	1	0.5 Kg	14.17	$ 14.17	
					Fungicide (Bravo)	1	400 cc	4.6	$ 4.60	
Plants Propping	Labor-days	40	5	$ 200.00	String	5	pounds	3	$ 15.00	
					Peg	1000	Unit	0.1	$ 100.00	
					Wire	15	pounds	4	$ 60.00	
5.- Harvest				**$ 335.00**					**$ 43.00**	
Harvesting	Labor-days	67	5	$ 335.00	Sack	400	Unit	0.1	$ 40.00	
					Rope	1	pounds	3	$ 3.00	
			Total	**$ 992.50**				Total	**$ 901.37**	

Annex 2. Production Costs of Tomato under Greenhouses

Costs for Tomato production under greenhouse (12m x 5m) in Nepal

Crop life (months): 11
Sowing distance (m): 0.7x0.6
Plants (60m2): 80
Yield (60m2): 1,000 Kg
Price per Kg, at Farm level 0.40 USD 75 NRP = 1 USD

Description	MANUAL LABOR				INPUTS					
	Unit	Amount #	Cost/Unit USD	*Subtotal 1*	Item	Amount #	Unit	Cost/Unit USD	*Subtotal 2*	Item
1.- Nursery				**2**					**5.27**	
Seed					Seed (hybrid)	1	pack	4.00	4.00	
Nursery	Labor-days	1	2	2	Fungicide (Methalaxil)	0.5	50 gr-pack	2.00	1.00	
					Insecticide (Carbendazin)	1	50 gr-pack	0.27	0.27	Plastic sheet (Kg)
										Compost (Kg)
2.- Greenhouse (12m x 5m)				**33.2**					**0.00**	
Greenhouse construction	Skilled labor-days	5	4.2	21						Bamboo poles
	Labor-days	5	2	10						Plastic sheet (Kg)
										Wire-galvanized (Kg)
										Rope (Kg)
										Iron roll (Kg)
Land preparation	Labor-days	1	2	2						
MIT Installation	Labor-days	0.1	2	0.2						
3.- Irrigation				**16**					**0.00**	
Irrigation	Labor-days	8	2	16						MIT
4.- Agricultural activities				**38**					**30.53**	
Transplanting	Labor-days	1	2	2	Micronutrient (Borex)	1	200 gr-pack	2.00	2.00	
					Compost (Kg)	240	Kg	0.00	0.00	
Fertilizing	Labor-days	1	2	2	Micronutrient (Multiplex)	1	100 ml bottle	0.87	0.87	
					NPK Fertilizer 18-46-0 (Kg)	3	Kg	0.53	1.60	
					Urea (Kg)	3	Kg	0.40	1.20	
					Potasium Permanganate (Kg)	3	Kg	0.40	1.20	
					Liquid Fertilizer (liter)	60	liter	0.00	0.00	
					Compost (Kg)	36	Kg	0.00	0.00	
Manual Weed Control	Labor-days	2	2	4						
Desuckering	Labor-days	2	2	4						
Pruning	Labor-days	2	2	4						
Plants Propping (stucking)	Labor-days	5	2	10						Peg
										String (Kg)
Pest Control	Labor-days	5	2	10	Insecticide (Prime)	1	100 ml bottle	2.67	2.67	Sprayer
					Insecticide (Sorbo)	1	100 ml bottle	2.67	2.67	Helicoverpa Trap
					Insecticide (Nuvan)	1	100 ml bottle	1.07	1.07	
					Insecticide (Robar)	1	100 ml bottle	1.07	1.07	
					Insecticide (Dorsban)	1	50 gr pack	1.87	1.87	
					Insecticide (Mostard cake)	2	Kg	0.60	1.20	
					Fungicide (Mancozeb)	3	100 gr pack	1.33	4.00	
					Fungicide (Methalaxil)	3	100 gr pack	2.67	8.00	

