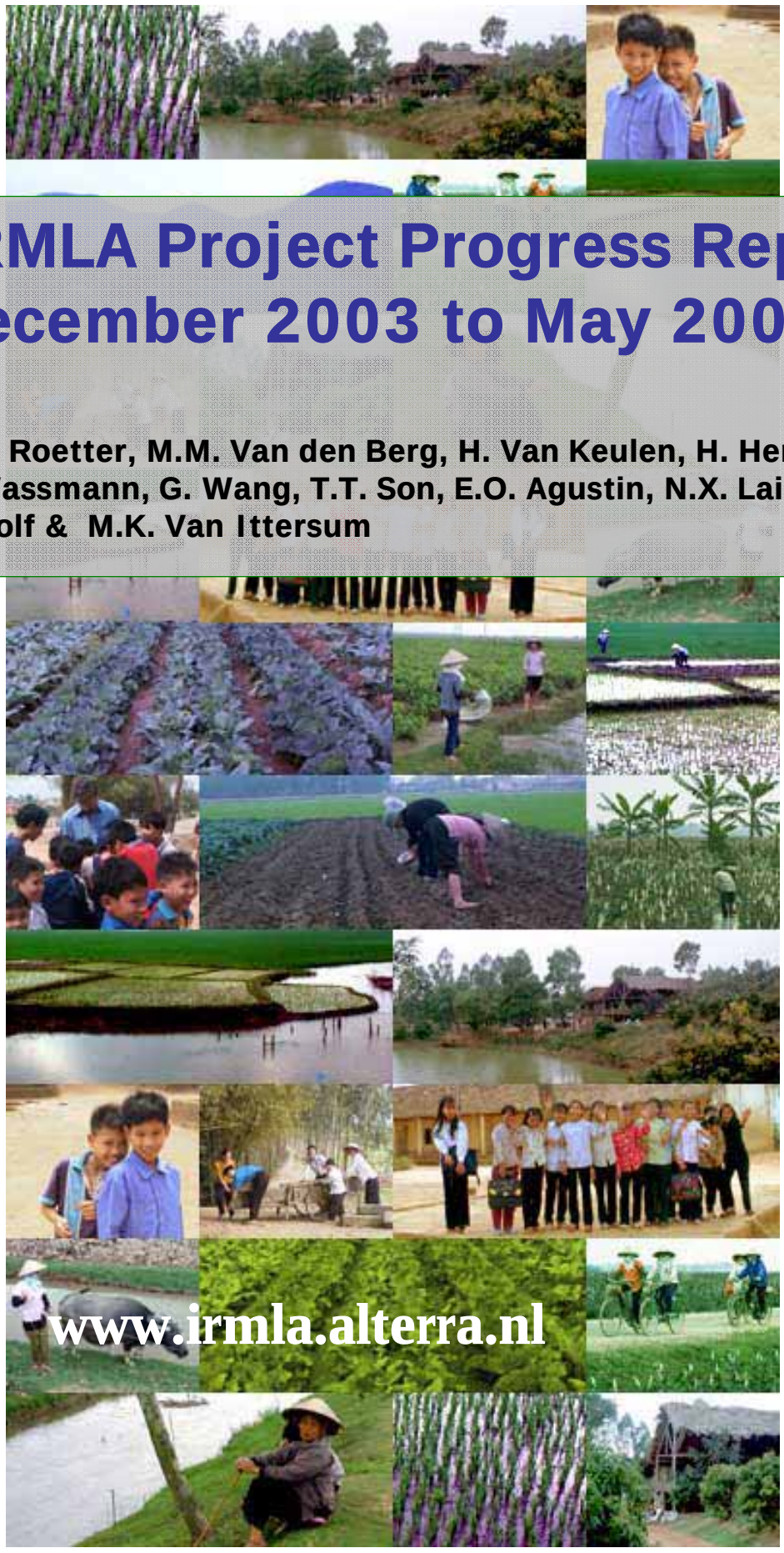

IRMLA Project Progress Report December 2003 to May 2004

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IRMLA Project Report no. 5

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ABSTRACT

R.P. Roetter, M.M. Van den Berg, H.Van Keulen, H. Hengsdijk, G. Wang, T.T. Son, E.O. Agustin, N.X. Lai, C.H. Lu, J. Wolf, &. M.K. Van Ittersum
IRMLA Project Progress Report: December 2003 to May 2004. Alterra, Green World Research, Wageningen.

IRMLA project is a research network for Integrated Resource Management and Land use Analysis in E and SE Asia. The four years project (2002-2005) was established to develop a framework and methods for multi-scale land use analysis and planning, and identify options for sustainable land use (at farm, district and provincial level). The current progress report covers the period December 2003 to May 2004. Major focus was on the finalization of the technical (generic) coefficient generator and its documentation and improved design of the regional and farm level LP models. Another round of (four) in-country workshops were held in March/April 2004, in which special attention was paid to the question whether stakeholders' perceptions on land use issues and resource management problems in four study regions were sufficiently taken into account. Progress in methodology and case study development, and results and conclusions from the in-country stakeholder meetings and team working sessions form the core of this report.

Keywords: resource use and management, land use planning, systems analysis, agricultural and environmental policies, multiple goal analysis, regional scenario, farm household modeling, Asia, stakeholders, decision behaviour

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Contents

Preface

Currently, in many of the highly productive lowland areas of E and SE Asia a trend to further intensification and diversification of (agricultural) land use can be observed. The gains in productivity and the associated environmental impacts of these developments are unknown. Effective land use planning and resource use analysis at different scales can help to make the issues transparent. This also includes design and analysis of resource-use efficient systems that can serve a broad range of development objectives. Both are key to identifying the scope for technical and policy change and its feasibility in a given region.

IRMLA project is a research network for Integrated Resource Management and Land use Analysis in E and SE Asia. The four years project officially started on 1 December 2001. It was established to develop a framework and methods for multi-scale land use analysis and planning, and identify options for sustainable land use (at farm, district and provincial level).
To this end, the IRMLA Project aims at broadening existing methodology for strategic land use analysis and policy formulation at sub-national scale:

- in width (incorporation of environmental impacts)
- in length (incorporation of long-term effects): and
- in depth (incorporation of farmers' decisions).

To develop and test this new approach, four case study regions have been selected. All are located in important agricultural areas :

1) Pujiang county, Zhejiang province, China (rice-rice)
2) Batac and Dingras municipalities, Ilocos Norte Province, Philippines (rice-dry season crops)
3) Tam Duong district (part of Tam Dao) , Red River Delta, Vietnam (double rice-winter crop)
4) Omon district, Mekong Delta, Vietnam (double or triple rice)

During year 1 of the project, detailed workplans were established (kick-off workshop in February 2002); land use options and resource use conflicts for current production systems were analysed at the regional level – including the temporal dynamics of some in- and outputs of the systems. Furthermore, detailed farm surveys were designed and carried out.

During year 2, technical coefficients describing input–output relations of innovative, future production technologies (years 2005-10, 2015-20) will be generated; adaptation strategies to climate-induced risks will be taken into account; farm household models (FHMs) will be developed to analyse effects of policy measures on resource allocation; farm survey results will be analyzed to gain insight into farmers' decision behavior and to define representative farm household types. Interim reporting and consultations with stakeholders will take place in each study region (March /April 2003) A next round of model refinement and reporting is scheduled for October 03

– as a follow-up to a workshop to be held at Wageningen (29 September – 4 October 2003). Training on relevant techniques and component models will be provided through workshops in Asia and at Wageningen UR. The training/design phase will be completed, and the project will increasingly focus on model development and evaluation.

During year 3, the farm household models will be finalized and operationalized; test results will be presented and discussed with local stakeholders (in-country workshops, in March / April 2004). Expert systems for estimating input – output relations will be refined. Technical documentations will be completed.

During year 4, the link of farm household and regional land use modelling will be operationalized and applied to analyse the response of farm households to different policy measures and examine whether and to what extent implementation of such policies would lead to realisation of policy objectives (rural development goals) at the regional level; on this basis feasible options for sustainable land use will be presented to policy makers; One of the milestones will be an Impact symposium organized by the project (to be held some time in April/May 2005, in the Philippines or Vietnam).

This report presents the main accomplishments made during the first 6 months of the 3rd project year. Focus is on work carried out in preparation of, during and immediately after 4 in-country workshops (15 March – 4 April 04). The report thus also contains part of the materials produced as input for the workshop, and several outputs (chapters 6 and 7).

Many thanks to all project team members and stakeholders from the case study regions who helped making the last six months a very fruitful and pleasant working period. Special mention deserve Wang Jiangdi (ZU), Alice Laborte (IRRI), Pham Quang Ha, Nguyen Van Chien, Vu Manh Quyet, V. D. Tuan, M. van Trinh (NISF), and Nguyen The Cuong (CLRRI) for contributing individual sections and compiling materials for this report.

Wageningen,
10 June 2004 IRMLA Project Co-ordinator

Contract number : ICA4-CT 2001-10055 (IRMLA) **Year** : 2004

Data sheet for progress report
June 2004

1. Dissemination activities

	Totals (cumulative)
Number of communications in conferences (published)	4
Number of communications in other media (internet, video, …)	7
Number of publications in refereed journals (published)	6
Number of articles/books (published)	2
Number of other publications	6

2. Training

Number of PhDs	3
Number of MScs	4
Number of visiting scientists	12
Number of exchanges of scientists (stays longer than 3 months)	0

3. Achieved results

Number of patent applications	0
Number of patents granted	0
Number of companies created	0
Number of new prototypes/products developed	0
Number of new tests/methods developed	1
Number of new norms/standards developed	0
Number of new softwares/codes developed	3
Number of production processes	0

4. Industrial aspects

Industrial contacts	yes	No	X
Financial contribution by industry	yes	No	X
Industrial partners : - Large	yes	No	X
- SME[1]	yes	No	X

5. Comments

[1] Less than 500 employees.

Executive Summary

Context

IRMLA project is a research network for Integrated Resource Management and Land use Analysis in E and SE Asia. The four years project (1 Dec. 2001 to 30 Nov. 2005) was established to develop a framework and methods for multi-scale land use analysis and planning, and identify options for sustainable land use (at farm, district and provincial level). IRMLA, in its third project year, is about to enter the main execution phase.

The current progress report covers the period December 2003 to May 2004. Four in-country workshops were held between 15 March and 4 April 2004, with the aim to check on whether the project is on track regarding design of a multi-scale modeling framework for land use analysis. In reviewing progress, special attention was paid to the question on whether stakeholders perceptions on land use issues and resource management problems in four study regions were sufficiently taken into account. Results and conclusions from stakeholder meetings and team working sessions form the core of this report.

Project progress

Project progress is largely in line with the original work plan (= Technical Annex to the project proposal). There are only two notable deviations from the original plan: Requirements for training in modeling components are higher than anticipated. This is partly due to use of new optimization software, increased complexity of component models (e.g. TechnoGIN) and, finally, high ambitions of IRMLA partners to advance methodologies in order to enhance the quality of outputs to be generated. This increased demand for capacity building and on-the-job training related to new tools /techniques, as well as the active dialogue with local stakeholders on case study development has implications on budget allocations/line items. A specific request was sent to the EU-INCO financial manager on budget re-allocation requests.

Originally, there was the intention to use outputs from existing regional MGLP models to identify conflicts in land use objectives and resource use in the case study regions. So far, this was only partly realized. Inclusion of two new study regions, as well as new developments in the study regions and insight from analysis of problems at lower level of aggregation, imply that the description/documentation of conflicts needs closer analysis – definite and comprehensive descriptions will be provided at a later stage.

Among the most important outputs for the entire reporting period are:

- Results from resource evaluation and mapping (GIS) for Tam Duong, Omon and Pujiang
- Technical coefficient generator (TCG) for Ilocos Norte and its documentation
- CD-ROM with materials (presentations, exercises) and prototype models and databases produced for and during the four in-country workshops 2004
- New versions of regional MGLPs and FHMs
- Extended farm survey results for case studies Pujiang, Tam Duong and Omon.
- Journal papers.

Some of these outputs can also be downloaded from the recently updated IRMLA homepage at
www.alterra-research.nl/pls/portal30/docs/folder/irmla/irmla/default.htm

Results from in-country workshops

The workshops consisted of three major parts:
- Stakeholder-scientist meeting (1 day)
- Team working sessions by IRMLA scientists on the various methodology components
- Work planning session on next steps required for development of component models, exchange with stakeholders and research capacity building

Major outputs from the workshops were:
1) Clarification of goals and targets, ranking of agricultural development objectives and characterization of case studies from a local stakeholder and scientists' perspective
2) Detailed account of work carried out by each team
3) Re-design of basic structure of regional MGLP and /or farm household models in response to information gathered and processed during the workshops
4) Increased insight of team members in techniques to be applied and required improvements of databases and component models - and outline of promising specific studies to close knowledge gaps
5) Detailed work plans for each team up to October 2004 and outline of work till April 2005 – including agreements on data exchange and responsibilities for delivery.

Chapters 2 of this report deal with progress made with respect to development of methodologies and tools. Chapter 3 describes the progress in the four IRMLA case studies. Chapter 4 encloses the individual partner reports. Chapter 5 gives an overview of intended publications and further studies. A detailed account of the deliberations and outputs from the four workshops, in particular the results from the planning sessions and the stakeholder meetings, is presented in Chapters 6 and 7.

1 Introduction

1.1 Project progress to date

The project, launched in February 2002 with a combined planning and training workshop at Hanoi, Vietnam, is currently in its third project year. The main focus in this year is on 'Main execution', i.e. application of developed methodologies and tools in the case study areas (Figure 1.1). This progress report is concurrently the fifth report released by the project and gives a detailed account of the progress made between December 2003 and May 2004.

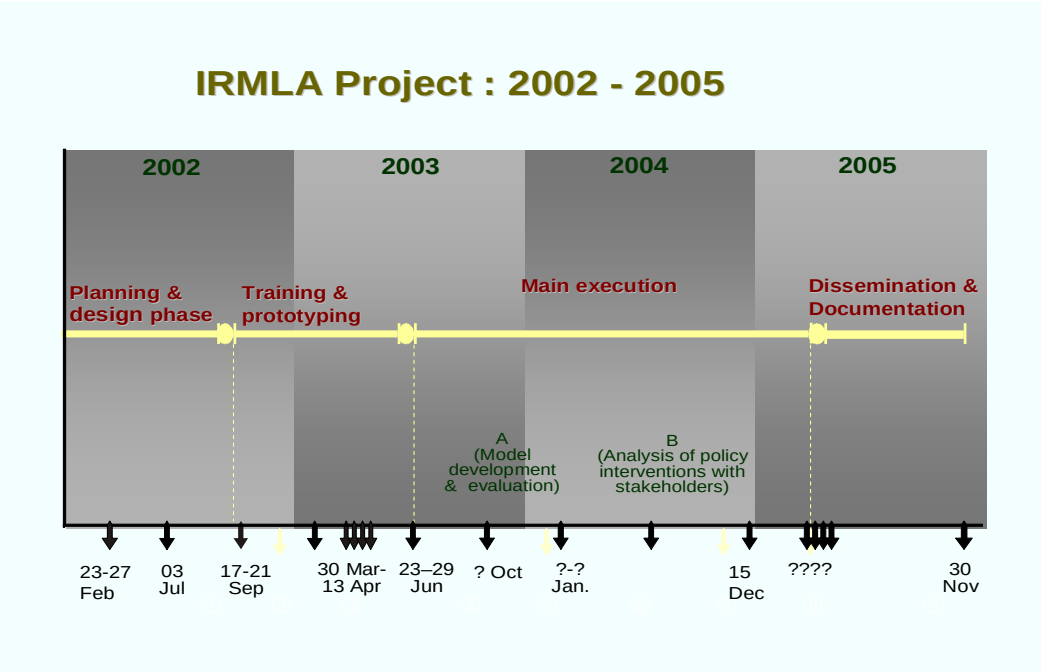

Figure 1.1 IRMLA Project phases

The reporting period was characterized by intensive preparations (documentation of work carried out, and dialogue with stakeholders) for a series of (4) in-country workshops held in the study regions between 15 March and 4 April 2004. The major part and remainder of this report deals with the results generated (from stakeholder meetings and working sessions) during and immediately after these workshops.

Among the most important outputs of the reporting period are:

- Journal paper on technical coefficient generator
- Journal papers on multiple-scale modelling approach and on regional land use scenario analysis in S and SE Asia
- Report for documentation of technical coefficient generator (TCG)

- CD-ROM with materials (presentations, exercises) and prototype models and databases produced for and during the 4 in-country workshops in March/April 2004
- New versions of regional MGLPs and FHMs
- Extended farm survey results for case studies Pujiang, Tam Duong and Omon.

Some of these outputs can be downloaded from the recently updated IRMLA homepage at http://www.alterra-research.nl/pls/portal30/docs/folder/irmla/irmla/default.htm

1.2 Set-up and aims of the four in-country workshops

The four in-country workshops were planned as an interim review and synthesis of work carried out by individual project partners. This included design of the case studies, bilateral dialogue between scientists and stakeholders, and development of databases and prototype component models for multi-scale land use analysis. The workshops were set up to bring together these various elements, check on the appropriateness of project activities and results in the light of stakeholders' information needs and comments, deepen understanding of methodology components, and integrate the information collected thus far by jointly re-designing prototype models in working sessions for the individual case studies. Finally, these workshops were meant for an internal review of the project's progress and strategy and for defining actions required in the project's main execution phase. These activities were translated into workplans. The planning was guided by both ways to contribute to research capacity building and activities to ensure that meaningful project output be delivered in time.

Workshop objectives were as follows:

- To consult with local stakeholders on land use and resource management issues
- To present capabilities and limitations of the IRMLA methodology and discuss exchange of data and results between local stakeholders and scientists
- To foster collaboration between project partners in developing a decision support system for multi-scale land use analysis and planning

A detailed account of the deliberations and outputs from the four workshops is presented in Chapters 6 and 7.

2 Development of generic methodologies and tools

2.1 Introduction

According to the workplan for project year 3, refinement of technical coefficients of crop and livestock production systems and associated expert systems for the various cases, development and realization of farm household models and completion of technical documentations are the major tasks to be accomplished. An account of the status with respect to these activities is presented in the following sections.

2.2 Documentation of Technical coefficient generator TechnoGIN-3

The documentation of TechnoGIN-3 has been finalized. For complete information, see QASA report no. 26 (Ponsioen et al., 2003). The summary and the table of contents of the documentation are given in the following. For more information, see Section 2.3 with parts of the submitted paper about TechnoGIN-3

2.2.1 Summary of TechnoGIN-3 documentation

This QASA report describes the features of TechnoGIN, which is a technical coefficient generator developed for cropping systems in Ilocos Norte province, Philippines, and later extended to other case study areas in East and Southeast Asia. The parameters describing the inputs and outputs of a land use system in quantitative terms are called technical coefficients. These are calculated using well-defined concepts and assumptions based on agro-ecological principles. The technical coefficients that are calculated, include monthly water and labour requirements, nitrogen, phosphorus and potassium fertiliser requirements and losses. For combinations of land use types (crop rotations consisting of wet season rice with dry season rice, tomato, sweet pepper, garlic, onion, corn, eggplant, soybean, mungbean, groundnut, tobacco, melon and an optional third crop or a single crop sugarcane, mango, cassava), land units (defined by combining soil, topography, land use, administrative and climatic maps), target yields, and different production techniques with user defined input use efficiencies, technical coefficients are calculated including monthly evapotranspiration, monthly labour requirements, nitrogen, phosphorus and potassium fertiliser requirements and losses, and economic indicators. Inputs and outputs are calculated on a yearly basis and per hectare. The model uses geographical data (soil and land characteristics, climate), cropping data and socio-economic data from a field survey, crop data from literature and expert knowledge, and transfer functions and assumptions that can be modified in order to constantly improve the model output quality. The technical coefficients are used to analyse the impact of different land use systems and technology on the socio-economic, agronomic and environmental objectives at higher scales (municipality, province). Future policy scenarios with different policies can be evaluated using generated technical coefficients of multiple land use systems and techniques in land use optimisation models.

2.2.2 Table of contents of TechnoGIN-3 documentation

2.3 Journal paper on TechnoGIN-3 in part

(submitted to Agricultural Systems)

Authors: Thomas C. Ponsioen, Huib Hengsdijk, Joost Wolf, Martin K. van Ittersum, Reimund P. Rötter, Tran Thuc Son & Alice G. Laborte

2.3.1 Introduction

East and Southeast Asia is increasingly challenged by various development objectives of rural societies, i.e. increased income, employment, improved natural resource use efficiency, food security, and reduced environmental pollution. Agricultural research therefore needs to be focused on the search of land use options that best match these objectives. This calls, among others, for effective research tools enabling resource use analysis at different integration levels (i.e. farm household, municipality or district, province, and state) to support decision-making with respect to agricultural land use. These tools must have the capabilities to identify potential conflicts among land use objectives and resource use in order to generate technically feasible, environmentally sound, and economically viable land use options that best meet a well-defined set of rural development goals.

Since the 1980s, the method of interactive multiple goal linear programming (IMGLP) has been proposed for an integrated analysis of resource use at regional or farm level (De Wit et al., 1988). This method has been applied in various land use studies (e.g. Van Latesteijn, 1995; Barbier, 1998; Bouman et al., 1999; Lu et al., 2004). Key components in this approach are: (1) databases on biophysical and socio-economic resources and development targets; (2) description of inputs and outputs of promising land use activities; (3) multiple criteria decision method (optimisation); and (4) sets of goal variables representing specific objectives and constraints.

This framework has been further improved and applied within the SysNet project that aimed at the development and evaluation of methodologies for exploring land use options at regional scale in South and Southeast Asia (Hoanh and Roetter, 1998; Roetter et al, 2004). Building upon this experience, a new research network "Systems Research for Integrated Resource Management and Land Use Analysis in East and Southeast Asia (IRMLA)" was set up for several multi-scale case studies in East and Southeast Asia. These studies combine the assessment of land use alternatives with evaluation of stakeholder-negotiated choices at different decision levels (farm, district and province) and supportive policy measures. TechnoGIN, the tool described in this paper, has been developed within this IRMLA project. Within IRMLA four case study areas have been selected, i.e. Batac and Dingras municipalities (Ilocos Norte province, Philippines); Pujiang county (Zhejiang province, China); Tam Duong district (Red River Delta, Vietnam); and O Mon district (Mekong Delta, Vietnam).

TechnoGIN allows the quantification of inputs and outputs of large numbers of current and future-oriented cropping systems in these case study areas. TechnoGIN stands for Technical coefficient generator for Ilocos Norte province, Philippines, as it was

originally developed for this province (Ponsioen et al., 2003). The term Technical Coefficient Generator (TCG) is used for similar tools that were developed for the purpose of explorative land use analysis under multiple goals (De Koning et al., 1995; Hengsdijk et al., 1996, 1998; 1999; Bouman et al., 1998). The term 'technical coefficient (TC)' refers to the inputs and outputs of land use systems in economic and physical terms as quantified by this type of tools.