Annex 3. Expansion of Greenhouses in Dhikurpokhari

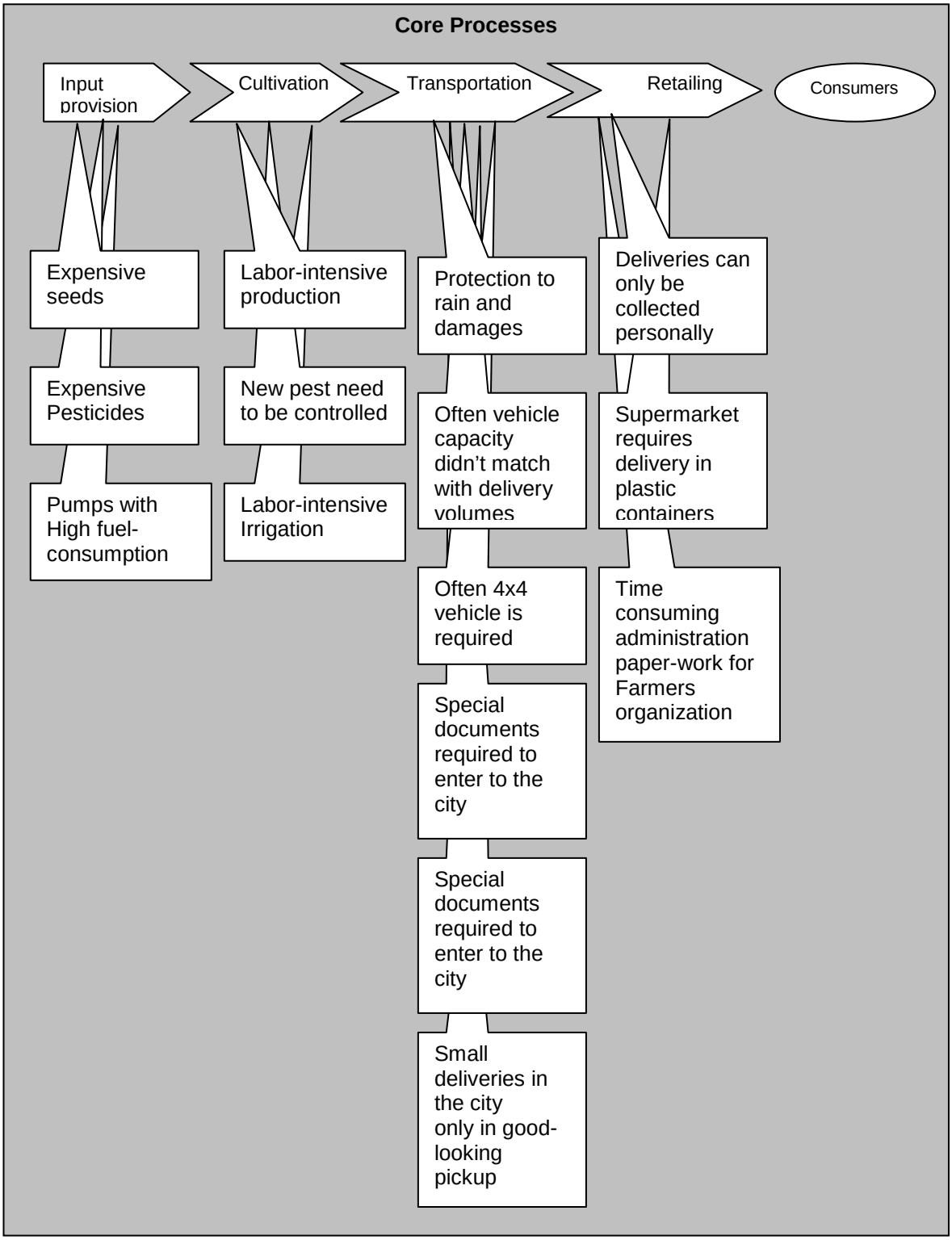
Number of Greenhouses promoted by Nepal SIMI project in Dhikurpokhari

Village	Year 2006							Year 2008						
	Number of Greenhouses according to sizes							Number of Greenhouses according to sizes						
	5m x 12m	5m x 10m	5m x 8m	5m x 6m	4m x 8m	4m x 6m	Sub Total	5m x 12m	5m x 10m	5m x 8m	5m x 6m	4m x 8m	4m x 6m	Sub Total
Goldanda		2					2		2					2
Paudurkot							0	2	12					14
Bhimuni					5		5	1				3		4
Dharapani					11		11	1				11		12
Majhthok						5	5						3	3
Mulachare					3		3					3		3
Daregauda	35						35	29						29
Serachaur		3					3		5					5
Bhimuni			5				5	1		8				9
Lakurkot			3				3			5				5
Simpali	2	42					44	7	42					49
Phallapani			6				6		1	8				9
Adhikaridanda			9				9	1		4				5
Moranche			2				2			1				1
Niware				10			10				7			7
Lewade			2				2			2				2
Sub Total	37	47	27	10	19	5	145	42	62	28	7	17	3	159