The purpose of this paper is to present the innovative aspects of TechnoGIN that add to the variety of approaches available. TechnoGIN allows integration of different types of information on crop production and may support the scientific community in integrated analysis of cropping systems. Important concepts that are used in TechnoGIN are defined in section 2. The structure of the tool and its data requirements are presented in section 3. The calculation rules that were applied for nutrient and water balances, labour requirements and cost-benefit analyses, are presented in section 4. To illustrate the type of output generated, an application is presented in section 5 for the case study Tam Duong district. The paper concludes with a discussion and conclusion section on the new features of TechnoGIN compared to other TCGs, possible applications of the tool, and factors that may affect the quality of its output.

2.3.2 Conclusion

New features in TechnoGIN compared to similar tools include the annual rotation of maximally three crops, the distinction between aerobic and anaerobic growing conditions of crops, and the procedure for estimating the crop nutrient uptake. TechnoGIN is illustrated with results from the Tam Duong district in North Vietnam.

TechnoGIN is designed to easily access its data, parameters and assumptions, and to generate and assess rapidly input-output relationships of land use systems in order to add new information and make improvements. Therefore, TechnoGIN is an important tool in the field of land use analysis for the integration of different types of data enabling us to make well-balanced decisions with respect to resource use.

TechnoGIN raises awareness concerning assumptions incorporated and thus also helps us to improve data collection and to set the research agenda with respect to land use processes for which knowledge is incomplete but relevant to show trade-offs between production, economic and environmental impacts of land use systems.

2.4 Farm household model for Omon

The basic features of the farm household model being developed were presented during the stakeholder meeting at CLRRI at Omon on 1 April 2004. A powerpoint presentation by MM van den Berg on the design, major features and data requirements is included on the attached CD-ROM.

2.5 Defining socio-economic constraints for farm housholds in Omon district

2.5.1 Introduction

For analysis at the farm level, the IRMLA team uses a farm-household modeling approach, which can be summarized as follows. Farmers are classified into various relatively homogeneous groups. For each group, a linear program is made, in which utility (or a derived objective) is maximized subject to resource and market constraints.

The farm-household models will be used to answer two sets of questions:

1. What is the suitability of various current and future-oriented farming systems for the specific setting of the farmers in the case study areas? and
2. What is the impact of feasible changes in policy on technology choice and farmer objectives?

2.5.2 Farm-household modelling in IRMLA

The first step in the development of farm household models for IRMLA was the development of a prototype model. The model maximizes either total income (returns to family land, labor and management) or discretionary income (total income above basic consumption requirements). The constraints involve: ownership of different types of land, family labor, seasonal credit for working capital, investment capital, monthly availability of off-farm and on-farm employment, and minimum consumption of rice.

The model is structured such that in each run results are generated for several different types of households. For adaptation of the prototype model to a specific case study, the following is required:

1. definition of inputs and outputs of current and future-oriented agricultural technologies;
2. classification of farm households in relatively homogeneous groups;
3. definition of resources per farm-household group;
4. definition of socio-economic constraints per household group;
5. inclusion of risk in the model (price variability, yield variability, farmer risk preferences)

The prototype model has been applied to illustrate the dual-scale land use modelling approach being pursued in IRMLA. Different farm types in Dingras, Ilocos Norte served as an example (a paper on the results has been accepted for presentation at the iEMSs 2004 conference – to be held from 14-17 June at Osnabrueck, Germany; see, also Section 5.2).

The prototype FHM is being adapted for O Mon through inclusion of site-specific biophysical and socioeconomic parameters. However, many of these parameters are indicative and require further investigation. A MSc study will contribute to refine the definition of the socioeconomic parameters in the model.

2.5.3 Definition of the socioeconomic model parameters

Important socioeconomic parameters that require further investigation are:

1. risk preferences;
2. risk management strategies;
3. specification of the most important types of risk (e.g. prices);
4. constraints on off-farm and non-farm employment;
5. constraints on sales of output and possible relation between quantity and price;
6. availability of short-term credit and working capital (use of off/non-farm income, savings from previous cropping season & livestock income).

Risk preferences are currently assessed on the basis of survey of 300 households executed in 2003. However, these survey data are not suitable to determine the remaining parameters. Yield and price variability can be deducted from time series data and combining previous surveys. The other data require specific fieldwork, which will be the task of a MSc student during period July and December 2004. The workplan is presented below:

Title of study: Defining socio-economic constraints for farm households in Omon, Vietnam

MSc student: Neeltje Suijkerbuijk
Master International Development Studies
Specialisation Development Economics
Wageningen University
Time: July until December 2004, in total the traineeship will endure six months.
Place: Omon, Vietnam

WUR Supervisors: Marrit van den Berg, Reimund Rötter (Alterra)

Local supervisor: Nguyen The Cuong

Goals of the traineeship:

To collect more information and data on several socio-economic parameters to obtain information on the local circumstances concerning the subjects further defined in this paper. These parameters will be included in the farm household model to make it complete. Herewith, a better view can be formed about local constraints for the farmers.

Field work (O Mon) is meant to collect data on:

-Output markets

- farmer access to output markets;
- constraint on sales of output and possible relations between quantity and price

-Finance

- access to credit and own funds for inputs and investment, working capital, use of off/non-farm income, savings from previous cropping season & livestock income (from the demand/ farmers side);

- availability of credit (supply side: (in) formal banks)

-Risk
- farmers risk behaviour and perception;
- farmers risk preferences and management strategies;
- the most important types of risk (e.g., yields, prices);

- Labour
- constraints regarding off-farm and non-farm employment
- hiring labour

Concerning these data, it is important to find out if the farmers are actually constrained in certain factors or that it is a choice of them to be involved or not in certain activities.

The period of the traineeship in Vietnam will be from September until December 2004, in total 12 weeks.

Methodology

While undertaking the field surveys, farmers will be interviewed about the above stated subjects. Further, key informants from institutions, for example credit institutions etc. will be interviewed. The most important way to get suitable information about the local circumstance of the farmers is to carry out field work: surveying local farmers. Herein, (semi-)structured interviews will be best regarding local circumstances and the great variability of answers possible to be given by the local farmers. Difficulties can arise when trying to structure and analyse these data; important herein is to be consistent in surveying. Structured surveys can be more useful in translating data in Excel. Herefor, when possible, surveys are best to be formatted in a structured way.

Target population:

The population to be surveyed is a selection of farm households present in the region of O Mon. The local households that will be surveyed, including comparable households in the region will benefit in the sense that the data collected will contribute to a better understanding of the local situation for different kinds of households.
The extended research carried out by IRMLA will finally contribute to a better understanding of what the suitability is of various current and future-oriented farming systems for the specific setting of the farmers in the case study areas and further it aims to get more understanding on what the impact is of feasible changes in policy on technology choice and farmer objectives.

Relevant literature (for a start):

De Janvry, A., M. Fafchamps and E. Sadoulet. (1991). "Peasant Household Behaviour with Missing Markets: Some Paradoxes Explained." *Economic Journal* 101, 1400-1417.

Dercon, S. (2002). "Income Risk, Coping Strategies, and Safety Nets." *World Bank Research Observer* 17 (2), 141-166.

Hoff, K. and J.E. Stiglitz (1993). "Imperfect Information and Rural Credit Markets: Puzzles and Policy Perspectives". In: Hoff, K., A. Braverman and J.E. Stiglitz (eds.), *The Economics of Rural Organisation. Theory, Practice, and Policy*. Oxford: Oxford University Press, pp 33-42.

Singh, I., L. Squire and J. Strauss. (1986). *Agricultural Household Models: Extensions, Applications, and Policy*. Baltimore: Johns Hopkins University Press.

Van de Walle, D. (2000). "Are Returns to Investment Lower for the Poor? Human and Physical Capital Interactions in Rural Vietnam". Washington, D.C. and Toulouse: World Bank and University of Toulouse.

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Plan for research

July and August:

Analysing existing data needed to describe production activities (inputs, outputs, returns) and refinement of farm classification. This will serve as basis for the field work directed at understanding of which output markets are most relevant, and which activities require a lot of capital /investments. Based on the refined farm classification it will be determined which farmers will be included in the survey (sampling across the relevant classes). Relevant literature will be read and there will be started with forming different kinds of interviews to be used in Vietnam.

September until December: fieldwork in O Mon, Vietnam (12 weeks)

In this period, most of the time will be spend on the actual field visits: surveying the local farmers to find out how they are trying to optimise their income and ascertain their consumption. Of importance herein will be to observe which farmers are actually incorporating new technologies in their household strategies, when they are doing this and why some are also not using new technology. Herein, rice diversification also is an important concept to find out more about.

Concrete planning of the weeks:

Week 1: Getting to know the research area, sharing knowledge and information with researchers at IRMLA. Adjusting survey probably necessary.
Week 2- 10: Carrying out field visits and interviews. Continuously reporting collected information and discussing it with local and WU supervisors.
Week 4: Visiting relevant institutions for example formal banks, informal lenders, credit organisation in general
Week 11-12: Rounding up of information gathering.

December

Report writing at Alterra, Wageningen.

2.6 Integration of animal production in MGLP for Pujiang

Author: Huib Hengsdijk

2.6.1 Introduction

For the IRMLA project simple calculation rules (in an Excel spreadsheet) have been developed for quantifying biophysical inputs and outputs of the following animal production activities:
1. dairy cows
2. fattening cattle
3. sows with piglets
4. slaughter pigs
5. broilers
6. laying hens
7. ducks
8. rabbits

The biophysical inputs relate to feed, i.e. quantity and quality in terms of N-content, and the outputs relate to milk, weight gain (or # of animals), eggs and the amount of available excreted N.

Applying this approach, the technical coefficients (i.e. inputs versus outputs) for animal production systems in Pujiang have been established.

2.6.2 Sources

The Calculation rules and parameters are formulated based on two sources:

- Ketelaars, J.J.M.H. and H.G. Van der Meer, 2000. Establishment of criteria for the assessment of the Nitrogen content of animal manures. Final report to ERM. Plant Research International Report 14 (not published)
- Jongbloed, A. A number of spreadsheets with calculations (not published).

Both sources have developed and applied simple calculation rules to estimate N excretion (Ketelaars and Van der Meer) and nutrient excretion (Jongbloed) for a wide range of animals under conditions prevailing in the EU. The approach of Jongbloed is more detailed, i.e. it includes more types of animals, mortality rates, different animal growth stages, and does not focus primarily on nitrogen as do Ketelaars & Van der Meer. The more simple approach of Ketelaars & van der Meer has been used because results are not much different from Jongbloed but can be realised with less information (less parameters). For calculation of inputs and outputs of dairy cows and fattening cattle, the approach of Ketelaars and Van der Meer has been modified using the energy intake level approach (Bakker et al., 1996). First the energy requirements for maintenance, weight gain and milk production are calculated and, subsequently the dry matter requirements with a well-defined quality (see Section 2.6.4).

2.6.3 Calculation rules

The calculation rules are available in one Excel file with different sheets. Each sheet represents one animal type (except for cattle) which is indicated in the sheet tabs. The sheets consist of a parameter part and calculation part. The parameter values are light blue and can be changed by the user (Fig. 2.6.1). Each parameter value contains a comment with a reference to the range of values found in both sources (see before) for a particular parameter. Be aware that both sources concern animal activities in the EU, parameter values in SE-Asia may differ as the first data from Illocos Norte show (see sheet broilers and slaughter pigs)! Spreadsheet cells containing the simple calculation rules are coloured light yellow.

Most calculations are based on a feed conversion factor (kg feed/kg live weight gain) for a given feed quality (N-content). For a well-defined output (number of piglets, number of eggs, etc.) the amount of required feed (with a given N-content) can be calculated. Based on the total feed intake and N-content of the feed, the nitrogen feed intake is calculated. Subtracting the nitrogen retained in the animal products from the total nitrogen intake results in the amount of available nitrogen in the animal excretion taking into account an unavoidable loss fraction. Latter depends on the animal housing system and animal excretion handling and, thus, is subject to a fairly wide range of uncertainty.

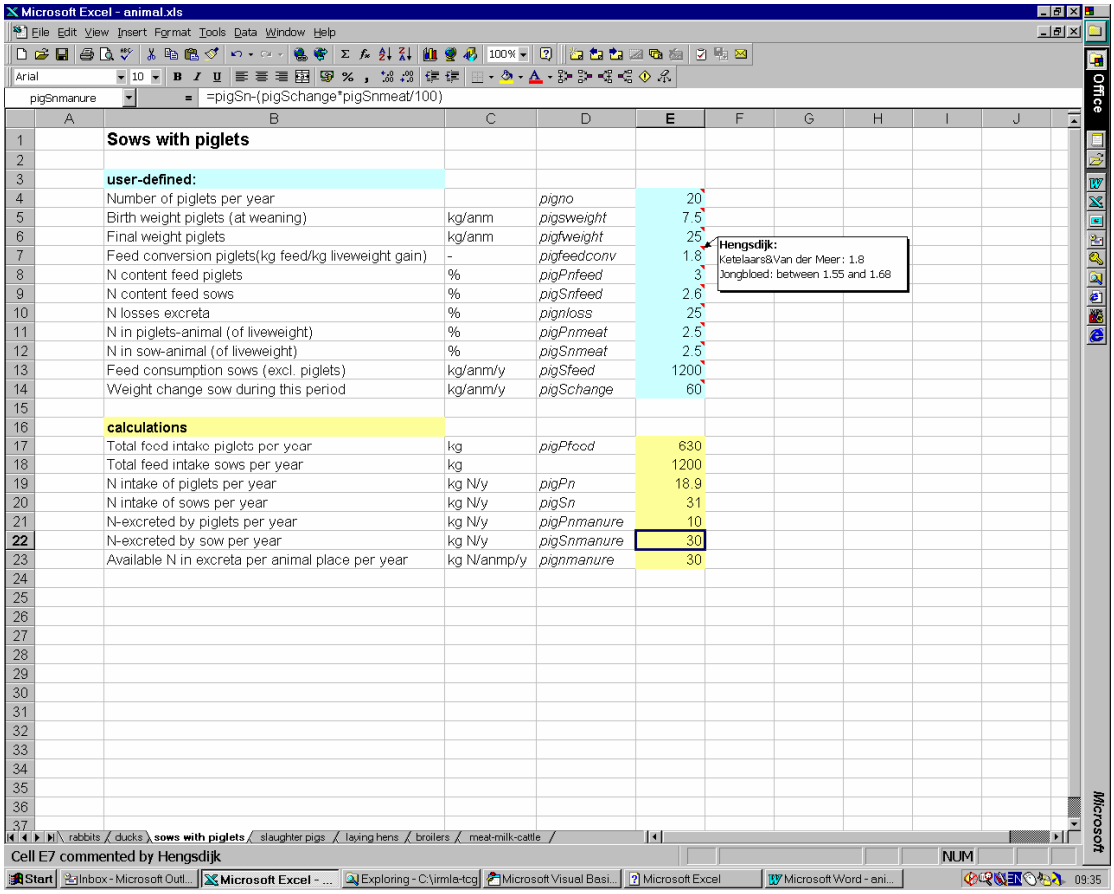


Fig. 2.6.1 Illustration of the sheet for calculation of inputs and outputs of sows with piglets.

2.6.4 Cattle (activities 1 and 2)

For dairy cows and fattening cattle a slightly different (and more detailed) approach has been applied. Other animals have life cycles of less than one year (laying hens a bit longer than 1 year). It is assumed that the production of such fast-growing animals is more or less standardised and uniform as they are mainly raised with feed supplements. Especially for grazing cattle, diet composition is much less under control of the farmer than for other livestock categories. As cattle productivity is highly correlated with feed quality the approach of both Ketelaars & van der Meer and Jongbloed seems less appropriate. Available fodder in SE-Asia is assumed to have much lower N-contents than those assumed in the models of Ketelaars & van der Meer and Jongbloed and, thus input-output relationships will be very different.

Therefore, a modified form of the approach described in Bakker et al (1996) for West-Africa has been applied. In this approach the biophysical input-output relationships are calculated based on an explicit relationship between animal productivity and quantity and quality of feed intake. Energy requirements are calculated for maintenance, and milk and weight gain which allow the calculation of the extra energy feed intake above maintenance requirements (i.e. total digestible organic matter (DOM) intake divided by DOM requirement for maintenance). These energy feed intake levels correspond with

well-defined feed qualities in terms of DOM content (Fig. 2.6.2). In a separate module feed rations are calculated taking into account the required feed intake level (Hengsdijk et al., 1996; Hengsdijk & Van Ittersum, 2002; Van de Ven et al., 2003). These rations indicate the fraction of each feed of a well-defined quality required to realise the set feed energy intake level. Each ration can contain up to three (fraction of) feeds with a different quality (DOM content). In the LP models these rations must be linked with the animal activities (see Section 2.6.5).

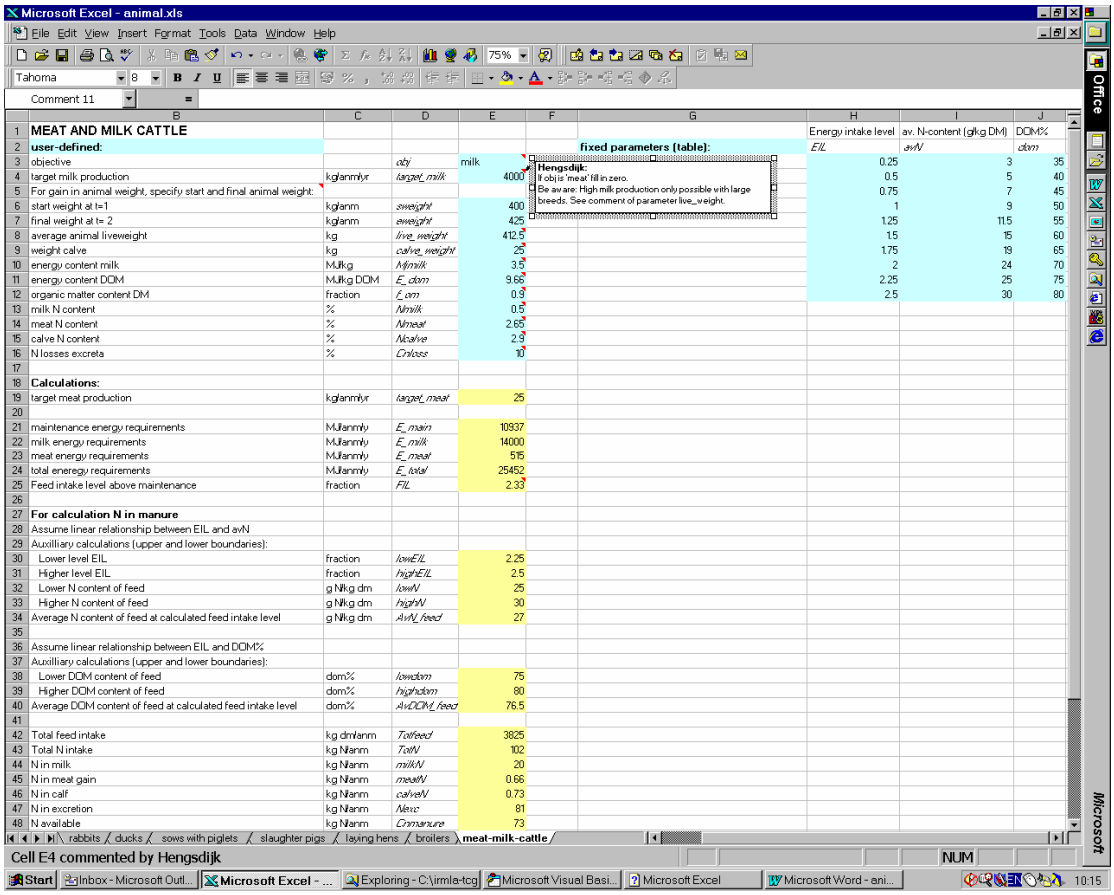


Fig. 2.6.2 Illustration of the sheet with calculation rules for inputs and outputs for fattening and dairy cattle.

This approach is more flexible than the one of Ketelaars & van der Meer, i.e. different target productivity levels and animal breeds (with different adult live weight) can be selected and it allows taking into account different qualities of feed available in the case study areas. The total feed intake and excreted nitrogen calculated on the basis of this approach was not much different from the approach used by Ketelaars & van der Meer using their data for dairy cows.

2.6.5 Using animal activities in LP-models

In addition to the biophysical inputs and outputs of animal activities also other inputs such as veterinary costs, labour requirements, housing and other costs should be defined. These can be based on the surveys that will be carried out by the IRMLA teams.

We should consider the following points while using animal activities in the LP-models:

- Output of laying hens (eggs, 60 g/egg) can be linked as input to broilers.
- Output of sows with piglets can be linked as an input to slaughter pigs. Final weight of piglets and start weight of slaughter pigs should be the same while generating inputs and outputs of both animal categories.
- Feed rations for dairy and fattening cattle should be met with feed containing at least 60% roughage (grass, crop residues) →LP-constraint in the feed choice of cattle.
- How do we consider grass production? As separate activity in technogin? If so, data available?
- How do we deal with excreted N in manure? Losses can be accounted for in the animal calculation rules. Now it is assumed that these losses relate to the housing system and handing of manure (mainly volatilization), but some animal categories graze perhaps outdoors at least for a part of their life. If so, what are the consequences for the nutrient balances?
- Only nitrogen is accounted for in the excretion of animals as most emphasis in cropping activities up till now has been on this nutrient. This simplification is valid? Fertiliser costs for P and K are also accounted for in cropping activities.
- The relationship between weight gain (as calculated for most animals) and marketable animal (meat) production? The same for each animal?
- Table with feed stuffs and their N-content (or feed quality class as defined in the spreadsheet) in the LP-model. Assume constant crop residue N concentrations.
- The feed conversion ratio and its relationship with feed N-content used for modelling inputs and outputs are crucial. Jongbloed estimated that such ratio's for China would be 10-20% less favourable due to genetic differences and feed quality (however, little info on N-content feed).

2.6.6 References for Animal production systems

Bakker, E.J., H. Hengsdijk & J.J.M.H. Ketelaars, 1996, Description des systèmes de production animale en zone soudano-sahélienne du Mali, Rapports PSS No. 27, 36 pp.
Hengsdijk, H. & M.K. van Ittersum, 2002. A goal-oriented approach to identify and engineer land use systems. Agricultural Systems 71: 231-247.

Hengsdijk, H., W. Quak, E.J. Bakker, J.J.M.H. Ketelaars, 1996, A Technical Coefficients Generator for land use activities in the Koutiala region of south Mali, AB-DLO-WAU DLV-report no. 5, 96 pp.