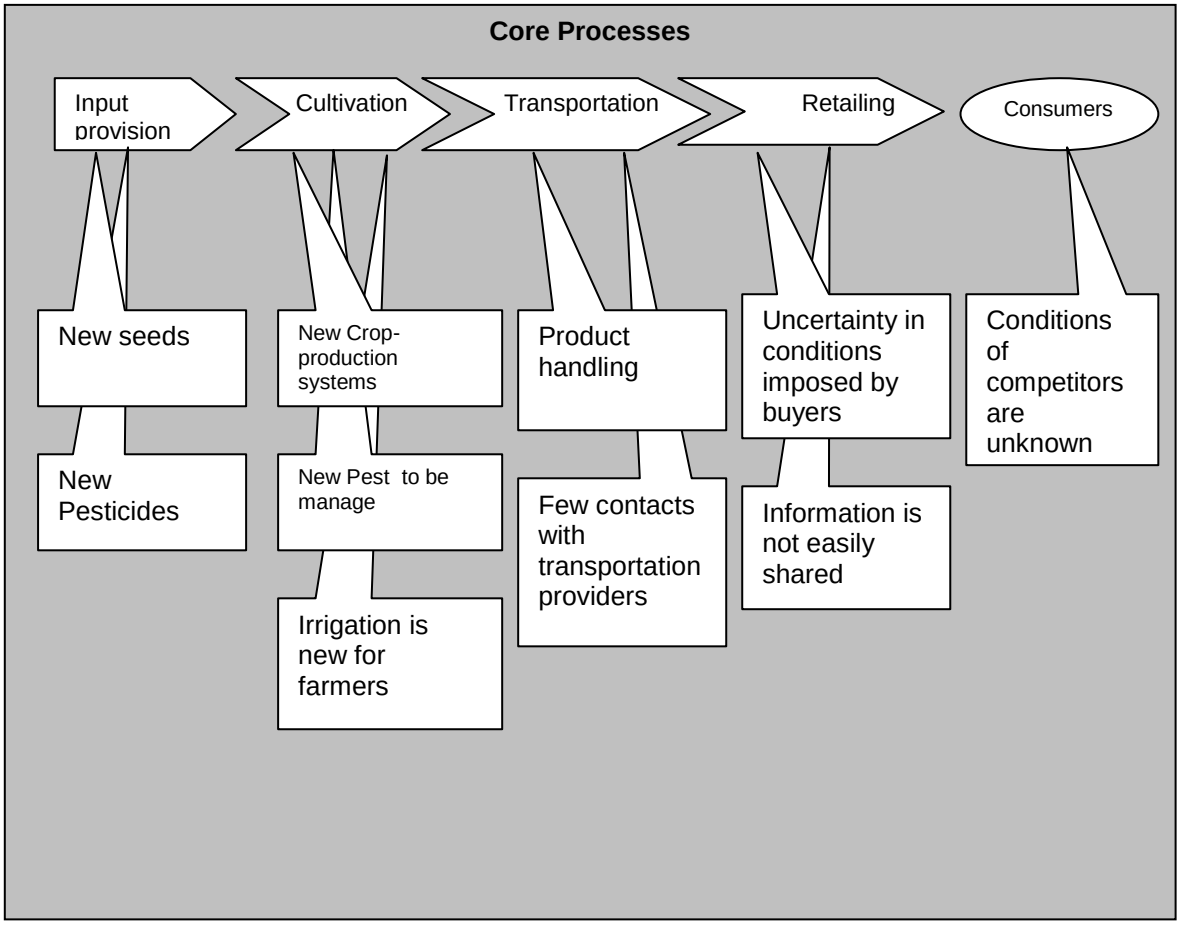
New greenhouses =	38	26%
Dismounted greenhouses =	19	13%