Ven, G.W.J. van de, N. de Ridder, H. van Keulen, M.K. van Ittersum, 2003. Concepts in production ecology for analysis and design of animal and plant-animal production systems. Agricultural Systems 76: 507-525.

3 Development of case studies

3.1 Introduction

IRMLA projects has three major objectives and pillars, which I briefly call:
1) development of methodologies and tools for resource and land use systems analysis in East and South-east Asia
2) Capacity building of national teams in Asia in tailoring and applying these tools to specific studies
3) Application of the methodology /tools to four case studies with focus on topics considered most relevant by local stakeholder platforms

The overriding theme that connects the four IRMLA case studies is:
Agricultural systems in transition: Influence of changes in access to resources/resource availability and production technologies on farming systems, food security and poverty reduction in the given region

The following sections are devoted to giving a flavour of the current status of problem definition based on several stakeholder consultations and the relevant bio-physical and socio-economic information gathered for the various cases.

First, a brief introduction to the major resource management issues and specific foci of methodology development and application is given. This is followed by a characterization of the bio-physical and socio-economic environment – as outlined below.

Ad A. Introduction to the problem
- What are the major bottle-necks to agricultural development from farmers perspective, policy makers perspective, and scientists' perspective

Ad B. Characterization of (bio)physical environment
- Topography/geomorphology and geology (altitude, physio-geographic units, parent material)
- Climate (rainfall, temperature, radiation and seasonality, adverse weather phenomena) and data sources
- Soils and Hydrology (major soil types, groups, drainage/irrigation, supply of ground and surface water, soil fertility problems)
- Land area and land use (total area , % land, % water % agricultural land; suitable arable land; % forest, % built-up area; main agricultural products, cropping systems, indicative cropiing calendar)

Ad C. Characterization of socio-economics and policy issues related to agriculture and environment

- Economic dynamics and expected development in the regions (past changes – last 10-15 years in farming systems, farm size, production orientation etc. changes in farm income, farm labor and off-farm labor costs etc.) development of prices for agricultrual inputs and outputs , population dynamics rural/urban - what farm survey methods were applied; what data sources where used ?
- Changes in agricultural and environmental policies during last 10-15 years; expected near-future policy measures and expected policy changes over next 10 years
- Development of infrastructure in the past and future plans (roads, bridges, etc. and also markets, agro-processing plants etc.)
- Development of availability of agricultural inputs; capital /credit facilities
- What has been the outcome of stakeholder consultations so far concerning identification of major land use objectives and constraints to agricultural development (include also: possible different perceptions by farmers, policy makers, scientists and other groups) ?

3.2 Pujiang case study

3.2.1 Introduction

Fertile soils and abundant water resources make Zhejiang province, and the remainder of China's greater Yangtse River Delta, one of the world's most productive rice growing regions. With low per-capita land availability, farmers have traditionally generated some of Asia's highest rice yields through intensive use of labor. Throughout the People's Republic period, continuous population growth and a concern for rice self-sufficiency stimulated technological development, which increased yields even further. The modern technologies involve dwarf-varieties and hybrids that are highly responsive to fertilizers and have a climate-adjusted, genetic yield potential of 10-12 t ha^{-1} in Zhejiang Province (Huang and Rozelle, 1996; Widawsky *et al.*, 1998). Zhejiang farmers have adopted these varieties at a large scale and have increased their use of chemical fertilizers at about 5 % per year during the 1980s and early 1990s (Widawsky *et al.*, 1998).

Despite these large technological developments, farmer yields have stagnated at 5.5-6 t ha^{-1} since 1985, and total rice production has decreased dramatically over the past decade. Industrialization and urbanization have caused a decline in rice area of about 2% per year, and about 500,000 ha of rice harvest area have been lost since 1980 (Wang, *et al.*, 2001). Moreover, Zhejiang was the first province where farmers are completely free in their choice of crops. Rice prices have been low and many farmers have replaced double rice for single rice production or for alternative crops such as fruits and vegetables. These crops now account for about half of all fertilizers applied in the province (estimate based on data from Zhejiang Statistic Bureau, 2001).

Based on a farm survey in Pujiang county, Zhejiang province and data from literature, nitrogen use and losses were calculated for the three main cropping systems: double rice, single rice and horticulture. Average fertilizer use was especially high for horticulture: 743 kg N ha^{-1}, compared to 298 kg N ha^{-1} for double rice and 150 kg N ha^{-1} for single rice. Previous research indicates that these high values are not unrealistic. These data correspond well with other data on average fertilization rate of field grown vegetables: 781 kg N ha-1 in Beijing suburbs and 1894 kg N ha-1 in Fanzuhuang, Yutian (Zhang and Liu, 2002, according to Härdter & Fairhurst, 2003; Zhang et al., 1996).

For horticultural crops nitrogen leaching constitutes 60-70% of all losses and for rice crops only 10-15%. Considering these leaching fractions and the average fertiliser application data as based on the farm survey, it was calculated that 60-75% of all nitrogen leached in Pujiang county from the three mentioned cropping systems originated from horticultural cropping. This implies that horticultural crops are a major source of nitrogen pollution of ground and surface water in Pujiang county.

It is not yet clear whether the current pattern of crop production in Pujiang county results in a nitrate content of groundwater exceeding the maximal limit for drinking water of 50 mg l^{-1}, as no water quality data are available. However, research in northern China indicates that the nitrate content in groundwater exceeds the upper limit when

more than 500 kg N ha-1 is applied and less than 40% of applied N is taken up by the crop (Zhang, et al., 1996).

The local government recognizes the damage that intensive fertilization can do to the environment and has declared the intention to reduce fertilizer use. At the same time, fertilizer application levels are likely to increase in the near future due to an ongoing shift in the cropping pattern from rice to horticultural crops. Although the government has not announced specific measures, the proclamation stresses the role of research and technology.

Summarizing, various analyses show that fertilizer application rates are high in Pujiang county and uptake rates are relatively low in single rice, double rice and annual horticulture, the three main cropping systems of the lowland area of Pujiang. This results in high losses of nitrogen to the environment. Despite the still limited area under horticultural crops, this cropping system is shown to contribute most to water pollution, a major concern of the local government. If measures are not taken, water pollution will increase in the near future due to a further shift from rice to vegetable production.

A final point is the development of a plan for special agro-product development in Pujiang county. Under the guidance of Zhejiang Province and Pujiang County, the suitability of the various land areas in Pujiang county with their natural characteristics for the cultivation of a number of important agro-products was established. Suitability maps for these agro-products were produced and presented through GIS. This proposal for special agro-product development in Pujiang passed the evaluation and was accepted by the county government on 29 May 2004. The implementation of the plan will be executed in the coming years. For more information, see Section 4.3.6.

3.2.2 Characterization of (bio)physical environment

Pujiang county covers an area of about 100,000 ha. The annual rainfall varies from 1,250 – 1,500 mm. Although no distinct dry or wet seasons can be distinguished, there is more rain in spring and summer (February – July) and less rain in autumn and winter (July – January). The mean annual temperature is 16 ^{o}C and the mean number of sunshine hours amounts to 2000 per annum.
In Pujiang county three distinct agro-ecological zones can be distinguished:

- Lowland zone < 50 m
- Medium zone 50 – 100 m
- Hilly zone > 100 m

Soils of the lowland zone are developed on alluvial deposits and are moderately to poorly drained and relatively fertile. The main crop is paddy rice. Yields vary from 6 – 9 t ha^{-1}. In total about 14,000 ha paddy is cultivated in Pujiang county. In the lowland zone other important activities are grape cultivation, duck farming and fish and pearl production.

In the medium zone of Pujiang county the main activities are fruit and tea cultivation (10,000 ha). The fertility of these upland soils is rather low and phosphorus is the major limiting nutrient.

The hilly zone (> 100 m) is covered by forest and bamboo plantations (50,000 ha). Bamboo is used for production of furniture and shoots are (partly) processed for consumption. The red soils in the hills offer excellent growing conditions for trees as compared with the lowland areas.

The Department of Agriculture in Pujiang distinguishes 7 major agricultural activities, in order of importance: tea, livestock, fruit, vegetables, fishery, ornamentals and bamboo.

For various reasons an estimated 26,000 ha of land of Pujiang county is not cultivated.

The price of rice is rather low: 1 – 2 Yuan $kg^{-1.}$ Hence, farmers are eager to grow more profitable crops, which is nowadays allowed under the new policy of the Government of China. However, there is a lack of knowledge which alternative crops are suitable and profitable under the Pujiang conditions. Additionally, most farmers are only part of their time involved in farming. In general the area is characterised by a labour surplus.

In Zhejiang province, as is the case all over China, land belongs to the Government and farmers only use the soil (usufruct rights). If land is not used for agricultural purposes it is returned to the local authorities and it may be rented by others. This procedure makes it possible that, in spite of the numerous small holdings that exist, some big plantations can be found. In the lowland zone each household cultivates an average 4.5 – 9 mu (0.5 – 1.2 ha).

In the case study, the definition and identification of land use types is based on three criteria, i.e. crop rotation, yield levels and production technologies. The land use definition for Pujiang county has taken into account the current agricultural practices, present land use problems and regional development objectives. Table 3.2.1 gives the land use types (i.e. crop rotations) that are representative and currently practiced in Pujiang. In total, 13 types of crop rotations were selected for Pujiang, for producing food grains and vegetables and for generating income. Most of the crop rotations are practiced under irrigated conditions. Rainfed cropping is limited to the hilly and mountainous areas, comprising mainly non-rice crops. Based on current practices and biophysical conditions of Pujiang, three production technologies were distinguished (Table 3.2.1). These technologies differ with respect to the degree of mechanization. Tree crop, livestock and fishery productions are promoted by the local government, to increase income of rural population. Table 3.2.2 presents the major types of tree crop, livestock and fishery production systems that are currently practiced or are to be introduced in the near future (e.g. cows) in Pujiang county.

Table 3.2.1 Selected crop rotations and production technologies for Pujiang county

Code	Crop/rotation types	Irrigated	Rainfed	Tech1[1)]	Tech2	Tech3
OR	Oil seed – single rice	y [2)]	n [3)]	y	y	y
RR	Early rice – late rice	y	n	y	y	y
sR	Single rice	y	y	y	y	y
VR	Vegetables – single rice	y	n	y	y	y
MR	Watermelon – late rice	y	n	y	y	y
WMR	Wheat – watermelon – late rice [4)]	y	n	n	y	y
BP	Soybean – sweet potato	n	y	n	y	y
cVR	Chinese vetch – single rice	y	n	y	y	y
oV	Outskirt Vegetables	y	n	n	n	y
BCV	Soybean/sweet corn – vegetables [5)]	y	y	n	n	y
mV	Mountain vegetables (Radish, eggplant, kidney beans	y	y	n	n	y
SS	Sorghum – sorghum	n	y	n	n	y
PC	Potato – sweet corn	n	y	n	n	y

[1)] Tech1: land preparation (plowing) and harvesting by machinery without use of draught animals; Tech2: all farming operations by hand except for land preparation (by machinery); and Tech3: manually without use of machinery and land preparation by draught animals

[2)] y = suitable/considered

[3)] n = not suitable/not considered

[4)] Wheat is just for producing residues used for the following watermelon

[5)] Soybean and sweet corn are intercropped.

Table 3.2.2 Tree crop, livestock and fishery production systems for Pujiang county

Fruit trees	Livestock	Fishery
Grape, Orange, Tea, Sweet pear, Chinese plum, Ornamental trees, Bamboo, Jujube, Chinese nut, Citron, Gingkgo	Pigs, Goats, Chicken, Duck, cow, Rabbit	Fish, Shrimp, Turtle, Pearl

Suitable land units

For the case study, six land units were identified with their degree of suitability for different land use types (Table 3.2.3), based on four criteria, i.e. land accessibility, irrigation water availability, surface relief (slope and elevation), and soil properties. For all suitable land units, it was assumed that the distance to villages should be less than 1 km. Lands under forests were excluded, because of their high conversion costs for growing food or tree crops, the potential risk of soil degradation by such land use conversion, and the resulting conflict with the current national policy.

Table 3.2.3 Land units in Pujiang county and their suitability for the identified land use types

Code	Land unit	Brief description	Suitability
APC	Alluvial plains, clay paddy soils	Elevation < 150 m, flat lands, deep and clay soils; irrigation systems available	Suitable for all land use types except for tea
APL	Alluvial plains, loamy paddy soils	Elevation < 150 m, flat lands, deep and loam soils; irrigation available; high groundwater table	Suitable for all land use types except for tea
AFL	Alluvial flats, loamy paddy soils	Elevation generally below 300 m in river valleys; deep and loam soils, irrigation systems available	Suitable for all land use types except for tea
HPC	Hillocks & piedmont, clay red soils	Altitude < 150 m, flat to gently sloping (slope < 6 degree); no irrigation systems available	Suitable for all rainfed cropping systems and all tree crops
GSL	Gentle slope lands, sandy red soils	Altitude generally between 150 and 600 m; sand loamy soils, flat to gently sloping (slope generally < 6 degree)	Suitable for rainfed cropping systems and all tree crops
SSL	Steep slope lands, sandy red soils	Hillside slopes, slope gradient generally between 15 and 25 degree and altitude between 150 and 600 m	Only suitable for tree crops, not suitable for annual crops and grapes due to erosion risks
USL	Unsuitable lands	Lands under forests, shallow soils, steep land (slope > 25 degree), lands with an altitude of above 600 m or the distance to residence areas exceeding 1 km Also, water surfaces, built-up areas and roads	Not suitable for all the identified land use types

3.2.3 Characterization of socio-economics and policy issues related to agriculture and environment

Zhejiang Province has a surface of 101,800 km^2 and 44.7 million inhabitants. In only 6 Provinces of P.R. China, the Gross National Product per person was in 1999 higher than USD 1,000. With 1,446 USD in Zhejiang, this Province ranked at the first place. The income in the urban areas Beijing and Shanghai amounted to about USD 2,080 and 3,300, respectively. Zhejiang province has a thriving private economy which produces over 70 % of the total industrial output. In recent years Zhejiang province witnessed a boom of investments from Taiwan and Japan due to its favourable location at the coast.

In Pujiang county in this province the number of inhabitants was 379,012 in year 2000, of which 46,420 lived in urban centres.

Zhejiang Province is the first Province so far where growers are free to grow their own choice of crops. This has resulted in a reduction of the area under rice cultivation of more than 16% and an increase of horticultural production, especially ornamental crops. Last year the income from horticulture reached 1,2 billion Yuan, one fifth of the national total. The major products of Zhejiang are woody ornamental plants. In 2000 Zhejiang growers produced 134 million seedlings with an estimated total value of 100 million USD. About 35 % of all seedling plants in China originate from Zhejiang province.

Agricultural growth in Zhejiang province has been impressive but had a negative impact on environmental quality. In these intensively cultivated eastern areas, leaching of fertilizers from agricultural fields has resulted in eutrophication of surface water and has made groundwater unsuitable for drinking. Moreover, rice production contributes significantly to the emission of greenhouse gasses to the atmosphere. Agricultural researchers have recognized the downsides of past developments and are designing more sustainable technologies. Policymakers consider these new technologies an important solution to pollution problems. However, it is open to debate how large the role of crop research and extension can be and to which extent additional policies like direct regulation, taxing agrochemicals, or developing markets for organic products are required.

In the discussions during the stakeholder meetings at Zhejiang University in March 2004, a number of main points with respect to future agricultural development were:

- Farmers have generally little or no (financial) security and hence, they (particularly the farmers in the mountain areas) put rather strong emphasis on food security at household level. Additional land (above that needed for subsistence) can be used for 'cash crop' production, in an attempt to increase income.
- It was difficult to 'extract' a future vision of the agricultural sector from the stakeholders, probably because they are too much concerned with current problems than to really be interested in 'future visions'.
- Likely future is: farmers encourage their sons to go to university, and if that is impossible to go into business, but NOT become farmers.
- Land (use rights, guaranteed via long-term lease from the government for a period of about 30 years) is very important to the household as a form of social security. Many of the young people working elsewhere (in urban areas) do return to the village to build a house, and they may come back if they loose their job to take up farming again.
- The idea of farm expansion appears still rather far-fetched to many participants.
- The Agricultural Bureau of Pujiang county is interested in market analyses comprising analyses of the whole chain for various products.
- The Agricultural Bureau is interested in ways to increase revenues and maximize farmers' benefits.
- The Agricultural Bureau is concerned about sustainability based on the policy statement of Zhejiang Provincial Government of 2003, stressing the need to reduce the use of 'chemicals', both in the form of fertilizer and biocides.

- The Agricultural Bureau is interested in farming technologies with more efficient use of water, nutrients, labour, etc.
- The Agricultural Bureau needs advice on how targeted areas/numbers for certain commodities (crops/animals) can actually be attained. Herman van Keulen notes that this indicates the need for agricultural policies (e.g. guaranteed prices and production subsidies).
- Special agro-products.

For more detailed information on these discussions, see Section 6.2.

3.3 Tam Duong case study

3.3.1 Introduction to the problem

List of objectives/problems as identified by multi-stakeholder platform were as follows:

- decrease crop production but increase livestock production
- 6 main commodities (rice, maize, mulberries, vegetable, fruit tree, flower)
- to produce 400,000 t grain food per year (i.e. mean yield level of 5.3 t/ha for rice and 4.1 t/ha for maize)
- 3000 ha of mulberries in total (increase from current: 2000 ha)
- 500 ha flower and bonsai
- 60-100 ha with environment-friendly produced (organic) vegetables
- 1000 ha tree cultivation (forestry)
- 1500- 2000 ha for fish and shrimp with 20,000 t total annual production
- 10,000 cows and 10,000 pigs in 2020
- 2313 billion VND income value per year from agriculture and fishery after 2005
- change from 64% of relative income from crop production to 48 - 50% after 2005

The main objectives for future changes in agricultural production are given in Table 3.3.1.

Table 3.3.1 Objectives for structural changes in agricultural production

	Year 2001	Year 2005
Crop production (%)	64	48
Livestock (%)	25.6	35-38
Fishery (%)	2.9	7-8
Forestry (%)	7-8	15
Cash (US/ha)	280	350-400?

3.3.2 Characterization of the bio-physical environment

Tam Duong District is one of the six districts of Vinh Phuc province (Fig. 3.3.1). The provincial capital, Vinh Yen, is located at 50 km from Hanoi and can be reached by road or by railway.

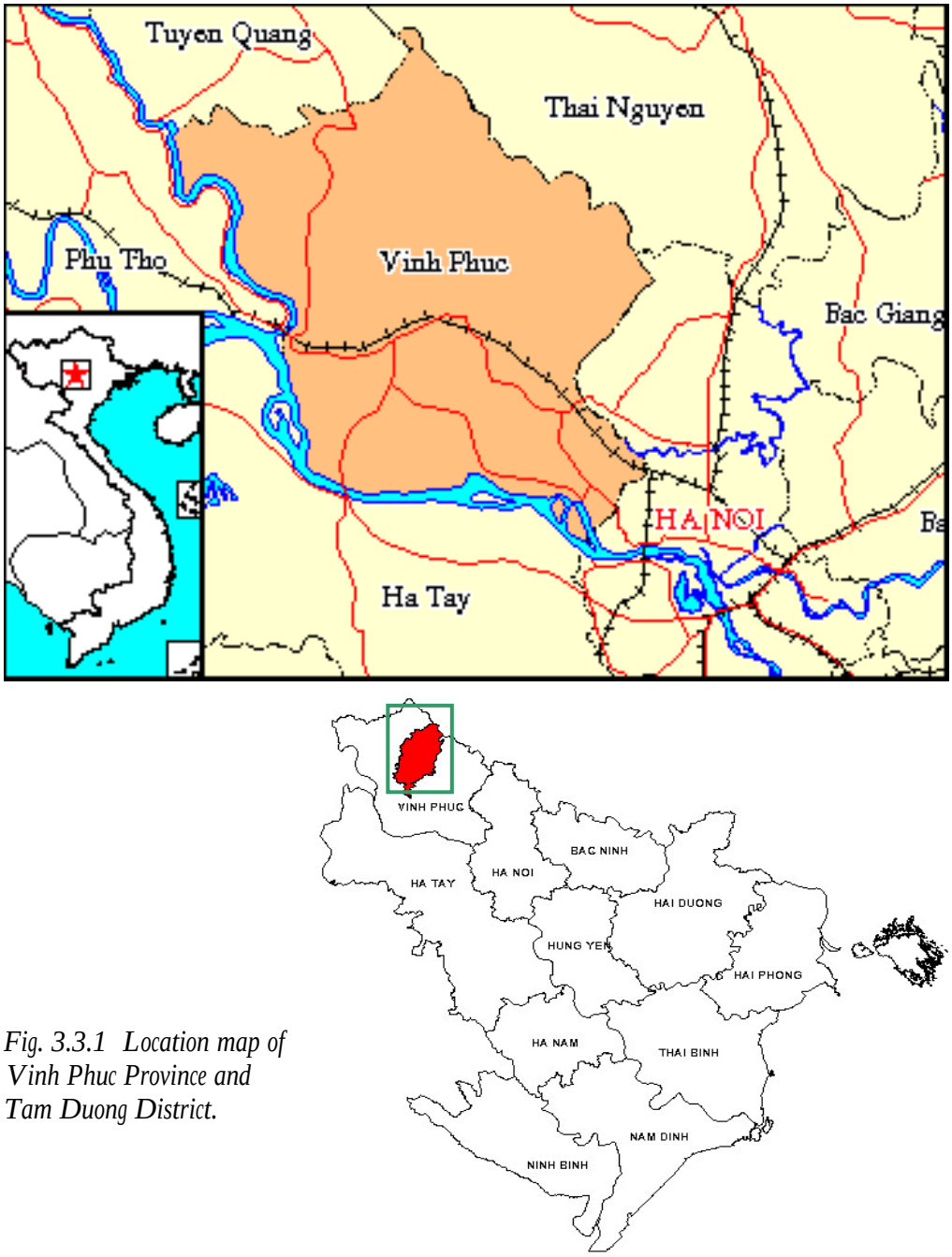


Fig. 3.3.1 Location map of Vinh Phuc Province and Tam Duong District.

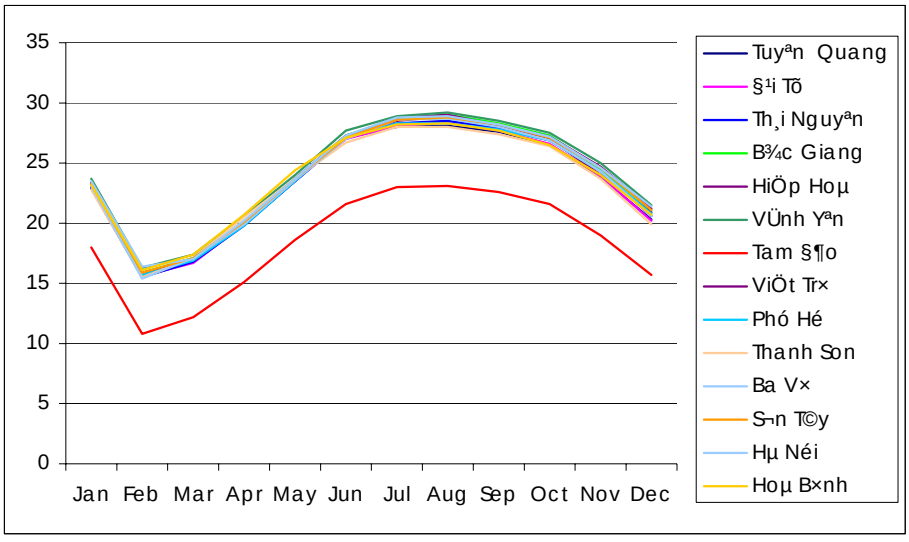
Tam Duong is located in the Red river delta which is one of the main rice producing areas of Vietnam. Tam Duong extends from 21^0 18' to 21^0 27'N, and 105^0 36' to 105^0 38'E. The district is located in the transitional zone between almost flat lowlands and mountainous regions. The southern part (3 communes) is flat and characterized by paddy rice and vegetable cropping systems, whereas the middle part (7 communes) consists of alternating flat land and hilly land at altitudes between 20 and 100 m above sea level (asl). More than half of the district area (7 communes in the Northern part) is mountaineous along the Tamdao range from northwest to southeast, at altitudes ranging from 100 to 1400 m asl. This part is characterized by steep slopes, and variable soils, rainfall, temperatures and cropping systems (Son and Chien, 2003).

The average monthly rainfall and temperature are presented in Fig. 3.3.2. These data are the average of recordings at 14 climatic stations.

Seven soil types can be distinguished:
- *Acrisols* in most hilly and mountainous areas, with ferralic and acid characteristics;
- *Cambisols* in the valleys, foothills and mountains;
- *Gleysols* in the valleys with water logging or poorly drained conditions;
- *Fluvisols* in the southern lowland part, annually affected by the Red River flooding regime;
- *Plinthosols* on the hill slopes and the transitional zone between mountains and valleys, where soils are strongly eroded, water table depths are fluctuating strongly between the wet and dry seasons, being conducive to lateritic processes, and soils have high contents of Fe_2O_3, Al_2O_3 and Mg_2O_3;
- *Arenosols* and *Leptosols* are scattered throughout the district, occupying relatively small areas.

Most soils in the area are acid to strongly acid, having derived from acid rock parent material and been subjected to strong erosion processes.

Some of the bio-physical characteristics of the district are summarized below (NISF, 2003):
-total land area: 19780 ha
-agricultural land 8035 ha of which 5687 ha paddy field
-forest land: 6744 ha
-hot and humid period in summer and cool dry period in winter.
-temperature (average): Annual = 24 °C; 12-17 in February and 23-28 in August
-rainfall, annual amount 1357 mm; ca. 20 mm in January and 280-520 mm in August



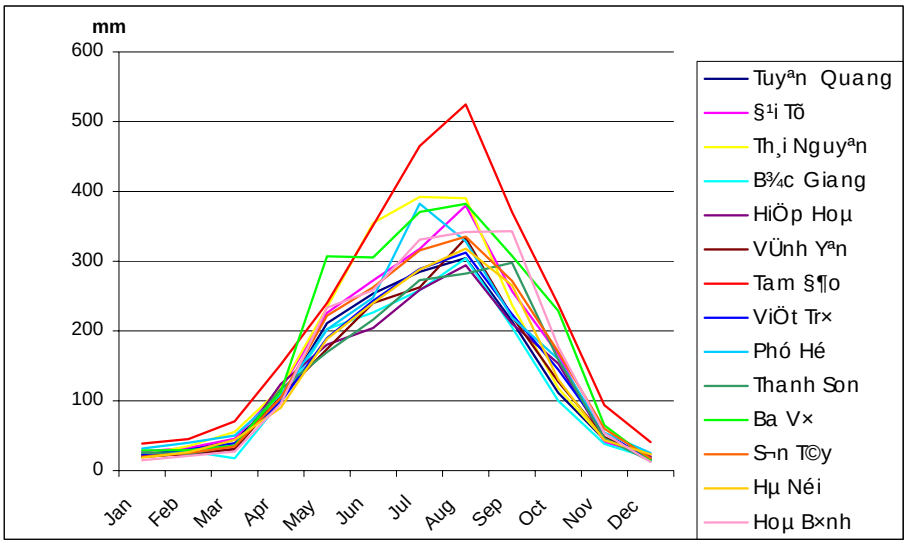


Fig. 3.3.2 Average monthly temperature (°C, top) and rainfall (mm, bottom) in Tam Duong district (NISF, 2003)

Soils in the study are mainly of sandy loam texture (Figure 3.3.3), with loamy soils scattered throughout the lower altitude terrain along the foothills and in the valley. Light clay soils cover very small areas in very low–lying land with water logging and can not always be used for triple cropping. For 12 farms in the study area Son and Chien (2002) showed that soils in the rice field have silt loam and loam textures with 11 % clay, 65% silt and 24% sand (Standard Deviation SD=5.4). Degraded soils were predominantly of sandy loam texture with percentage of sand is 67.5% (Xo et al., 1996).

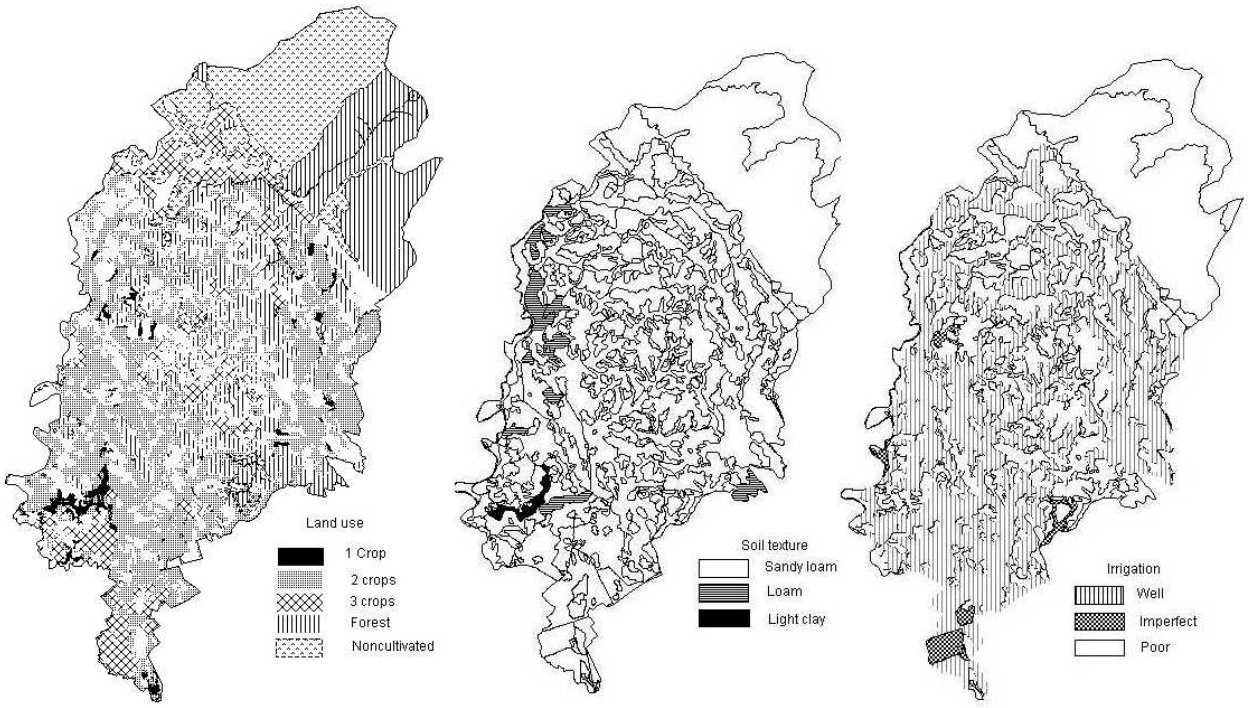


Figure 3.3.3 Land use, Soil texture and Irrigation maps to be combined for model analysis of rice base cropping system in Tamduong district (Van Trinh et al., in prep.)

The main types of land use and irrigation facilities in Tamduong are also shown in Figure 3.3.3. Agriculture is the main economic activity in the district. Annual crops are predominant. Rice, maize, soybean, peanut and vegetables are the main crops (Table 3.3.2 and Figure 3.3.4).

Table 3.3.2: Tam Duong : Current situation and plans for future land use

Index	2001	2010	2020
Natural land	19,800	19,800	19,800
I. Agricultural land	8,036	8,124	8,024
a. Annual crop cultivation land	6,138	5,781	5,941
1. Rice + Rice and upland crop		5,419	5,374
- 3 crop land		1,467	1,467
- 2 crop land		3,898	3,848
- seedbed land		54	54
2. Perennial plant cultivation land		561	
- Multiple plant garden	1,056	180	175

- Perennial tree cultivation land	636	2,334	2,174
II. Forest land	6,844	7,454	7,445
III. Land for special purpose	2,512	2,782	2,882
IV. Resident land	861	927	1,047
V. Unused land	1,628	401	401

Among the many crops grown in the area, rice is cultivated on the largest area (5,374 ha in 2002), planted in both the spring and summer seasons (Figure 3.3.4), followed by maize (2,005 ha), cultivated in the winter season, soybean (503 ha), summer soybean planted outside the river levees after spring rice and before autumn rice (30 ha), winter soybean after summer rice (473 ha) (Agricultural Department of the District). Cropping calendars of the main crop rotations in Tamduong district (including the main rotation spring rice – summer rice - winter crops) are shown in Figure 3.3.4.

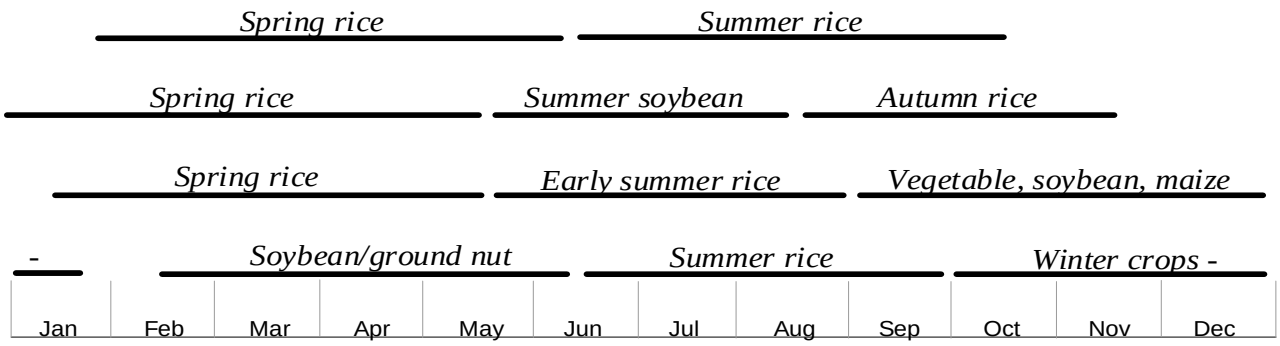


Figure 3.3.4: Cropping calendars of the main crop rotations in the lowland area of Tamduong district (Van Trinh et al., in prep.)

3.3.3 Characterization of socio-economics and policy issues related to agriculture and environment

The main problems and regional objectives for Tam Duong district are given in Table 3.3.3.

Table 3.3.3 Problems and regional objectives

Overall strategy	Direct objectives	Comments
- Develop sustainable agricultural system - Industrialization/modernization	- Increase income (farmers' and regional) - Increase production and quality of products	- Economical growth - Food self-sufficiency - Environmentally sound practices

- Diversification/specialization within the region	- Improve quality of natural resources - Reduce poverty	- Environmental protection - Poverty eradication
Province Increase income	Increase in fishery and animal husbandry	Step by step decrease in cropping area

The main remarks about land use analysis were:

1. Minimum use of agricultural lands for other purposes → put in a value for actual non-use of land areas;
2. Agricultura production toward Industralization & Modernization (specialization and large plantations?);
3. Establish three economic zones: a) mountainous (tree plantation, forest protection, industrial tree, fruits, food crop, big live stocks); b) middle areas (industrial crops, rice for food, fruit, live stockes), and c) deltas areas (rice for food, rice - maize, soybean-vegetables, pig, fishery,) with their specialities of crops and lives stocks;
4. 6 main crops: rice, maize, soybean, peanut, fruit trees, vegetables;
5. Transfers of 20-25 % of low yield rice lands into non-rice crops of high cash values;
6. Rice areas only (8000-8300 ha) with target yields: 6.0-6.5 ton/ha (2005); 7.5-8.0 tones/ha (2010) → total rice production: 80.000 tons;
7. 500 m^2 of land area per capita; 3600 m^2 per farm house; cash input VN$ 2.000000-3.000.000 for rice-maize;
8. big farming (2ha-8 ha) → 30 total (up lands);
9. Credit: 20 mil./farm house holds.

During the stakeholder meetings at NISF in Hanoi in March 2004, a number of main discussion points with respect to future agricultural development were mentioned:

- direction of (natural) resource use
- how to build up good marketing systems
- technical solutions for bringing harvest to the market (transportation)
- in the next five years 1000 ha of rice land will be converted to non-rice (soybean, maize)
- animal activities will be expanded
- how to market the products

3.4 Dingras/Batac case study

3.4.1 Introduction

According to current local government views, agriculture will maintain its central role in the economic development of Ilocos Norte province. However, agriculture will increasingly compete for land with for instance industrialization, recreation parks and tourism areas. Competition for scarce natural resources, particularly land and water, is evident in the most recent provincial development plan, which includes conversion of some agricultural areas into other uses. Such conversion will not spare the strategic agriculture and fisheries development zones (SAFDZ) identified in earlier plans, such as Dingras municipality. The provincial plan sets boundary conditions on future availability on agricultural land resources. Recent dialogues between scientists and Ilocano stakeholders on agricultural land use issues revealed that assessment of trade-offs between rice production, diversification of production and farmers' income was a major issue for the Ilocos Norte province as well as for Dingras municipality. Environmental issues, such as nitrate pollution and excessive pesticide residues needed to be addressed as well (Roetter and Wolf, 2003).

3.4.2 Characterization of (bio)physical environment

Ilocos Norte Province, in northwestern Luzon, Philippines, has a population of nearly 0.5 million people and a total land resource of 0.34 million ha, of which 46% is covered by forests. Mean annual rainfall ranges between 1650 mm in the southwest to more than 2,400 mm in the eastern mountain ranges. On average, 6-7 typhoons per year cross the province (mostly between August and November). About 38% of the total area is classified as agricultural land. Rice-based production systems prevail. Rice is grown in the wet season (June-October), whereas diversified cropping (tobacco, garlic, onion, maize, sweet pepper and tomato) is practiced in the dry season, using irrigation (mainly) from groundwater. A well-developed marketing system facilitates this relative intensive production system of rice and cash crops (Lucas et al., 1999). The two studied municipalities in Ilocos Norte Province, Dingras and Batac have respectively a population of 33,300 and 47,700 persons and a total land resource of 17,400 and 16,100 ha, of which 55% is agricultural land.

The main land use types included in the case study comprise (i) single cropping of root crops, sugarcane, and rice followed by fallow; (ii) double cropping: two rice crops, rice in rotation with (yellow or white) corn, garlic, mungbean, peanuts, tomato, tobacco, cotton, potato, onion, sweet pepper, eggplant, and vegetables; (iii) triple cropping: three rice crops, and rice in rotation with garlic and mungbean, with (white or yellow) corn and mungbean, and with water melon and mungbean.

In the case study, land was classified based on land use type (see above), land unit (water regime), drainage condition's (as perceived by the respondents) and tenure.

The six land units include:

a. Surface irrigated throughout, well-drained
b. Surface irrigated throughout, poorly-drained
c. Surface irrigated wet season (WS), well-drained
d. Surface irrigated WS, poorly-drained
e. Rainfed, well-drained
f. Rainfed, poorly-drained

Landholding per household is either owned or share cropped, and the major sharing arrangement is 65:35 (tenant:landlord).

3.4.3 Characterization of socio-economics and policy issues related to agriculture and environment

The main land use issues in Batac and Dingras are given in Table 3.4.1 (as presented by the Municipal Agricultural Officer). This table gives also information on the development goals for both municipalities.

Table 3.4.1 Land use issues and development goals in Batac and Dingras, Ilocos Norte.

Site	Land Use Issues	Development Goals
Batac	Crop diversification both in the dry and wet seasons	Agro-industrialization through crop and market zonification and putting up of agri-based industries and scouting of market outlets of farm produce
	High use of agricultural chemicals and groundwater in the dry season	Reduce risk due to drought by establishment of SWIPs, dams and SFR
	Water pollution by nitrates and pesticide residue	Adoption of environmentally-friendly technologies such as balanced fertilization and IPM
	Agricultural land conversion to urban use	Increase farmers income
	Establishment of and integration of fish culture in SWIP, dams and SFR	
Dingras	Crop diversification in the dry season and farm mechanization	Agro-industrialization
	Agricultural land conversion to urban use	Sustain status as an exporter of rice
	Agricultural land conversion to fish ponds due to promotion of fish culture	Increase farm income
		Reduce production inputs through IPM, labor saving technologies and use of BT corn

Model analysis of the effectiveness of different policy instruments (public investment to improve access to credit, off-farm employment and price instruments) in contributing to regional development goals was performed for representative farm types in Dingras municipality. The policy instruments resulted in variable trade-offs between income, rice production and ecological sustainability of agricultural production depending on farm type. This analysis shows that increased availability of off-farm employment and capital are likely to hamper adoption of sustainable technologies, while increased prices of agrochemicals appear quite effective in stimulating adoption of these technologies at only limited cost of household income.

During the stakeholder meetings at MMSU in March 2004, a number of main discussion points with respect to future agricultural development were mentioned:

- priority productions are: rice, corn, high value commercial crops (e.g. garlic, mango), livestock, fishery;
- support of agriculture through subsidies (e.g. on hybrid rice seed), loans, farmer field schools-IPM, trainings, breeding program, construction of minidams, rehabilitation of irrigation systems, etc.;
- there is a problem in marketing products; need to strengthen cooperatives to improve marketing strategies;
- encouragement of farmers to venture to other (vegetable) crops by assisting in marketing of produce and by supplying loan at low interest.

For more detailed information on these discussions, see Section 6.4

3.5 O Mon case study

3.5.1 Introduction to the problem

One of the major constraints to agricultural development in Omon, Cantho province is lack of sound information on the potential and opportunities for diversification of agricultural production, and the unknown environmental consequences of further intensification (cropping intensity and use of agro-chemicals) of rice-based productions systems.

The first focus of the Omon case study is, to develop the methodology and tools required for a (at least) dual-scale analysis of land use options and apply these, embedded in a participatory process, at regional and farm level to

a) explore opportunities for reaching multiple land use objectives through analyzing and discussing alternative options of technical and policy change at the regional level;
b) examine the effectiveness of a set of policy interventions for different farm types in the region in view of satisfying the multiple objectives expressed by stakeholders.

For the Omon case, a second focus for in-depth studies has evolved in the course of the project. The aim of the in-depth studies is to disentangle (by quantifying as much as possible) the effects of changes in agro-technology and policies on (rice-based) farming systems. For this we need to understand impacts of such changes in the past and present and then identify (with the help of the region-specific tools we're developing) future options for sustainable agricultural development. Based on a better understanding of how and to what extent technology and policy (or broadly speaking, institutional change) have influenced rice-based farming, the analytical tools (regional MGLP, FHM, TCG; for details, see a.o. IRMLA poster) developed by the project will be applied to explore feasible future land use options.

Thus, we look at the past, the present and then we concentrate on the future.
For the present we rely on own farm surveys (300 farms in Omon, surveyed in 2003; and some more specific ones in 2004 in support of FHM development/understanding of technology adaption behaviour of different farmer groups); for the future we apply modeling tools /expert systems.

For the past, we have to pay particular attention to the developments after the initiation of the economic reforms in 1986/87. Doi Moi or the new economic reforms have been mainly triggered by wide-spread food shortages of the early 80s (Watts, 1998), partly a result of previous collectivization which had deprived farmers of incentives to produce more food (as income no longer depended on quality and productivity of their work). Vietnam was a rice importer from 1965 to 1981 (Dawe, 2004). In response to food shortage, Directive 100 in 1981, sanctioning the output contract system allowing households to contract production directly, was the first formal government initiative in favour of the household economy (Luttrell, 2001). Major changes (triggered by

subsequent reforms) only became visible after 1988 following the effective dismantling of agricultural cooperatives.

Referring back to the overarching IRMLA topic, we would thus like to know specifically (and formulate and test two related hypotheses for the Mekong Delta - and Omon in particular) what counted more in the past, policy /institutional change or technology changes:
Hypotheses:

1. Dismantling of agricultural production cooperatives has had a major influence on changing farming systems (higher yields, shift to other activities than rice - such as aquaculture and fruit tree cultivation);
2. Technology changes in agricultural production (such as new varieties, increased use of agrochemicals; higher resource use efficiency through improved production techniques) has had a major influence on changing farming systems.

As for the future, we look at the agricultural development objectives /policy views with a time horizon of 5-15 years ahead. For this, we have distilled a number of land use objectives/development targets and constraints from various bilateral stakeholder consultations and two formal meetings (in spring of 2003 and 2004) with multi-stakeholder platforms. For details see IRMLA project report 3 and Section 6.5 of this report.

3.5.2 Characterization of the bio-physical environment

Omon district (105° 32' E, 10° 08' N) in Can Tho province is in the heart of the Mekong Delta, and is part of Vietnam's rice bowl. The district is about 54.000 ha of which 80% is used as agricultural land. Improvement of food security is one of the major objectives that stimulated the intensification of rice production in Omon. Conditions for rice growing are favourable. Omon is located along the Mekong river which provides throughout the year sufficient irrigation water, and temperatures vary between 25 and 33 ^{0}C. In the past 3 decades, there has been a rapid transition from single to double, and then to triple rice systems. In 2000, about 26% of the agricultural area in Omon consisted of triple rice systems and 53% of double rice systems.

3.5.3 Characterization of the socio-economics and policy issues related to agriculture and environment

Due to low rice prices and decreasing farm size, farmers increasingly tend to diversify out of rice and into soybean, maize, watermelon and vegetables to increase income. Currently, 47% of the farm income is from rice cropping, 29% from non rice crops and livestock and 24% from non and off-farm employment activities (Roetter et al., 2003). In contrast, on average 90% of the farm area is under rice.