Annex 4. Value Chain Maps of the Project in Ecuador

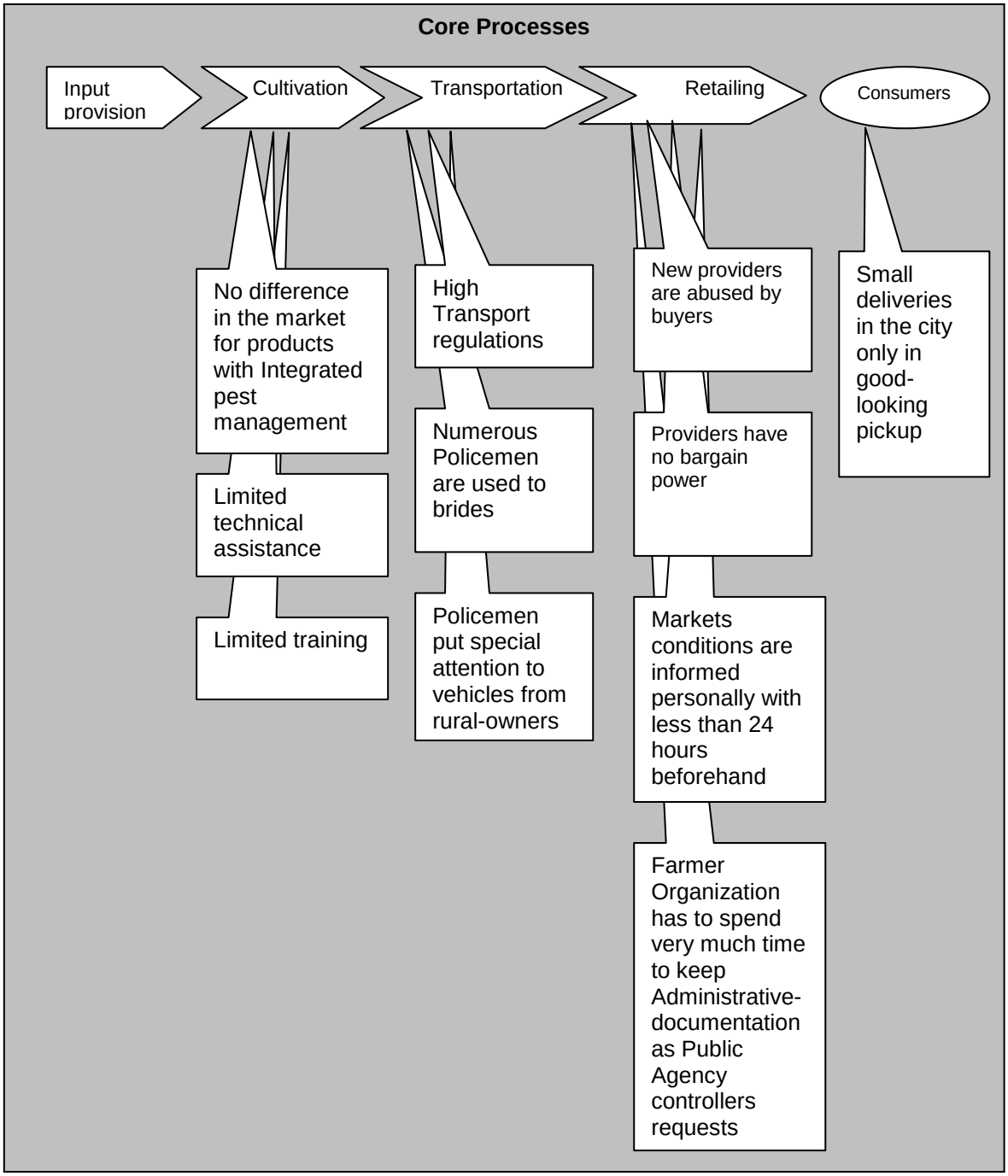
Map Annex 4.1. Constraints in terms of technology



Map Annex 4.2. Constraints in terms of Knowledge



Map Annex 4.3. Constraints in terms of Rules, Enforcement & Support Services



Map Annex 4.4 How the constraints in La Providencia can be manage