Current land use Omon:
(status: data available by Oct. 2002)

Total land area	54 541 ha
Agricultural land	47 364 ha (87% of total land area)
Forest	125 ha (0.2 %)
Specific uses	3 416 ha (6.3 %)
Residential area	1 470 ha (2.7%)
Not used	2 289 ha (4.2%)

Annual crops cover 40 356 ha, of which 39 812 ha is used for rice-based systems; other crops (such as sugarcane) cover 534 ha.

Perennials: 6941 ha of which more than 6000 ha with fruit trees, such as mango, pomelo, orange, sapodilla, industrial plants, mandarin (decreasing), orange, sapidilla, pomelo (increasing)

Main difficulties/problems are:
- Knowledge of farmers > change structure of planting
- There is not yet a land use plan up to 2010 for Omon

Major characteristics of the rice cropping systems in Omon are described by Pham Sy Tan et al. (2004).

***Major development goals*:**
- Industrialization
- Change in production style: domestic and export
- Increase interactions between different sectors

People's Committee approved the stated development goals in March 2003
One of major aims: to increase diversity in land use.

Detailed plan for up to 2005 for agriculture:
- Share of crop production in agricultural activities to be reduced
- Develop high quality rice production
- Agricultural production: increase 4-5% per year
- Fishery: increase 18-20% per year

Agricultural development goals for up to 2005 of Omon district

a. High quality rice programme (mainly for export)

2003:	10 000 ha
2004:	20 000 ha
	315000 tons/year
	rice export: 160 000 tons/yr, 35M USD

2005: 31 320 ha

b. Hybrid corn, mungbean, soybean: *4200 ha*

2003: 5000 ha (hybrid corn, mungbean, soybean: 2200)
2004: 5700 ha (hybrid corn, mungbean, soybean 3400)
2005: 7500 ha upland crops (hybrid corn, mungbean, soybean 4200 ha)

c. Healthy citrus, orchards

Improved from unbeneficial orchards in the past, size wont be improved
2003: 2100 ha (good quality)
2004: 2800 ha
2005: 7000 ha (beneficial orchards)
Citrus: 2500
Mango: 1000
Longan, rambutan etc.\: 1500
Others: 2000

d. Cows (Milk and Meat)

(2002: ~ 500 local cows)
2003: 590 heads
2004: 921
2005: 1355 in all (302 milk cows only)

e. Fishery

(2002: 2500 ha)
2003: 2964 ha (shrimps: 200, catfish: 150, tillapia: 5, fish pond: 609, rice fish: 2000, floating cage for raising fish: 40)
2004: 4009 ha (shrimps: 600, catfish: 250, tillapia: 50, pond: 609, rice fish: 2500, floating cage for raising fish: 40). Thoi Thanh village: intensive shrimp production area
2005: 5509 ha (shrimps: 1200, catfish: 500, tillapia: 200, pond: 609, rice fish: 3000, floating cage for raising fish: 40)

f. Changes in economic structure, irrigation system, transportation, housing

All the above mentioned factors will affect the rice based production

- Transportation: newly built roads, more intensive up to hamlet level
- Irrigation system: maintain enough water for irrigation
  2 irrigation projects:
  Thot Not-Omon 28 000 ha
  Omon-Xano 36 000 ha
- Housing: 1250 houses safe from annual flood
  Total: 11 locations (3.5 ha each)

List of objectives (selected and ranked from a list of possible objectives)

- *(1) The province/district should produce enough food for its people (Mekong Delta should produce rice for Vietnam – includes Omon) --- fertilizer price subsidies, low export tax, encourage rice storage)*
- The region should produce healthy food
- Each individual should have enough to eat, either through own production or through market purchase with cash income
- *(2) Income per capita should increase through higher income per hectare*
- *(5) The poor should become richer*
- Drinking water should be clean
- *(4) Agricultural production should not be harmful (drinking water, farmer health, soil productivity, healthy food)*
- *(3) There should be employment for everyone*
- Production methods should not harm the health of the farmer

4 Individual partner reports

4.1 Introduction

The partner institutes present in the following a short overview of their activities within the IRMLA project, their progress, publications and other project output. The reports are given in the following order for: Alterra, Netherlands, Zhejiang university, P.R. China, NISF, Vietnam, MMSU, Philippines, CLRRI, Vietnam, IMK-FZK, Germany, PPS-WU, Netherlands, and PRI, Netherlands.

4.2 Report from Alterra, The Netherlands

4.2.1 Progress over the last half year

Progress from December 2003 to May 2004 is in line with the plan.

4.2.2 Progress of project

Major activities within the project comprised: 1) Analysis of regional resources and conflicts in land use objectives; 2) Documentation and application of technical coefficient generator; 3) Farm household modelling; 4) Co-ordination and training.

Analysis of regional resources and conflicts in land use objectives:
Progress was made in making regional (agricultural) development objectives and intended policy measures more explicit. This was achieved through bilateral stakeholder consultations and multi-stakeholder meetings during the four in-country workshops in March/April 2004.

Documentation and application of technical coefficient generator:
Data on case-study specific land use systems and production environments have been used to make the TCG operational for each of the four case study regions, in co-operation with Alterra, PRI and PPS of Wageningen university.

Technical documentation of Techno-GIN 3 has been published as QASA report no. 26 (December 2003), PPS, Alterra & PRI.

Farm household modelling:
Alterra contributed to the development and first applications of a farm household model for Omon district (S-Vietnam) and Batac-Dingras municipalities (Philippines).

Co-ordination and training:
- Participation in two in-country project workshops held in Asia in April 2004.
- Internal and external communication organized and provided by producing progress reports, newsletters, training materials and workshop documentations (e.g. CD ROMs and reports) and by maintaining and expanding project website.
- Training and support organized and provided to local teams on the basis of individual needs and requests.
- Monthly meetings of Wageningen research groups on scientific, capacity building and other project issues held and documented.

4.2.3 What progress has the project made in achieving its objectives over the last half year? Is the project still expected to achieve all the original objectives that were specified? Explain any problems/difficulties encountered to date in achieving the objectives of the project (or any envisaged in the future).

Alterra has co-ordinated and facilitated the interdisciplinary work and exchange of information among partners on the various methodological and case study research questions. As a result, work on development and application of TCG (Techno-GIN 3) has been completed (WP3). Likewise, work on developing and applying farm and regional level models is on schedule.

4.2.4 Any other information you wish to comment upon during this period of six months?

No.

4.2.5 If the project timetable has slipped or changed, provide an updated project implementation timetable for the remainder of the project.

No change in timetable.

List of papers published:

During the last half year, one paper was published as a proceedings paper (1), two papers were accepted and published in international journals (2-3), and two papers were submitted to international journals (4-5). Furthermore, one paper was accepted as a conference contribution (6).

1. Marrit van den Berg, Wang Guanghuo, and Reimund Rötter (2003) Decreasing the use of agrochemicals in rural China: setting priorities for research and policy in Zhejiang province. Proceedings of the international seminar on Economic Transition and Sustainable Agricultural Development in East Asia, Nanjing, P.R. of China, 20-22 October 2003.

2. Roetter, R.P., C.T. Hoanh, A.G. Laborte, H. Van Keulen, M.K. Van Ittersum, C. Dreiser, C.A. Van Diepen, N. De Ridder and H.H. van Laar, 2004. Integration of systems network (SysNet) tools for regional land use scenario analysis in Asia. Environmental Modelling and Software, in press.

3. Van Ittersum, M.K., R.P. Roetter, H. van Keulen, N. de Ridder, C.T. Hoanh, A.G. Laborte, P.K. Aggarwal, A.B. Ismail, A. Tawang, 2004. A systems network (SysNet)

approach for interactively evaluating strategic land use options at sub-national scale in South and South-east Asia. Land Use Policy 21, 101-113.

4. De Ridder, N., Van Keulen, H., Roetter, R., Van Ittersum, M.K., Hoanh, C.T., Aggarwal, P.K., Ismail, A.B., Lansigan, F.P., Francisco, S.R., Lai, N.X., Laborte, A.G., 2004. A generic methodology for strategic land use analysis applied to four sub-national regions in South and Southeast Asia. Submitted to Agriculture, Ecosystems and Environment.

5. Ponsioen, T.C., Hengsdijk, H. Wolf, J., Ittersum, M.K. van, Roetter, R.P., Son, T.T., Laborte, A.G., 2004. TechnoGIN, a tool for exploring and evaluating resource use efficiency of cropping systems in East and Southeast Asia. Submitted to Agric. Systems.

6. Roetter, R.P., Berg, M.van den, Hengsdijk, H., Wolf, J., Ittersum, M. van, Keulen, H. van, Agustin, E.O., Son, T.T., Lai, N.X., Wang, G., Laborte, A.G., 2004. A multiple-scale modelling approach to integrated resource management in East and Southeast Asia: challenges and potential solutions. Paper to be presented at IEMS conference MODSS 2004 to be held at Osnabrueck, Germany, 17-21 June 2004.

List number of PhDs and number of MScs:

Finalized: 1 M.Sc. by Ms Anne Gerdien Prins – supervision by partner PPS: Dr. M.K. van Ittersum and Dr. M.M. van den Berg.

Ongoing: 2 Ph.D.s with R.P. Roetter, Alterra as co-promotor by

a) Ms. Alice Laborte A multi-scale land use analysis tool for Ilocos Norte Province, Philippines;
b) Mr. Mai Van Trinh Integrated nutrient dynamics with special emphasis on erosion and leaching in Vietnam.

List of conference / seminar / workshop presentations:

Paper 1: Marrit van den Berg, Wang Guanghuo, and Reimund Roetter (2003) Decreasing the use of agrochemicals in rural China: setting priorities for research and policy in Zhejiang province. Presented by Marrit van den Berg at international seminar on Economic Transition and Sustainable Agricultural Development in East Asia, Nanjing, P.R. of China, 20-22 October 2003.

Paper 2: Reimund Roetter et al. (2004) A multiple-scale modelling approach to integrated resource management in East and Southeast Asia: challenges and potential solutions. Presented by Reimund Roetter at IEMS conference MODSS 2004, Osnabrueck, Germany, 17-21 June 2004.

Two times two presentations on IRMLA held by R.P. Roetter at in-country workshops and stakeholder meetings at Hanoi (April 2004) and Omon (April 2004)

Various presentations on project set-up and planning held by R.P. Roetter at IRMLA Wageningen UR workshop on integration of data and models, 29 September – 4 October 2003.

4.3 Report from Zhejiang University, P.R. China

4.3.1 Major activities and progress over the last half year from December 2003 to May 2004

Progress from December 2003 to May 2004 is in line with the plan.

4.3.2 Progress of project

Major activities within the project comprised: 1) generation of input-output tables; 2) MGLP modelling for Pujiang; 3) In-country workshop held at ZU and Pujiang in March 2004; 4) Plan for special agro-product development in Pujiang.

Generation of input-output tables:
The social-economic information of farmers and the input-output data of main cropping systems obtained from the farm survey in 2002 were re-examined and verified with the Agriculture Bureau of Pujiang. The general input-output tables were produced and formed the ***TechnoGIN-Pujiang-TP-3techn*** data base to generate the technical coefficients for the main cropping systems currently practiced in Pujiang.

MGLP modelling for Pujiang:
MGLP model for Pujiang was tested using the technical coefficients obtained from running TechnoGIN model (see previous paragraph). Livestock husbandry input-output information was also included.

In-country workshop held at ZU and Pujiang in March 2004:
In-country workshop was held from 16 March to 20 March at ZU and Pujiang. More stakeholders' opinions were received on MGLP modelling and new scenario analyses on land use in Pujiang were carried out. Detailed reporting was done by by Prof. Herman van Keulen (see Sections 6.2 and 7.2).

Plan for special agro-product development in Pujiang:
Under the guidance of Zhejiang Province and Pujiang County, the suitability of the various land areas in Pujiang county for the cultivation of a number of important agro-products was establised. Suitability maps for these agro-products were produced and presented through GIS. This proposal for special agro-product development in Pujiang passed the evaluation and was accepted by the county government on 29 May. The implementation of the plan will be executed in the coming years. For more information, see section 4.3.6 with Annex and see also Prof. Van Keulen's report (section 6.2 and 7.2).

4.3.3 What progress has the project made in achieving its objectives over the last half year? Is the project still expected to achieve all the original objectives that were specified? Explain any problems/difficulties encountered to date in achieving the objectives of the project (or any envisaged in the future).

No problems and difficulties encountered.

4.3.4 Any other information you wish to comment upon during this period of six months?

No.

4.3.5 If the project timetable has slipped or changed, provide an updated project implementation timetable for the remainder of the project.

No change in timetable.

List of papers published:

1. Marrit van den Berg, Wang Guanghuo, and Reimund Roetter (2003) Decreasing the use of agrochemicals in rural China: setting priorities for research and policy in Zhejiang province. Presented by Marrit van den Berg at international seminar on Economic Transition and Sustainable Agricultural Development in East Asia, Nanjing, P.R. of China, 20-22 October 2003.

2. Roetter, R.P., Berg, M.van den, Hengsdijk, H., Wolf, J., Ittersum, M. van, Keulen, H. van, Agustin, E.O., Son, T.T., Lai, N.X., Wang, G., Laborte, A.G., 2004. A multiple-scale modelling approach to integrated resource management in East and Southeast Asia: challenges and potential solutions. Paper to be presented at IEMS conference MODSS 2004 to be held at Osnabrueck, Germany, 17-21 June 2004.

List number of PhDs and number of MScs:

Mr. Fang Bin, Ph.D. student, worked on TechnoGIN model for Pujiang;
Ms. Xie Wenxia, Ph.D. student, worked on crop potential yield estimation for TechnoGIN model and rice experiment for WOFOST calibration.

4.3.6 Annex: Major special agro-products emphasized in Pujiang county

1. Mountain vegetables
    - Altitude 150 -600m
    - Cultivated land
    - 50 mu or more connected land area
    - good irrigation
2. Ornamentals (woody and cut flowers)
    - transport less than 1 km to the high way.
    - water table lower than 1m
    - 50 mu or more connected land area
    - level land
3. Grapes
    - alluvial or al-diluvial plains (in land unit 1 or 3)
    - paddy soil
    - higher accumulated temperature
    - water table lower than 80 cm
4. Chinese plum
    - hillock, clayey red soils or loamy rock soils surrounding the basin
    - good drainage
    - occasionally irrigation available
5. Pears
    - hillock, loamy rock soils surrounding the basin, south part; gentle slope lands, clayey red soils
    - good drainage
    - occasionally irrigation available
6. Tea
    - no strict requirement for slope
    - original tea lands except the tea land surrounding the basin
    - 20 mu or more connected land area
    - higher altitude
    - acid soil
7. Almonds
    - altitude 200-800m
    - deep soil layer
    - no pollution
8. Free-ranging (broiler-type) chickens
    - far from the villages
    - mountain valleys
    - water available
9. Goats
    - north-west mountain area
    - originally connected rice fields

- gentle slop

10. Pig
    - water available
    - located in the basin
    - far from villages, lower part of the river coasts
    - easy to treat the manure

An overview of the suitable areas in Pujiang county for these special agro-products are given in Table 4.3.1.

Table 4.3.1 Suitable areas in Pujiang county for special agro-products

Products	Area	
	km^2	ha
Mountain vegetables	25.76	2576
Ornamentals (woody and cut flowers)	14.91	1491
Grapes	12.04	1204
Chinese plum	27.23	2723
Pear	33.88	3388
Tea	8.54	854
Almonds	9.45	945
Free-ranging (broiler-type) chickens	5.88	588
Goat	14.63	1463
Pig	7.91	791

4.4 Report from NISF

4.4.1 Progress over the last half year

Progress from December 2003 to May 2004 is in line with the plan.

4.4.2 Progress of project

Major activities within the project comprised: 1) Generation of input-output tables; 2) MGLP modelling for Tam Duong district; 3) preparing and conducting in-country workshop at NISF in March 2004.

Generation of input-output tables:
After the April 2004 workshop, we are now adjusting some input – output as appropriate for Tamduong conditions – this includes better information on rainfall distribution, evaporation and leaching for different crops. Especially factor for Nitrification and Nitrogen volatilization as well as for Nitrate leaching .

MGLP modelling for the district.:
Group have been busy with processing data and preparing model runs for 5 Technology levels. They completed runs for 2 levels of Technology, that are: Current resource with Technologies TAC and TAF.

Additional Farm household surveys
Received form for surveying input – output information on animal production systems. We have not yet done it because of lack of budget and technicians. In addition, farmers are now very busy harvesting spring crops – surveys may be done in August /September 2004.

In-country workshop at 'National institute for Soils and Fertilizers' in March 23 – 27 2004:
Involved most institutions from province and district, workshop was held at NISF.
Local stakeholders included representatives from :

- Provincial Dept. of Resource and Environment
- Station of Soils and Fertilizers research

From NISF and other research institutions participants included:

- Dr. Bui Huy Hien, Director of NISF
- Dr. Tran Thuc Son, Team leader
- Dr. P. Q. Ha

- Dr. N. V. Chien
- M. V. Trinh, PhD student of WUR
- N. M. Quyet
- N. V. Dao
- N. Q. Hai
- B. T. Hao
- N. T Hien
- N. T. Nguyen from VASI
- Dr. N. N. Ha, head department of soil and fertilizer in HAU
- N. T. Dao, teacher of HAU
- N. T. Ha. Teacher of HAU

Content of workshop:
Day 1:
1. Opening ceremony by Dr. B. H. Hien,
2. Overview, objective and methodology of IRMLA by Dr. Reimund Roetter
3. Progress reports by the working groups:

- Land evaluation and land unit making
- Economic survey and TechnoGin
- Modelling
- Validation of possibility of TechnoGin and Modelling

Day 2 & 3:
Individual working of different working groups and implementation of different scenario
Progress reporting by PhD student research Mai Van Trinh

Day 4:
Meeting with stakeholders (6 persons) and progress report presentation by working groups with selected scenarios.
The 6 stakeholders represented the following institutions:
- Dept. of Resource and Environment management
- Dept. of Agriculture and Rural Development
- Station research for Soils and Fertilizers
- Extension Center of Province and Ext. station of District
- Dept. of Agriculture and Rural Development of Tamduong ditrict

Day 5:
- Visiting farm household in Daotu commune, and research site of PhD student Mai Van Trinh in Tamquan commune

Remark: We have had a stakeholder meeting in district to make all agreements and give feed-back to stakeholder about landuse planning systems as well as TechnoGin output to make recommendation of Fertilizer use for farmer in the project area.

4.4.3 What progress has the project made in achieving its objectives over the last year? Is the project still expected to achieve all the original objectives that were specified? Explain any problems/difficulties encountered to date in achieving the objectives of the project (or any envisaged in the future).

We completed land use planning and suitability for Tamduong with different scenarios and we had 2 presentations to stakeholder from province and district. But the best selection depends very much upon the Local policy that is still flexible (not very stable) now (e. g. split and merge of communes and district). On the other hand, land use planning as we do it needs to have close ties to the planning and projections of the province; the latter is not always clear and liable to change.

4.4.4 Any other information you wish to comment upon during this period of six months?

Coefficients for TechnoGIN should be traced from local sources and/or adjusted for a given study area; the source of information for archving these coefficients have to be certified

4.4.5 If the project timetable has slipped or changed, provide an updated project implementation timetable for the remainder of the project.

No change in timetable.

List of papers published:

In progress/submitted: international paper on TechnoGin and farm survey draft papers (see List of papers in report from Alterra (Section 4.2))

List number of PhDs and number of MScs:

- Mai Van Trinh, PhD student of WUR, The Netherlands
- Mr. Nguyen Manh Quyet: MSc student in Born University

List of conference/seminar/workshop presentations:

- March 15 2004, Workshop in Tamduong district with different stakeholders
- March 23-27 2004, In-country workshop in NISF

4.5 Report from MMSU, Philippines

4.5.1 Progress over the last half year

Progress from December 2003 to May 2004 is in line with the plan.

4.5.2 Progress of project

Major activities within the project comprised: 1) Generation of input-output tables; 2) Farm household modelling; 3) In-country workshop held at Batac and Dingras in March/April 2004.

Generation of input-output tables:

Reviewed farm survey questionnaires considering the issues raised by stakeholders during the in-country workshop which include among others land use types, production input-outputs, net income from production activities particularly on rice, and farm household income. Results are now integrated in the required input-output tables.

Farm household modelling:

a) The FHM that was submitted before the workshop in Wageningen and was further refined with the inclusion of the following sets/parameters:

- Animal production activity – cattle, pig, chicken
- Set combining products consumed but produced in different seasons – i.e., Ri1.Ri, Ri2.Ri, Ri3.Ri, Yc1.Yc, Yc2.Yc, Yc3.Yc
- Fertilizer types – included 9 fertilizer types (commonly used by farmers in the area): 2 organic and 7 inorganic. This is used by GAMS in calculating fertilizer input cost
- Nutrient content of the commonly used commercial feeds
- Animals that consume feeds – cattle and pig
- Shock parameters – price, labor and fertilizers
- Land units where upland crops could be grown in the wet and dry seasons

b) We came up with a detailed description of the FHM (new version, June 2004, available)

c) Definition/description of alternative technologies (see, Excel file on CD-ROM)

In-country workshop held at Batac and Dingras in March/April 2004:

Received stakeholders' opinions and feedback on farm household modelling and new scenario analyses. For a detailed report (by Prof. H. van Keulen, M.K. van Ittersum, A.G. Laborte and E. Agustin), see Sections 6.4 and 7.4.

4.5.3 What progress has the project made in achieving its objectives over the last year? Is the project still expected to achieve all the original objectives that were specified? Explain any problems/difficulties encountered to date in achieving the objectives of the project (or any envisaged in the future).

No problems/difficulties encountered.

4.5.4 Any other information you wish to comment upon during this period of six months?

No.

4.5.5 If the project timetable has slipped or changed, provide an updated project implementation timetable for the remainder of the project.

No change in timetable.

List of papers published:
See list of papers in report from Alterra (Section 4.2)

List number of Ph.Ds and number of MScs:

Ms. A.G. Laborte, Ph.D student, works on multi-scale modeling approach;

Ms. Anne-Gerdien Prins, MSc student WUR, worked on farm household model for Batac (finalized thesis in April 2004).

4.6 Report from CLRRI, Vietnam

4.6.1 Progress over the last half year

Progress from December 2003 to May 2004 is in line with the plan.

4.6.2 Progress of project

Major activities within the project comprised: 1) Generation of input-output tables; 2) Farm household modelling; 3) In-country workshop held at Omon, April 2004.

Generation of input-output tables

- Reviewed farm survey questionnaires considering the issues raised by stakeholders during the in-country workshop – not yet completed;
- Plausibility of technical coefficients from alternative technologies requires revision.

Farm household modeling

- FHM that was submitted before the workshop at Wageningen was further refined during the stay of Mr Cuong at Wageningen in February 2004 and during the in-country workshop at Omon, April 2004;
- Marrit van den Berg from WUR came up with an updated version of the detailed description of the FHM (new version, June 2004, available).

In-country workshop held at Omon, April 2004:

Received stakeholders' opinions and feedback on farm household modelling and backing to continue work as outlined during the stakeholder meeting. Report (by R Roetter and Cuong/Mrs. Chuc) available.

4.6.3 What progress has the project made in achieving its objectives over the last year? Is the project still expected to achieve all the original objectives that were specified? Explain any problems/difficulties encountered to date in achieving the objectives of the project (or any envisaged in the future).

No problems/difficulties encountered.

4.6.4 Any other information you wish to comment upon during this period of six months?

No.

4.6.5 If the project timetable has slipped or changed, provide an updated project implementation timetable for the remainder of the project.

No change in timetable.

List of papers published:
See list of papers in report from Alterra (Section 4.2)

List number of PhDs and number of MScs:
None so far – MSc student recruited from Wageningen to carry out research in support of FHM development – in period July to December 2004.

4.7 Report from IMK-FZK, Germany

4.7.1 Progress over the last half year

Progress from December 2003 to May 2004 is in line with the plan.

4.7.2 Progress of project

Major activities within the project comprised: 1) Inclusion of greenhouse gas emissions into land use analysis tools; 2) Assessment of climate induced risks; 3) Field visits.

Inclusion of greenhouse gas emissions into land use analysis tools:

Initial steps were taken to include greenhouse gas emissions in the

- FHMs of Omon, Dingras, and Batac;
- Regional models of Pujiang and Tamduong.

Input tables for CH4 and N2O emissions were developed using empirical data from comparable sites as a prototype for envisaged use of the DNDC (**D**e**N**itrification-**D**e**C**omposition) model to compute site-specific emission rates. New model parameters variables were defined to allow future modification of objective functions under different emission scenarios.

Assessment of climate induced risks:

Model results on potential and water-limited yields were supplemented by compilation of actual yields on county and province level. For each of the case studies, the available data base comprises > 12 years of yield records.

Field visits:

Details of risk assessment and possible mitigation of greenhouse gas emissions were discussed during field visits in Omon and Hanoi (Dec. 2003).

4.7.3 What progress has the project made in achieving its objectives over the last year? Is the project still expected to achieve all the original objectives that were specified? Explain any problems / difficulties encountered to date in achieving the objectives of the project (or any envisaged in the future).

The work of WP2 is basically on track to comply with the objectives related to yield gap and environmental risk analysis.

4.7.4 Any other information you wish to comment upon during this period of six months?

No.

4.7.5 If the project timetable has slipped or changed, provide an updated project implementation timetable for the remainder of the project.

No change in timetable.

List of papers published:

Wassmann R., Hien N.X., Hoanh C.T., Tuong, T.P. (in press) Sea Level Rise affecting Vietnamese Mekong Delta: Water Elevation in Flood Season and Implications for Rice Production. Climatic Change

List number of PhDs and number of MScs:

None

4.8 Report from PPS-WU, The Netherlands

4.8.1 Progress over the last half year

Progress from December 2003 to May 2004 is in line with the plan.

4.8.2 Progress of project

Major activities within the project comprised:
1) Generation of input-output tables (ir. T. Ponsioen);
2) MGLP modelling for Tam Dao, Vietnam (Dr. M.M. van den Berg);
3) Farm household modelling for Omon, Vietnam and Ilocos Norte, Philippines (Dr. M.M. van den Berg; Dr.ir. M.K. van Ittersum; Ms A.G. Laborte);
4) In-country workshops in North and South Vietnam, 25-28 March and 29 March-1 April (both Dr. M.M. van den Berg) and Ilocos Norte, The Philippines at MMSU, Batac, March 22-25, 2004 (Dr.ir. M.K. van Ittersum).

Generation of input-output tables:
The Technical Coefficient Generator (TCG) Techno-GIN has been completed and a report (Ponsioen et al., 2003) has been published. Also after its release there has been and will be a continuous need for small amendments and maintenance.

MGLP modelling for Tam Dao
See general report.

Farm household modelling for Omon, Vietnam and Ilocos Norte, Philippines:
General outlines of the Farm household models for the two regions were available at the start of the reporting period and were further implemented and operationalized within the past six months. Progress and results were discussed during the in-country workshops and presented to stakeholders. A publication for the Ilocos Norte case is in preparation (Laborte et al.) and preliminary results have been presented at the International Agronomy conference in Manilla (March 2004).

In-country workshop in Vietnam and Philippines in March/April 2004
Reports on the four in-country workshops can be found in Chapters 6 and 7 of this progress report. Dr. M.M. van den Berg prepared and contributed to the two workshops in Vietnam and Dr. M.K. van Ittersum was involved in the preparation and co-lead the workshop in the Philippines.

4.8.3 What progress has the project made in achieving its objectives over the last year? Is the project still expected to achieve all the original objectives

that were specified? Explain any problems/difficulties encountered to date in achieving the objectives of the project (or any envisaged in the future).

Major progress has been made with respect to the farm household modelling, particularly for the Batac community in Ilocos Norte and increasingly also for Dingras in the same province. The next challenge will be the multi-scale analysis for Ilocos Norte (integration of analyses at provincial, community and farm scale). It is anticipated that the project will achieve the original objectives.

4.8.4 Any other information you wish to comment upon during this period of six months?

No.

4.8.5 If the project timetable has slipped or changed, provide an updated project implementation timetable for the remainder of the project.

No change in timetable.

List of papers published:

1. Van Ittersum, M.K., R.P. Roetter, H. van Keulen, N. de Ridder, C.T. Hoanh, A.G. Laborte, P.K. Aggarwal, A.B. Ismail, A. Tawang, 2004. A systems network (SysNet) approach for interactively evaluating strategic land use options at sub-national scale in South and South-east Asia. Land Use Policy 21: 101-113.

2. Roetter, R.P., C.T. Hoanh, A.G. Laborte, H. Van Keulen, M.K. Van Ittersum, C. Dreiser, C.A. Van Diepen, N. De Ridder and H.H. van Laar, 2004. Integration of systems network (SysNet) tools for regional land use scenario analysis in Asia. Environmental Modelling and Software, in press.

3. Ponsioen, T.C., A.G. Laborte, R.P. Roetter, H. Hengsdijk, J. Wolf, 2003. Techno-GIN-3: a technical coefficient generator for cropping systems in East and Southeast Asia. Quantitative Approaches in Systems Analysis No. 26, C.T. de Wit Graduate School for Production Ecology and Resource Conservation, Wageningen University, The Netherlands, 69 pp. ISBN 90-6754-735-2

List number of PhDs and number of MScs:

PhD

1. Ms. Alice Laborte – Operationalisation of a decision support system for land use planning and analysis: a case study for Ilocos Norte Province, Philippines

2. Mr. Mai van Trinh – Integrated nutirent dynamics with special emphasis on erosion and leaching in Tam Duong district, Vietnam

MSc

1. Ms. A.G. Prins – Using a farm household model to analyse the adoption of new technologies in Batac, Ilocos Norte, Philippines. MSc thesis Plant Production Systems, Wageningen University, The Netherlands, 114 pp. Completed April 2004.

List of conference / seminar / workshop presentations:

Laborte, AG, AG Prins, M. Hossain, MK Van Ittersum, H Van Keulen, MM van den Berg (2004) Using a farm household modelling approach to analyze technology adoption behaviour of farmers in Ilocos Norte Province, Philippines. Paper presented at the 35th Annual Scientific Conference of the Crop Science Society of the Philippines, March 8-12, 2004, Davao City, Philippines.

Furthermore, various presentations during the in-country workshops in March and April 2004 (e.g. Overview of IRMLA project and various detailed technical/methodological presentations).

4.9 Report from PRI, The Netherlands

4.9.3 Progress over the last half year

Progress from December 2003 to May 2004 is in line with the plan.

4.9.2 Progress of project

Major activities within the project comprised:

1) Contribution to multi-stakeholder workshops in Pujiang (China) and Illocos Norte (Philippines) to further establish stakeholder platforms (March/April 2004).
2) Contribution to the further development of technical coefficient generators for cropping systems in Dingras, Pujiang, Tam Duong and Omon.
3) Development of technical coefficients for animal activities.
4) Contribution to the further exploitation of farm survey data from the case study areas and on the basis of this the calibration of input data of TechnoGIN.
5) Co-authorship of two journal papers and four conference contributions (see below).

4.9.3 What progress has the project made in achieving its objectives over the last year? Is the project still expected to achieve all the original objectives that were specified? Explain any problems/difficulties encountered to date in achieving the objectives of the project (or any envisaged in the future).

Progress is in line with the plan. The project is able to realize its original objectives.

4.9.4 Any other information you wish to comment upon during this period of six months?

No.

4.9.5 If the project timetable has slipped or changed, provide an updated project implementation timetable for the remainder of the project.

No change in timetable.

List of papers published:

- M.K. van Ittersum, R.P. Roetter, H. van Keulen,N. de Ridder, C.T. Hoanh, A.G. Laborte, P.K. Aggarwal, A.B. Ismail and A. Tawang, 2004. A systems network (SysNet) approach for interactively evaluating strategic land use options at sub-national scale in South and South-east Asia. Land Use Policy, Volume 21, Issue 2: 101-113.
- R.P. Roetter, C.T. Hoanh, A.G. Laborte, H. van Keulen, M.K. van Ittersum, C. Dreiser, C.A. van Diepen, N. de Ridder, H.H. van Laar, 2004. Integration of Systems Network (Sysnet) tools for regional land use analysis in Asia. Environmental modeling & software (in press).

List number of PhDs and number of MScs:

- Zhong Jiayou (China): Options for rice-based farming systems in a humid subtropical region: a case study for Jiangxi Province, China
- Jing Qi (China): Improving nitrogen and water use in rice-wheat cropping systems.
- Alice Laborte (Philippines): A multi-scale land use analysis tool for Ilocos Norte Province, Philippines.

List of conference / seminar / workshop presentations:

- Rötter, R., Van den Berg, M., Hengsdijk, H., Wolf, J., Van Ittersum, M.K., Van Keulen, H., Agustin, E.O., Son, T.T., Lai, N.X., Guanghuo, W., Laborte, A.G., 2004. A Multiple-scale Modelling approach to Integrated Resource Management in East and South-east Asia: Challenges and Potential solutions (accepted). International Environmental Modelling and Software Society Conference "Complexity and Integrated Resources Management" in Osnabrück, Germany from the 14th to 17th of June, 2004 (peer reviewed, accepted).

- Zhong, J., Hengsdijk, H., Van Keulen, H., Shi, Q., Zhao, X., 2004. A methodology to explore options for rice-based farming systems in a humid subtropical region: a case study for Jiangxi, China. 4th International Crop Science Congress, Brisbane, Australia. poster paper (peer reviewed, accepted).

- Hengsdijk, H., Van den Berg, M., Roetter, R., Wolf, J., Guanghuo, W., Lai, N.X., Cuong, N.T., Van Keulen, H., 2004. Consequences of technologies and production diversification for the economic and environmental performance of rice-based farming systems in East and South-east Asia. Abstract for the World Rice Research Conference, November 2004.

- Qi Jing, Herman van Keulen, Weixing Cao, Huib Hengsdijk, Tingbo Dai, Dong Jiang, Xiaotao You, 2004. Characterizing N flows and improving N use efficiency in Rice-Wheat (RW) cropping systems. The 3rd International Nitrogen Conference Nanjing, China, 12-16 October 2004.

5 Intended publications and studies

5.1 Introduction

A number of contributions to scientific meetings and papers for submission to scientific journals are either completed recently or are at present in the process of writing. For three of these papers, the abstract are given in the following sections. The titles are:

1. A Multiple-scale Modelling approach to Integrated Resource Management in East and South-east Asia: Challenges and Potential solutions;

2. Consequences of technologies and production diversification for the economic and environmental performance of rice-based farming systems in East and South-east Asia;

3. Research, extension, and agricultural pollution in Southeast China

5.2 Paper 'A Multiple-scale Modelling approach to Integrated Resource Management in East and South-east Asia: Challenges and Potential solutions'

Reimund Rötter[1], Marrit van den Berg[2,3], Huib Hengsdijk[4], Joost Wolf[1], Martin van Ittersum[2], Herman van Keulen[2,4], Epifania O. Agustin[5], Tran Thuc Son[6], Nguyen Xuan Lai[7], Wang Guanghuo[8], and Alice G. Laborte[9]

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5 Mariano Marcos State University, Batac, Ilocos Norte, Philippines
6 National Institute for Soils and Fertilizer, Hanoi, Vietnam
7 Cuu Long Delta Rice Research Institute, Omon, Cantho, Vietnam
8 Zhejiang University, Hangzhou, P.R. China
9 International Rice Research Institute (IRRI), DAPO, Box 7777, Metro Manila, Philippines

Paper presented at IEMS conference MODSS 2004 to be held at Osnabrueck, Germany, 17-21 June 2004. For more information on paper, see website of meeting: http://www.iemss.org/iemss2004/

Abstract: Currently, in many of the highly productive lowland areas of E and SE Asia a trend to further intensification and diversification of (agricultural) land use can be observed. Growing economies and urbanization also increase the claims on land and water by non-agricultural uses. As a result, decisions related to the management and planning of scarce resources become increasingly complex. Technological innovations at the field/farm level are needed but not sufficient – changes in resource use at regional scale will also be essential. To support decision-making in such situations, we advocate a multi-scale modelling approach embedded in a solid participatory process. To this end, the Integrated Resource Management and Land use Analysis (IRMLA) Project is developing an analytical framework and methods for resource use analysis and planning, for four sites in Asia. In this multi-scale approach, integration of results from field, farm, district and provincial level analysis is based on Interactive multiple goal linear programming (IMGLP), Farm Household Modelling (FHM), production ecological concepts and participatory techniques. The novel approach comprises the following steps: (i) Inventory/quantification of current land use systems, resource availability, management practices and policy views, (ii) Analysis of alternative, innovative land use

systems/technologies, (iii) Exploration of the opportunities and limitations to change resource use at regional scale under alternative future scenarios, (iv) Modelling decision behavior of farmers and identification of feasible policy interventions, and (v) Synthesis of results from farm to regional level for negotiation of the most promising options by a stakeholder platform.

In the current paper, the operationalization of the approach is illustrated by the outputs (development scenarios, promising policy measures and innovative production systems) from various component models for the case study Ilocos Norte, Philippines. A procedure is discussed for the integration of results from the different model components at two different decision making levels (farm and province).

5.3 Paper 'Consequences of technologies and production diversification for the economic and environmental performance of rice-based farming systems in East and South-east Asia'

Huib Hengsdijk[1], Marrit van den Berg[2,3], Reimund Roetter[4], Joost Wolf[4], Wang Guanghuo[5], Nguyen Xuan Lai[6], Nguyen The Cuong[6] and Herman van Keulen[1,2]

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5 Zhejiang University, Hangzhou, P.R. China
6 Cuu Long Delta Rice Research Institute, Omon, Cantho, Vietnam

Paper to be presented at World Rice Research Conference held at Tokio and Tsukuba, Japan, 4-7 November 2004. For more information, see website of meeting: http://www.irri.org/wrrc2004/default.htm

Abstract: Rice-based farming systems in East and Southeast Asia are undergoing rapid transformation in response to population and urban growth, opening up of markets, and changing consumer preferences. Increasingly, rural population migrates to urban centres in response to the rapid industrialisation and associated employment opportunities. On the one hand such development reduces labour availability in rural areas but on other hand it may improve the income portfolio of rural population. Along with rising living standards comes a growing demand for a more diversified diet including vegetables. Rice will, however, remain the main staple crop in Asia and demand will continue to increase with growing populations. For this reason, new knowledge-intensive rice technologies, such as site-specific nutrient management and integrated pest management are further being developed to maintain the quality of the natural resource base and make rice farming financially more attractive. Thus, rice-based farming systems are forced to further diversify and intensify with unkown consequences for the economic and environmental performance of such systems.

In this study a farm household modelling approach is applied to gain understanding of the economic and environmental consequences of introducing new rice technologies and of production diversification towards vegetables for different farm households in important rice growing areas. In the analysis, the performance of rice-based farming systems is expressed in terms of total and partial factor productivity, income stability, and environmental sustainability indicators such as the emission of nitrogen to different compartments of the environment and biocide use. Typical rice-based farming systems

from the Mekong delta of Vietnam and in Zhejiang province, China are used as case studies.

5.4 Paper 'Research, extension, and agricultural pollution in Southeast China'

Marrit van den Berg[a,b], Wang Guanghuo[c], and Reimund Rötter[d]

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[b] Plant Production Systems Group, Wageningen University, Wageningen, The Netherlands
[c] Zhejiang University, Hangzhou, China
[d] Alterra, Wageningen UR, Wageningen, The Netherlands

Paper to be submitted for publication in Agricultural Ecnonomics

Abstract: This paper analyses the potential role of research and extension in decreasing agricultural pollution for Pujiang, a county in the intensively cultivated coastal zone of China. Contrary to the common practice of introducing research as an explanatory variable in an aggregate production function, we use a case study approach involving a comparison of farmer practices and improved technologies. This approach has three advantages: it is forward looking, allows for disentangling the role of extension and research, and enables consideration of other crops than those with large data coverage. The results show that research and extension have a large potential to decrease fertilizer pollution for both rice and vegetable production. Extension can decrease nitrogen losses from rice production by 30% and new research by another 50%. The potential of research and extension to decrease fertilizer pollution from vegetable seems even higher. However, both local and international research on vegetable technologies is too weak to give a reliable estimate of the potential impact.

6 Results from stakeholder meetings

6.1 Introduction

The stakeholder meetings at Zhejiang University, P.R. China, NISF, Vietnam, MMSU, Philippines, and CLRRI, Vietnam are described in respectively the following Sections 6.2, 6.3, 6.4 and 6.5.

6.2 Results from Zhejiang university

A stakeholder meeting was held at Pujiang, March 16, 2004. Present at the meeting were:

Mr. Wu Wenyi	Senior agronomist, Agricultural Bureau Pujiang
Prof. Ding Xiangha	Agro-technology Extension service of Jinhua
Mrs. Zhang Zhenlian	Director, Agro-technology Extension service of Pujiang
Mr. Lou Jidao	Agronomist, Agricultural Information Centre of Pujiang
Mr. Cheng Fengmin	Pujiang Township Office Manager
Mrs. Pan Qingzhang	Agronomist, Quality Inspection Centre of Agro-products of Pujiang
Mr. Wu Guochong	Vice-governor of Pujiang
Mr. Jiang Jingzhou	Director Office of Pujiang Government
Mr. Zhong Danyang	Agricultural Bureau of Pujiang
Mr. Zhang Jianwen	Vice Party Secretary of Pujiang County (dinner only)

IRMLA: prof. Wang, Jiangdi Wang, prof. Lu Changhe, Herman van Keulen

Introductions

Introductory words by Mr. Wu; Vice-governor of the county stuck in traffic!!

Introduction by prof. Wang:
Some of the basic maps of Pujiang being used in the analysis, i.e. DEM; soil map; distribution of rice production (see ppt-file).

Presentation Herman van Keulen: Overview of IRMLA-project: objectives, approach, accomplishments, outlook (see ppt-file).

Presentation Wang Jiangdi: Land suitability for Special Products in Pujiang (see ppt-file).

Comments by stakeholders

- For the mountain vegetables, the criterion of contiguous area of at least 50 mu may have to be relaxed for some areas (mountain), where homogenous areas are smaller. A size of 20 mu may be used instead of 50 mu.
- For ornamentals: condition < 1 km from main road could be modified to also include county roads, and maybe even township roads.
- Almond growing is presently limited to a small area. Farmers having no tradition in almond production, might be difficult to be convinced to grow the commodity. Almonds take about 8 years before starting flowering, while first fruits can be harvested three years after start of flowering, hence very long period before returns on investments.
- Remark on food production: in the plan, only stimulation of 'special products' is treated. Food production is declining steadily and food has to be imported in the province.
  (Measures are being discussed this week at different decision-making levels (Province, District, County) to stimulate food production. This deals with generation of incentives for farmers to start growing early rice – late this month, early April, direct-sown –. The possibilities include a subsidy on area grown (in the order of 20 Yuan/mu) or delivery contracts (guaranteed price). Prof. Wang, even though he regrets that, thinks that these incentives will hardly swing many farmers.)
  Hence, the feeling is that Agricultural Bureau should not indiscriminately promote growth of special products.
- Flooding is not very important in the County, hence the condition for some commodities of distance to river > 200 m could be relaxed or removed.
- In the south of the county, there are already 5000-6000 mu of ornamentals. These are operated by 'rich' outsiders that rent land from farm households that have left to look for alternative employment. (annual rent in the area at the moment 300 kg of rice/mu).
- Credit is a problem: small farmers generally can not borrow more than Yuan 5000.- from the bank (no collateral). The earlier mentioned 'rich individuals' can borrow larger sums, using the planting material or their house as collateral.

Presentation IMGLP Pujiang

Relatively short presentation on:

a) Resource evaluation (climate, soils)
b) Production systems; constraints included
c) Results from two rounds of optimization:
   1) maximizing income at current price; 2) maximizing income at a 50% increase of price

Discussion

- The discussion was rather difficult; apparently the tool and/or results did not sufficiently appeal to the stakeholders to rouse enthusiasm or they did (as yet) insufficiently grasp its possibilities and options.
- A remark was made that the given highest limit of 100 000 ton of rice for the county was too high. It may not be possible for this county to produce this quantity of rice

based on the production in the last few years. It is necessary to discuss this issue in the team: have 'unreasonable assumptions' been made either with respect to yield level or to suitable area?

- Suggested to include in the analysis minimum values for each agro-product.
- It was felt that food security should not be set as a goal at county level, but rather at township level. In an exchange of ideas it was said that the analysis might suggest growing of for instance grapes in a certain area of the County. This would then imply that farmers in other parts would have to be responsible for food production of those farmers. (Some of the) stakeholders felt that farmers and township government would be unhappy with such a development. As farmers have little or no (financial) security, they (particularly the farmers in the mountain areas) put rather strong emphasis on food security at household level. This can be attained fairly easily (on only part of their land), so that additional land can be used for 'cash crop' production, in an attempt to increase income (that IS an important objective of farmers – and also of policy makers).
- It was difficult to 'extract' a future vision of the agricultural sector from the stakeholders, probably because they are too much concerned with current problems than to really be interested in 'future visions'.
- Income is dynamic or variable because of changing prices – the model should be able to consider this aspect.
- What is the (likely) future: farmers encourage their sons to go to university, and if that is impossible to go into business, but NOT become farmers. However, the land (use rights, guaranteed via long-term lease from the government for a period of about 30 years) is very important to the household as a form of social security. Many of the young people working elsewhere (in urban areas) do return to the village to build a house, and they may come back if they loss their job to take up farming again. The idea of farm expansion appears still rather far-fetched. Yes, land can be rented out for a longer period, but still does not form part of a larger farm enterprise

Reaction Mr. Wu Wenyi

What is it the Agricultural Bureau is really concerned with and on what issues would it welcome support?

- Land suitability assessment, i.e. which soils are most suitable for which crops;
- Resource availability assessment: land, water;
- Land productivity
- Market analysis, this in fact comprises analysis of the whole chain for various products;
- Increasing revenue, possibly maximizing farmer benefits;
- Sustainability – in the analysis some indicators of sustainability should be included; it appears difficult to identify more tangible ideas, but it is clear that the policy statement of Zhejiang Provincial Government of 2003, stressing the need to reduce the use of 'chemicals', both in the form of fertilizer and biocides plays an important role in the considerations [*note HvK*: do we know anything about emission levels at County level? Do we have that included in the analysis?]

- Technology – land use activities should be described in more detail; obviously here the desire is more for direct technical advice on more efficient (productivity, water-, nutrient-, labor-) systems;
- Advice on how targeted areas/numbers for certain commodities (crops/animals) (see special products report) can actually be attained [*Note HvK*: It seems to me that this is indeed agricultural policy, but is directly related to economic policy; the strong production increase in the EU in the 1950s and 1960s was the result of a policy based on guaranteed prices and production subsidies; the position of cotton farmers in the US is stabilized only because of massive subsidies by the government, etc.];
- The model should not consider only the current conditions/production activities, but should consider the future possibilities.

My conclusion is that we need a further discussion with the project team to see whether they have a clear future vision, and in what way they think the IMGLP model could be applied in a useful way. This might entail modification of the description of the activities, inclusion of (more) alternative activities and/or redefinition of goals and/or constraints.

6.3 Results from NISF

A stakeholder meeting was held at Hanoi, March 27, 2004. Present at the meeting were:

Province:	Director of Environment and Resource dept.
	Director of Agriculture & Rural development dept.
	Agricultural extension Center
	Station of Soils and Fertilizers
District:	Head and deputy head of district
	Head of Agriculture & RD dept.
	Head of Investment and Planning dept.

HAU scientists …….

IRMLA Scientists: Dr. Hien, Dr. Son, Dr. Ha, Dr. Chien, Mai van Trinh (NISF)

Objectives

1. To present project results to stakeholders: analysis of alternative land use scenarios for Tam Duong;
2. To get more insight in problems and possible solutions for sustainable resource management in the case study region;
3. To arrive at joint conclusions on how to further adjust tools/databases for the study purpose.

Expected Output

1. Information on status of land use scenario analysis exchanged with local stakeholders;
2. Dialogue and partnership between scientists and local stakeholders strengthened;

3. Joint conclusions drawn on how to improve tools/databases, documented and workplans amended accordingly.

Programme

9:00-9:10	Welcome and opening, Bui Huy Hien, Director of NISF
9:10-9:20	IRMLA project activities, Tran Thuc Son, vice director of NISF
9:20-9:40	Objective of stakeholder meeting and next steps (Reimund Roetter)
9:40-9:55	Presentation by Group A (include short discussion) (Vu Manh Quyet)
9:55-10:10	Presentation by Group B (Nguyen Quoc Hai)
10:10-10:25	Presentation by Group C (Methodology) (Mrs. Vu Nguyen)
10:25-10:40	Break
[group foto]	
10:40-11:00	Review policy assumptions (incl. Stakeholder response)(Nguyen Van Chien)
11:00-11:20	Presentation of results from set of short-term scenarios (Pham Quang Ha)
11:20-11:40	Discussion
11:40-12:00	Presentation of results from set of Long-term scenarios (Pham Quang Ha)
12:00-12:25	Discussion
12:25-12:30	Closing
12:30-13:30	Lunch

Presentations

1. Dr Tran Thuc Son, introduces participants to workshop objectives and process.
2. Dr. Bui Huy Hien, director of NISF open the workshop, firstly he thanks IRMLA partner from Wageningen University. He gives a review on land use trend in Vietnam, especially the five stage of land use research done by IRMLA with each group for each task as resource evaluation, data collection and modeling, and emphasizes that IRMLA project will get very good results.
3. Dr. Tran Thuc Son, introduces the IRMLA program; He reported how IRMLA teams do the work in Tamduong and Vinhphuc including field, farm household surveys, soil survey and land evaluation, doing land use planning using LUPAS and maximization of land use. IRMLA has got some results, presented in district as in IRMLA workshop in Wageningen University in 2003, because this is open in program. Running model in different scenarios to apply in district depend on how people oriented.
4. Dr. Reimund Roetter, gives introduction about IRMLA progress and the planning for next period.
5. Presentations by groups:
   Group A, presented by Nguyen Manh Quyet:
   - Overview on climate, topography
   - Land, water eveluation
   - Land suitability for agriculture production
   - Suitability include plant suitability and land suitability using raster

- Soil map is refined from old soil map
- Soil map and simplify to 8 main soil unit
- Slope map is derived from contour map and classified to 6 classes
- Land use map is derived from landuse map in 2000
- Irrigation map and potential
- Requirement of plant about soil quality
- 21 LUT is established
- Discussion
- Dr. Tran Thuc Son explains why they have 22 LMU, because of many soil units and subunits with small area that difficult to present in soil map. He ask Mr. Quy, Director of Agriculture extension center, and Mr. Trieu, soil scientists agree to that classification;
- Mr. Dien, Deputy head of Agriculture dept. of district said that in Tamduong there is some special soil unit that waterlogged and it suitable for rice and fish raising. But Acid alluvial soil occupy small area. About 120 ha of waterlogged soil should be separated to reclaim.

Group B, presented by Nguyen Quoc Hai, TechnoGin

- overview on TechnoGin goals
- Structure of TechnoGin include Input, Macro, Output
- Selection 21 LUT and 22 LMU
- Establish Technologies A=current, B=QUEFTS recommendation, C= …
- Others inputs
- Output: yield, fertilizer, labor, water, biocide, nutrient loss, …
- Present some results and explain the output for every combination of LMU, LUT, Technology, and Season

Discussion:

-Dr. Tran Thuc Son explain on TechnoGin and its application for agriculture production. TechnoGin output is appropriate to practice and acceptable.

-Dr. Pham Quang Ha: TechnoGin is developed for all sort of regions but the input coefficients should be refined for each studied region.

-Dr. Nguyen Nhu Ha, from Hanoi Agriculture University asks Mr. Ha to run TechnoGin for example and recommend to have best fit recommendation to reality because of the fact that farmers apply more fertilizer than recommendations.

Group C, presented by Vu Nguyen

- Explain about the structure and calculating procedure of model, input parameter for the model as soil, land use, labour, current
- Which input file is needed for model and how to format this input file
- Scenarios for running modeling
- Some outputs for different scenarios (short term and long term)

6. GAMS-MGLP model, presented by Mr. Pham Quang Ha

Explanation about short term land use planning include 6 scenarios as (current tech., current tech +food security, New tech., new tech + food security, new tech + increase of fert and Biocide, new tech + increasing fert., biocide and food security).
Object based on development of district: maximize cereal production, gross output of agriculture, minimize labor cost, etc.
Output gives detailed information for all LMU, commune and district.
Model result have to be checked by stakeholders to give a final recommendation as presented on maps.
Discussion:
Dr. Tran Thuc Son explains the survey results on current land use and what is different from simulated results.
Mr. Dien, talks about current land use in Tamduong, explaining the district's emphasis is on 6 main crops (rice, maize, soybean, peanut, vegetable and fruit tree) and 4 animals (pig, cow, pountry and fish), to develop in central of intermediate and big farms and to establish the field with income of 50 mill. VND/ha/year, typical some area obtained 140 mill. VND/ha/year.
In the uplands most land is covered by fruit trees, besides the district recommends the farmer to establish small reservoir in the water logging land that unfavour to rice production to raise fish, duck and supply water for irrigation for fruit tree. District very welcome project to deeply research and give very good results for planning in the future.

7. Review policy assumptions presented by Mr. Nguyen Van Chien. He gives an overview on land use data, resource and constrains, current fertilizer use for crops, district plan in 2005, 2010 and asks stakeholders to discuss and give some correction for refining tools and database.
   He presents farm household survey results in Tamduong and gives a conclusion on current land use, farmer, labor and knowledge of farmer.

   Mr. Dien from district talk about district plan:
   - Change 1000 ha to industrial and vegetable crops.
   - District wants to develop processing production after harvest
   - District wants to develop better animal husbandry, especially milk cow

Major points for discussion

1. Following the presentation of group A (land evaluation), maps on resources (soil, land use, weather) and criteria for defining 22 LMUs (land management units) and necessary simplification are discussed with the Stakeholders.
   Stakeholders suggest consideration of the variation in soil conditions and the suitability of different problem soils (e.g. soil type to be separated which requires different management);

2. Application of model (TechnoGIN) for generating input – output relations for major production systems in Tam Duong:

for 20 crops; 21 cropping systems; 5 technologies (2 current, 3 future), i.e. Actual, ImpNPK, INM, INM+IPM, ICM; this shows inputs and outputs and nicely illustrates the differences among technologies;

- On request of stakeholders, a brief demonstration is given of TechnoGIN – generating input – output coefficients for one land use type and one LMU (with corresponding positive effect of the accurate and varied output produced);
- A conclusion was that after this stakeholder workshop, a joint HAU, Tam Duong district and NISF workshop is organized for calibrating /evaluating TechnoGIN for different crops in Tam Duong;
- Following the presentation of methodology group C, and modeling results (Dr Ha), the following question arose: every 5 years new committee elected (next election will be in April 2004), then new plans for the next 5 years will be made in May 2004; NISF team will take these up and elaborate /construct new scenarios and analyse these; documentation before 1 September (workshop 2nd week September);
- Presentation on current situation of land use and direction of (natural) resource use with response from the district and the province: how to build up good marketing systems; and technical solutions for bringing harvest to the market (transportation); in the next five years 1000 ha of rice land will be converted to non-rice (soybean, maize) and animal activities will be expanded; how to market the products (real demand from the Tam Duong district officer !!!)

Things to receive more attention :

- coordination to be strengthened among NISF groups and between Wageningen and Dr Son;
- more emphasis on bilateral communication;
- more emphasis on proper financial reporting by NISF

6.4 Results from MMSU

A stakeholder meeting was held at MMSU, Batac, Ilocos Norte, March 22, 2004.

Presentations

1. Dr. Saturnino Ocampo (President MMSU)
   - Opening remarks;
   - Hopes that the local government unit (LGU) will be able to use the tool, with assistance of MMSU staff;
   - Hopes that LGU will eventually use the tool even without assistance from MMSU.

2. An overview of the IRMLA project – context, aims, methods, progress and outlook (Dr. Martin van Ittersum, Prof. Herman van Keulen; ppt-presentation available)

3. Overview of agricultural sector (ppt-presentation available)
(Engr. Roland Ross Irapta - representative of Ms. Norma Lagmay, OIC, Office of the Provincial Agriculturist). Main topics are:
Provincial planning
Food secure agro-industrial center
Productivity enhancement of food, and cash crops and fish
R&D demo for crops and fisheries
Institutional development cooperatives irrigation associations
Private/public partnership
Develop small-scale irrigation systems
Reduction production costs, post-harvest losses, value-adding opportunities.

Discussion:

E. Agustin: What are the terms & interest rates for agricultural credit?
R. Irapta: Provincial government has various programs on lending; money from provincial development fund
OPAG provides link between farmers & financing institutions

Number of farmers who avail of loans from financing institutions is minimal, because they are afraid of the terms and conditions

H. van Keulen: Is the risk involved in investing too high?
R. Irapta: QUENDANCOR (financing institution) requires postdated check. To open a checking account the minimum is P10,000[2]. If they default then they are criminally liable; farmers don't want this condition

Q: What are the priority crops?
R. Irapta: Priority crops: rice, corn, hvcc (high value commercial crops), livestock, fishery
Hvcc: garlic, mango,..

A. Laborte: Regarding the program on distribution of inputs: distributed for free or at subsidized rates?
R. Irapta: Hybrid rice seeds at subsidized price of P1,000/ha (buying price is P2,400/ha)
Foliar fertilizers at subsidized amount: 50% of cost to be paid at harvest time

M. Alimbuyuguen (OIC Director for Extension, MMSU): Sustainability of programs that involve subsidies: Not encouraging farmers to be self-reliant?
R. Irapta: Main task of government is to give assistance to farmers

T. Layaoen (MMSU): What happened to the plan for the trading post?
R. Irapta: Approved in principle.
P. Agcaoili (Provincial Planner): The trading post will be incorporated in the Batac Public Market

[2] P (pesos): is under pressure; current exchange rate approx. 55/U$

N. Diculen (Agricultural technician, Batac): Impact of projects: BFS (balanced fertilization strategy) – techno-demos for the past years show that productivity per hectare increased substantially; increased profitability while reducing farm costs

M. Caluya (MMSU): Zonification of markets and crops in the land use plan
R. Irapta: To be presented by Provincial planner later

T. Layaoen: How about payment of loans during typhoons? What does the provincial gov't do to help affected farmers?
R. Irapta: Consolidating data on the seasonality of crops in Ilocos Norte
For natural calamities, minimize damage by giving warnings; give seeds to replant at subsidized cost or for free to affected farmers
M. Gappi (Municipal Agriculturist, Batac): Government assistance: payment of loans of farmer borrowers; encourage farmers to insure their crops; free or subsidized seeds
C. Derrada (Municipal Agriculturist, Dingras): those who borrow money are automatically ensured PCIC(?)

A. Alcoy (MMSU): How provincial government address the issue of increasing price of fertilizers, feeds of livestock?
R. Irapta: Before prices of fertilizers are regulated; since 1972 price control was abolished
Government cannot subsidize price; free tariff on fertilizer (but not pesticide)
Use organic fertilizers
Pesticide: spray on a need basis and not calendar spraying -> can reduce production cost

N. Alibuyo (MMSU): conversion of irrigated lands to commercial zone
R. Irapta: Stipulated in every municipalities' Comprehensive land use plans (CLUP); conversion should be within allowable limits
For small water impounding projects (SWIP): owner of land should agree with conditions

Presentation by Ms. Merryline Gappi, MAO, Batac

(ppt-presentation available)
Vision: to achieve sustainable growth for Batac & its people. Development has to be anchored on agriculture & entrepreneurship
Total land area: 16,101 ha

Population:
Farming: 6,665
Livestock: 6,665
Semi-commercial: 10
Fishing: 30
Total no. of farmers: 6665
Avg farm size 0.75 ha

Fishery resources:
Billoca fisheries: 10.5 ha

SWIP (Small Water Impounding Project): 13 ha
Small farm reservoir (SFR): 6 ha
Lakes: 66 ha
Lagoons : 6.8 ha

A. 5 banner programs:

1. Rice
   - commercialization of hybrid; 50% seed subsidy (DA (Department of Agriculture national) initiative)
   - certified seed subsidy; 50:50 (DA)
   - fertilizer loan; 2 years roll over scheme (National government initiative)
   - municipality palay (rice) seed loan; procure hybrid rice or certified seed in bulk; loan to farmers (Municipality program)
   - putting up of techno-demos – in coordination with research institutions
   - conduct technical briefings
   - modified dry direct seeding in mitigating nitrate leaching
   - conduct of FFS (Farmer Field School)-IPM (Integrated Pest Management) Kasakalikasan
   - certified seed production – maintain seed growers in municipality; catering also to other municipalities

2. Corn
   - input loan to saline areas – thru municipal govt
   - putting up of techno-demo
   - fertilizer loan
   - FFS-IPM Kasakalisakasan
   - marketing assistance

3. HVCC
   - seed loan
   - isubli manen
   - FFS-IPM Kasakalikasan

4. Livestock & poultry – Natl-assisted project
   - barangay livestock breeding loan program
   - animal dispersal
   - boar loan
   - multi livestock loan
   - GAD
   - Corn livestock

5. Fisheries
   - fingerling dispersal
   - hands-on training on fish cage making
   - conduct of trainings

B. Support services

- Construction of SWIPs, SFRs, DDs (diversion dams), mini dams, irrigation canals
- Rehabilitation of irrigation systems – NIA (National Irrigation Administration)
- Concreting & dredging of irrigation canals
- Construction of MPDPs (multi purpose drying pavements) – Natl govt
- Pre & postharvest facility loan program – loan STW (shallow tube well), mini tractors, corn sheller
- Construction of bagsakan center (trading post); received P400,000 from DA, Batac municipality counterpart P1.5 M
- Distribution of 29 farm tractors & 24 STWs to the rural barangays (grant)
- Greenhouse construction– not yet operational

C. Other activities

1. Institutional development
   a. Org/reorganization of Sanjera
   b. APO – agric producers organization
   c. Cooperatives
   d. RIC
   e. 4H
2. Tulong ti Barangay program – distribution of tractors part of this
3. supplemental feeding & nutrition education
4. collection of farm machinery fee & agricultural loans
5. collection of soil samples for soil mapping
6. maintenance of plant nursery
7. establishment of maintenance of FITS Center or TechnoPinoy Center

Discussion

M. van Ittersum: How are programs evaluated?
M. Gappi: Monitoring & evaluating programs
Field days: farmers present the output of techno-demo, project implemented in the municipality; convene farmers to present results
Records in office; gets the productivity level after the implementation of seed & fertilizer subsidy to see impact of the assisted project

H. van Keulen: Activities, investment of public money (provincial & municipal) very much directed towards maintaining viable agricultural sector in the municipality. Is this the overriding objective of municipality?
M. Gappi: Develop agricultural sector; municipality successful in agricultural development; market big & full of products, trading post of whole province; going into entrepreneurship; Batac- vegetable bowl in Ilocos Norte

E. Agustin: Complaints from farmers – there are more sellers than buyers in the trading post; expanded market but did not look into prospective buyers
M. Gappi: There is a problem in marketing products; strengthen cooperatives to improve marketing strategy; Storage facilities cannot be afforded by the municipality

M. Alimbuyuguen: Greenhouse not needed right now; need to assess which is needed
M. Gappi: They thought it is a grant (Dir. Concepcion?) then realized later that it is cost-sharing

E. Agustin: Greenhouse not for commercial operation; but showcase for off-season vegetable production

Engr. Casil (Agric technician, Batac): Greenhouse is crop-protection type; inside greenhouse is very hot compared to outside; not suitable to Ilocos Norte condition;
Need to modify by putting exhaust fan

M. van Ittersum: how do you identify, set programs? Do they come from national?
M. Gappi: Conduct meetings with farmers to thresh out problems & their priorities, representative from the planning office will discuss this

E. Agustin: how production targets are established?
M. Gappi: Annual development plan; make targets for the year for implementation based on previous accomplishments; projecting the productivity level per hectare or percentage;

A. Laborte: How to encourage farmers to venture to other crops to meet targets? Incentives given?
M. Gappi: Thru meetings; Incentives: assist in marketing of produce, input loan at low interest; Some farmers difficult to encourage to plant other crops

Q: Techno-demo for off-season vegetables last year: tie up with seed company: Is this sustainable? The seeds are expensive, how will you assess adoption of off-season vegetables in the future?
M. Gappi: Off-season variety from MMSU & diamante (variety from east-west seed company) – last year loan subsidies were given

A. Laborte: (addressed to farmer from Batac): Will you still grow off-season vegetables even without loan subsidy?
Farmer Danny (Batac): Will grow if he has enough capital because of high income from off-season tomato & eggplant. If he does not have enough capital, he will borrow from DA; if not available from DA, he will borrow from other sources; but would prefer to borrow from DA

Presentation by Engr. Cornelio Balbesina, Agricultural technician, Dingras

Agriculture is centerpiece of municipal government
Highest performance on the use of hybrid rice in Region I (consisting of Ilocos Norte, Ilocos Sur, La Union)
Highest production of rice in 2003
Use Bt corn (GMO) in 2003 was successful. 500 bags Bt corn seeds sold in San Marcelino (village)
7,038 ha wet season rice; 3,245 ha dry season rice

Peak month of planting rice July (different from cropping calendar in the Dingras model!)
Champion in Ilocos Norte in the distribution of hybrid rice F1 seeds
Exceeded target for hybrid rice seed distribution

Sources of irrigation
NIA/INIS, Communal, Other sources (SFR, STW, purely rainfed)
Promotion of hybrid rice in Dingras: 1 bag hybrid rice seed at subsidized rate + 1 bag urea fertilizer free (quick turn around – QTA). Plant now, pay after harvest
Certified seeds: 216 farmers served, area covered 232 ha.
F1 hybrid rice seeds: 236 farmers served, 253 ha covered.

C. Derrada: Regional Director's directive: for every 100 ha planted with hybrid rice, the municipality gets 1 MPDP (multi purpose drying pavement)
Cost of hybrid rice seeds paid after harvest at 50% subsidy P1,200 (how come provincial officer and MAO of Batac said P1,000?)
Aquaculture: problem with source of fingerlings

Discussion
E. Agustin: What happened to the BFS promotion program?
C. Derrada: still pursuing; in Dingras problem with distribution of organic fertilizers

R. Irapta: Soil testing; not yet ready to digitize map
A lot of discussion on GPS, GIS, base maps, etc.
Lat/long coordinates available for Batac & Dingras (follow up on this!)

Presentation on Policies & Development Perspectives by Engr. Pete Agcaoili,
(PPDO, Ilocos Norte; ppt-presentation available)
Vision statement: Agri-industrialized province and tourist destination with well-managed natural resources

Private public cooperation
Reclassification of land along the road

Discussion
T. Layaoen: Land conversion of productive land to residential & commercial
P. Agcaoili: Still within allowable limits
E. Agustin: Did not consider productivity of land. Within allowable limits but these are the most productive lands

M. van Ittersum: Is there increased pressure? Further expansion of area? Affecting nature reserves?
P. Agcaoili: Yes, pressure also on the uplands, slash & burn – cannot do anything about this; try to enforce the laws still there are violations

A. Alcoy: dwindling supply of agric land; what schemes to protect uplands
P. Agcaoili: Finish land use plans, provincial plan is only framework. The main actors are the municipal planners.

Presentation / discussion with Engr. Noralyn Manahan, PPD, Batac

E. Agustin: proposed program on agroforestry: FAO project for upland farming; project failed because there is no such thing as 100% upland farmer; integrated agroforestry program of province, often abandoned because this is only a part time activity of the farmers; what is the issue being addressed in agroforestry?
N. Manahan: Not agroforestry – orchards

H. van Keulen: Attention for extension service; is it an issue that technologies that originate from research do not reach community? Role of extension insufficient? If working properly no need for modification?
N. Manahan: Agricultural technician do transfer technology
M. Gappi: Mature technologies from research institutions being transferred thru symposia/ conventions to extension workers; then extension workers transfer to farmers
TechnoPinoy center in coordination with ILARRDEC (?)
Conduct technodemo or field days
This indicates the need to change attitude of farmers (?) – some still do not absorb or adopt the technology;

N. Diculen: Municipal govt gives P5,000 to rural barangay (village) for construction of pump type artesian wells; digs 70-100 ft, can penetrate hard soils because of improved equipment;

M.Gappi: Organic farming a solution to problem of water contamination
H.van Keulen: Organic farming is good for environment but not for farmers; consumers are not prepared to buy organically grown products at a higher price

Presentation on Farm household model results by E. Agustin and discussion

(ppt-presentation available)
M. Alimbuyuguen: assumptions in capital availability
15% savings from income from the previous year may not be correct, because usually farmers do not have savings

Irapta: farmers do not tell the truth in terms of income, see status of farmers if they have savings by looking at the state of livelihood; need to make assumption based on experiences and farming situation

Farmer from Dingras: After harvest of first crop, they use the earnings to pay for labour & fertilizer; remainder for consumption & other family expenses

M.van Ittersum: compare results with reality – see farm surveys, ask audience

C. Derrada: 50% for liquid farm assets too high
15% of the income from previous year too high
Per capita consumption (kg/capita): pork: 9.1, beef 2.52, chicken 5.52
Garlic 4 (? includes green & bulb)
FTA
Rice-Bitter gourd area too big (0.18 ha)
Rice-rice-pepper - limited areas under this lut
FTB
RRP
RRT 0.26 ha too small
RGa – plant only for consumption?
Results not acceptable

Irapta
Area data seems too low e.g. FTB, LU6, RBg rent 0.0004
Far from reality

C. Derrada:
Dominant cropping systems
Rice-rice-rice
Rice-rice
Rice-yellow corn
Rice-cabbage (Team: did not encounter villages which grow cabbage; CD: more areas now under cabbage)

Farmer from Dingras:
After looking at the classification, he thinks he falls under farm type FTC
His cropping systems:
Rice-rice
Rice-yellow corn
Rice-vegetables (pole sitao)
In 2000, planted rice-pepper
Did not grow 3 crops in a year "to rest the soil"
Plant pepper – harvest March to April no more time for another cropping;

C. Derrada: rice-rice-pepper -> not recommended, because at harvest time of pepper price is low; not possible

6.5 Results from CLRRI

A stakeholder meeting was held at O Mon, April 1, 2004.

Overview of program

Time		Speaker
8:00-8:05	Workshop welcome	Deputy director
8:05-8:15	Workshop objectives	Nguyen Xuan Lai
8:15-8:45	IRMLA objectives, approach, result and perspectives Focus: FHM	Dr Roetter Dr van den Berg
8:45-9:15	Overview of agricultural production of the district, current policy and development	Agricultural Office of District
9:15-9:45	Overview of agricultural production of Cantho province, current policy and development	Depart. of Planning and Investment
9:45-10:15	Discussion	
10:15-10:45	Tea break	
10:45-11:15	Presentation of results from different components of the project focussing on analysing development options and related issues	Nguyen Xuan Lai
11:15-12:00	Discussion	
12:00	Lunch break	

The presentations given by the IRMLA team members on project overview, approach and progress in case study development, etc. are available as powerpoint presentations (see, attached CD-ROM). The major points of the presentations made by local government representatives can be found below.

Presentation on Agricultural production in Cantho district by Mr. Dao Hung, Head of Agricultural Office

A. Current status and structure of agricultural land use:

Co Do district is now belonging to Cantho city. Its agricultural and forest area is 34152ha, in which:

1. Agricultural area of 33962 ha comprising of:
   - Rice: 31.409 ha
     Triple rice: 20036ha
     Double rice: 11373ha
     Sown area in 2004 Winter – Spring season: 31409
     Average yield: 6.7 tons/ha
     Rice – upland crop – rice: 912ha
     Rice – aquaculture: 7990, in which:
       Rice – Shrimp: 75ha
       Rice – fish: 7915ha
   - Perennial crop (fruit trees): 2553ha, in which fruit tree – aquaculture: 402ha
   - Unbeneficial crops: 1154 ha

2. Water surface area used for aquaculture (lake and pond): 190ha

B. Solutions to support agriculture:

1. Extension
   - At district level: Organize Extension office for management, function and operation of extension activities.
   - At village level: Assign one staff for extension activities.

2. Irrigation:
   - In 2004, increase flood-protected area reach 20791ha. Improve 2 irrigation systems in Truong Xuan and Dinh Mon villages.

3. Implement extension programs, agricultural variety supporting programs. Implement models in changing farming systems (crops and animals).

4. Encourage agricultural services, enterprises for purchasing and processing agricultural products.

C. Development programs:
   - Develop appropriate programs according to local conditions
   - Priority program:
     a) High quality rice production for domestic consumption and export;
     b) Increase upland crop area and aquaculture, reduce triple rice area
     c) Improve unbeneficial garden to cash crop garden.

Presentation on Agricultural development, current policies and development perspective by Mrs Nguyen Thi Chuc, Vice Director

A. General information:
- Natural / total area: 138960 ha
- Population (2003): 1121141 people, in which
  - Urban population: 559040 (49.86%)
  - Rural population: 562101 (50.14%)
  - Agricultural population: 731609 (65.26%)
  - Non-agricultural population: 389532 (34.74%)
- Average population density: 807 people/square km
- Administrative units: 67 basic units (village/commune/ward level) located in 4 urban and 4 suburban districts.

B. Feature, location, function and mission:

Cantho is located in the central region of the Mekong delta, near the central economic area of southern Vietnam (HCM city). It is the converging area of main transportations (road, river and aviation) in the Mekong delta.

Economic growth of Cantho is high as compare to that of other provinces in the Mekong delta. It has high potential in industry, commercial, services, education, scientific and technology in the region.

C. Economic and agricultural development

1. Economic structure change and growth:
   - Economic growth increased 13.72% (in 2003), in which:

- Agriculture: 4.44%
- Service: 20.33%
- Industry: 14.19%

- Contribution ratio (in 2003)
  - Agriculture: 21.82%
  - Service: 35.53%
  - Industry: 42.65%
- Contribution of sectors to its economic during 2001-2003:
  - Agricultural contribution reduced 0.59%
  - Contribution of service increased 4.40%
  - Contribution industry reduced 3.8%
- Exported value of product: 252.79 millions USD (increased 57.64% as in 2000)
- Investment value in the period of 2001-2003: 7296 billion VN dong
- GDP per capital: 8.1 millions VN dong (523 USD / person equivalent) increased 47.43% as in 2000.
- Poor households reduced to 3.59%.

2. Agricultural and rural development in 2001-2003:
- Average production value increased 9.28% per year, in which:
  - Agriculture: 90.86% (2000) and 82.59% (in 2003)
  - Forestry: 1.24% (2000), and 0.92% (2003)
  - Aquaculture: 7.9% (2000), and 16.49% (2003)
- Within agriculture:
  - Crop production increased 4.16% in average
  - Animal husbandry increased 20.85% in average
  - Agricultural service increased 2.55% in average

  In 2003:
  - Ratio of crop production value occupied 82.2% (reduced 4.34% (2000))
  - Ratio of animal production value occupied 12.70% (increased 4.92% (2000))
  - Ratio of agricultural service value occupied 5.1% (reduced 0.5% (2000))
- Land use in 2003:
  - Total area: 138959.99ha, in which:
    - Agricultural area: 116867.96ha (84.1%)
    - Aquaculture: 124.38 ha (0.09%)
    - Forestry: 26.71ha (0.02%)
    - Special use area: 9402.96ha (6.77%)
    - Inhabitant area: 4667.47ha (3.66%)
    - Unused area: 7870.5ha (5.66%)
  - Agricultural land use: 116867.96ha, in which
    - Annual crops: 96447.9ha (82.55%), in which rice occupied 94942ha, land use intensity index: 2.2 (2000) and 2.6 (2003)
    - Perennial crops: 20420.06ha (17.47%)
- Crop production value per ha in 2000 was 17.6 million VN dong/ha, and in 2003 was 24.2 million VN dong/ ha.

3. Current policies:

- Implement 9 programs and 7 projects on social-economic development in 2001-2005 and planning for 2010.
- Tax reduction or exemption for agricultural land use. Subsidize animal and crop variety: 60% for rice, fruit tree, aquaculture variety, animal … Support credit to household who have agricultural production, especially for those who join animal and crop variety production.

D. Future planning:

- Focus on crop intensification with application of new technologies to increase productivity, quality, and income and reduce production cost per ha: complete implementation of 70000-75000 ha of export rice, remains rice production at 1 million tons/year focusing on quality. Changing inefficient rice area to other crops, or crop rotation with fishery, upland crop rotation.
- Upland crop rotation with rice: 20000-25000ha.
- Improve unbeneficial garden and plant new fruit trees with free-disease and new variety having high yield: 18000-20000ha.
- Increase no. of cow: 5000-5500, in which 2500-3000 for milk
- Increase aquaculture area to 20000ha

- Invest, establish and develop variety production units at farm level. Strengthen Co Do variety production farm.
- Start to build rice market, fruit market. Develop agricultural services.
- Implement tax exemption policy.
- Support through credits, decrease interest, increase loan duration and amount for farmers to extend their production.

7. Results from planning sessions

7.1 Introduction

The results from the planning sessions at Zhejiang University, P.R. China, NISF, Vietnam, MMSU, Philippines, and CLRRI, Vietnam are described in the following Sections 7.2, 7.3, 7.4 and 7.5.

7.2 Results from Zhejiang University

The planning of the work by the Zhejiang University team is described in the following. First, the work on the modelling tools is described.

Work on TCG and on technical coefficients

- quantification of alternative production activities, especially production of special products. This will have to be done 'by hand', as inclusion of these (partly perennial) crops in TechnoGIN would make the model too unwieldy, and moreover, for these products 'improved technologies' for these special products are defined differentially from those for rice. For instance, for grapes it may involve drainage of the soil.
- technical coefficients of (current) animal production systems will be derived from planned farm survey. Comparisons will then have to be made with the values generated by the animal-TCG developed in Wageningen (see Section 2.6). A further discussion is needed on the coefficients that have to be included considering the targets, goals and constraints to be included in MGLP.
- technical coefficients of 'special products' have been based on farm survey data; they need to be examined in the light of (production-ecological and expert) knowledge.
- it is felt that the current procedure in TechnoGIN that defines a range of technologies for all land use activities included, leads to definition of a whole series of completely irrelevant and maybe even spurious coefficients. Four technology levels may be appropriate for 'traditional' field crops such as rice, but are inappropriate for such activities as growth of ornamentals or mountain vegetables. A plea is held therefore, for including an option for differential treatment of different (groups of) commodities.
  It was suggested that 'Wageningen' should provide only a general description of the implications of definition of different technologies. These general rules should then be implemented according to the specific requirements/knowledge of the case study.
- the description of the land use activities, including the different technology levels is geared towards generation of technical coefficients for inclusion in MGLP. It is felt that explicit comparison should be made with the technology descriptions formulated by the Extension Service to promote adoption of improved technologies by the farmers. This may in some instances require more detailed descriptions of the activities in TCG, but is necessary to create confidence in the technical coefficients ('technology descriptions') by the agro-technical stakeholders.

- in connection with earlier remarks: for each land use activity a specific definition of 'improved technology' is required, replacing the 'generic description' used now, that defines 'improved' in terms of more efficient resource use.

(This wish list requires a substantial amount of work on the description of the technical coefficients, including comparisons with TechnoGIN-derived TCs. Fang Bin has been responsible for work with TechnoGIN, but is parallelly working on his thesis that should be finished by June, and he is actively looking for a job following his graduation. That means in practice that he will have very little time to work on the subject. That leaves us with a vacancy and a knowledge gap.)

Work on MGLP

- (latest version of) the model has to be checked and first results (more critically) analyzed.
- for some commodities (vegetables, flowers, ..) that have to be locally marketed, a so-called 'downward sloping' demand curve has to be included. The principle has been used in the REPOSA-project, and the necessary preparations should be made.

Work on Scenarios

Objectives to be considered in scenario definition are:

- food security; this should in first instance be defined at county level. It may be considered whether in a later stage this could possibly be incorporated at lower spatial level.
- income
- labor: maximizing labor productivity (but that involves, I think a non-linearity?) could be considered, or minimizing agricultural labor use.
- sustainability; not fully clear what is 'meant' by that; however, in a policy document released by the provincial government last year, emphasis was placed on the need to reduce the use of (chemical) fertilizers and biocides.
- equity; again question whether and how that could be included; if resources are explicitly defined at administrative level, that might provide a handle
- investments; a rather long discussion on the relevance and the way in which that could be included; the reasoning is that when maximizing income, economically attractive activities in terms of the ratio annual income/annual costs could easily be selected, but establishment of such activities (for instance greenhouse vegetables) requires considerable investments. The same holds for instance for production of grapes on soils where the risk of high groundwater tables is high. That could be overcome by installation of a drainage system, again at considerable investment costs.

  (Can 'simply' the required investments divided by technical lifespan be used as annual costs? In Haryana study (SysNet) introduction of capital-intensive technologies was restricted on the basis of farm typology characteristics: 'small' farmers cannot invest 'large farmers' can adopt the most expensive technologies)
- cost/benefit ratio: would that be useful, can that be done?

Planning till June 30

- animal husbandry survey plus data analysis
- survey on woody ornamentals plus data analysis (PPO)
- completion of 'special products'-study in support of the Agricultural Bureau for submission of the plan to the County People's Congress (April '04)
- Operationalization of current version of MGLP and study of results

Planning for period July 1 - December 15

(deadline for 3rd annual IRMLA report)

- improvement of TC-description
- comparison of technical description of land use activities in TechnoGIN and as provided by Extension Service and other agro-technical services in China
- improvement of MGLP

7.3 Results from NISF

The planning of the work by the NISF team is described in the following.

First activities

Group A → few revisions of soil map and rainfall and next documentation

Group B → documentation/publications that support the assumptions of coefficients for different technologies

Group C → remove errors in the program and do sensitivity analysis

Planning for April till September 2004

- Continue development and (preliminary) documentation of methodology steps (resource evaluation (Group A), yield estimation and generation input–output and environmental impact assessment (Group B), scenario analysis (Group C), introduction to case study and synthesis) and component models;
  WUR group initiates elaboration of 2-3 scientific papers on topics such as, for example, (i) evaluation of TechnoGIN for one case study region, (ii) handling of risk in LP / sustainable intensification, (iii) concepts applied for technical coefficient generation for animal activities.

- Establish priorities regarding functionality of user interface for GAMS models including the links to GIS and start designing user interface (Wageningen / C. Dreiser)

- Each team: Make revisions of models /databases (refine and expand), run model for different scenarios, briefly describe results and exchange these during technical workshop at Wageningen in September (1 person per team). Wageningen scientists to review and amend reporting and support teams in model refinement.

Planning for September till December 2004

- Making the tools ready and continue documentation of the methodology and tools for each case study including some preliminary results;

- 15 November: third annual scientific report (incl. manuscripts of case study specific documentation of methodology & tools)

- 15 December: deadline for extended abstracts for SUMAPOL workshop.

7.4 Results from MMSU

The planning of the work by the MMSU team is described in the following.

Main discussed activities

1. Recap of yesterday's activity
2. How to implement alternative technologies in TechnoGIN
3. How to implement scenario analysis
   a. Change in price
   b. Availability of water
   c. Capital availability
4. What can we do for municipal/provincial scale
5. Look at calculations of NPK in TechnoGIN
6. Planning for next year's activity

Ad. 1

The conclusions from the field day were summarized by Epi and supplemented by others. Next, implications were discussed for the technical coefficients and the FHM:

- we need to adjust rice yields: +40% compared to survey, because farmers supplied net yields (= net of labour and land rent costs); for the other crops we decide not to correct, since we have no solid basis;
- Credit: 9% for 6 months
- Sharing arrangement: select dominant; introduce the arrangement-specific for each crop
- some costs (e.g. irrigation costs) need to be verified with what was told in Dingras. Irrigation fee: farmers pay 2x a year P900 for wet season, P1,500 for rice for the dry season; P900 for other crops in the dry season in Saludares; in Bungcag higher

During the discussions later during the day, it turned out that the assessment of water availability for the dry season on LU3 and LU4 (water that can be used for irrigation using groundwater) is not correct: the available water is so low, that no (or hardly any) crop can be grown during the dry season on LU 3 and 4.

The adjusted rice yields were run with TechnoGIN and included in the FHM. It was not possible to come up with new results of the FHM before the end of the workshop.

A recap was provided of the principles of Linear Programming and sensitivity analysis.

Ad. 2

Alternative technologies that were mentioned yesterday can be grouped into the following alternative technologies that might be analysed with the FHM:

- rice-fish cultivation
- livestock production: enhanced breeds and on-farm feed production. Need new LUT for improved grassland; utilization of crop residues: mungbean & corn stover
- integrated crop management: INM, IPM, green manure
  (Agricultural economics Research Institute (LEI, the Hague, the Netherlands) working on IPM for vegetables in Vietnam & China (website: vegsys)
  NUTMON (nutrient monitoring system) – farm surveying activity, look at all inputs/outputs ; Tricho cards, plastic mulch to control weeds)
- mechanisation: increase labour use efficiency (including related to post-harvest losses)
- improved crop cultivars: hybrid-rice, Bt corn
- zonification: with the municipal model, not with the FHM

An introduction was given, to explain how alternative technologies can be implemented in TechnoGIN

Ad. 3

Scenarios and policy instruments to be analysed

- options to release the capital constraints: seed and other input supply subsidies
- changes in commodity prices
- water availability seems to be assessed very optimistically in base runs: in reality a 3rd crop is not possible due to water limitation. The present definition of land units does not easily allow considering water limitation: if the farmer 'pays' he can irrigate. Water limitation could be 'simulated' by restricting the area for the 3rd crop.
  (Water constraint; Even for areas under NIA; Get data from NIA (amount of surface water available); Under base run no triple cropping systems, add a scenario later when water is available to grow third crop)

Ad. 4

Municipal and provincial scale analysis

a. what are the questions at stake
b. feasibility to do this by the group

ad. a:

The following options for an aggregated analysis at municipal scale exist:

1. Aggregation of FTA, B, C, D to Municipal level
2. Municipal model for Dingras similar to SysNet methodology

Why does the team want a municipal model:

- to verify and analyse consequences of production targets
- zonification: is this possible, e.g. can quota systems be used at barangay level.

- to analyze labour surplus or availability at municipal level, e.g. for expanding industries
- what would be/are effects of new or existing policies: e.g. what does it cost that the municipality subsidizes inputs in terms of farm income, food production, environmental issues, etc.
- supply and demand relationships/tensions at farm-municipal scale.

A provincial scale analysis is not perceived feasible.

ad. b:

It needs to be found out how the sampling in the survey took place precisely. Fifteen barangays out of 31 were sampled, with 3 income groups per barangay (not of equal size=number of farms). The precise number of farms per income group and barangay need to be verified: if these are known it may be possible to find out how many farms belong to FTA, B, C and D.

Aggregation via Barangays gives a problem, as the Farm types are not typical for the barangays, i.e. the composition of land resources may be similar to one of the farm types, but the area not. Hence, assigning FTs to Barangays is not without problems.

It is suggested to ask the Municipal officers the number of farms in the strata (income and barangays) that were taken for sampling. This would allow to estimate the number of farms belonging to the various FTs. Once this is known the FTs can be aggregated to municipality. Then, the aggregated areas should be compared with the total land unit areas known for the municipality (via maps that are available at provincial level). If there is a discrepancy for particular land units, then the areas of the various land units per farm type, need to be adjusted, to make the total areas fit. This will require reruns of the FHM.

This aggregation procedure will allow analysis of production and labour scarcity (though the latter requires adjusting of the labour availability assessments: they were different for the farm level versus the municipal level: e.g. student labour during weekends yes/no included.

Analysis of water scarcity is not recommended: data for water availability are very poor.

An outline of a SysNet type of model for the municipal scale was provided (Objectives, constraints, activities).

Ad. 5

Because of time limitation, this item was skipped.

Ad. 6

Planning of the work:

- verify database of current activities: April till May 15
- adjustments of inputs: May 15-June 15
- finalize FHM by June 15
- documentation of FHM after June 15
- parallel to finalizing FHM collecting info for municipal scale modelling (May 15-June 15)

- start to aggregate FHM and develop municipal model: July – October
- revisions + documentation of FHM+municipal models: November
- submission of 3rd Progress report: December

Glossary

BFS Balanced Fertilization Strategy
CAF College of Agriculture and Forestry
CLUP Comprehensive Land Use Plan
DA Department of Agriculture
DD Diversion Dam
FFS Farmer Field School
FHM Farm Household Model
FTA Farm Type A
FTB Farm Type B
FTC Farm Type C
FTD Farm Type D
GAD
GIS Geographic Information System
GMO Genetically Modified Organism
GPS Global Positioning System
HVCC High Value Commercial Crops
LGU Local Government Unit
LU Land Unit
LUT Land Use Type
MAO Municipal Agriculture Office
MMSU Mariano Marcos State University
MPDP Multi-Purpose Drying Pavement
NIA National Irrigation Administration
OIC Officer in Charge
OPAG Office of the Provincial Agriculturist
PPDO Provincial Planning & Development Office
SFR Small Farm Reservoir
SSNM Site-Specific Nutrient Management
STW Shallow Tube Well
SWIP Small Water Impounding Project

7.5 Results from CLRRI

The planning of the work by the CLRRI team is described in the following.

General conclusions

- good organization of stakeholder meeting;
- good presentations from Lai and Cuong;
- too few specialists (SSNM; IPM; agronomy) involved for too short a time
- input from specialists needs to be improved and co-ordinated; otherwise the FHM will just be as good as its rather inaccurate input (certainly it will be a challenge to

realize this within current institutional setting; way to involve (busy) specialists show some results of mutual interest from preliminary survey on technology adoption)
- positive is the clear stakeholder interest and focus on learning more about technology adoption with additional questionnaire
- request to P S Tan on defining 3 reductions 3 gains
- support by Phung on TC definition for site-specific nutrient management; support by Chau on TC definition for IPM
- From September /October Neeltje Suikerbuijk (student at Wageningen university) will do research at CLRRI on markets (see Section 2.5).

Planning for April 2004 till March 2005

2004

1. Documentation of Group A work (land evaluation), see example in Haryana book, chapter 4. (ready June 1)
2. Technologies defined and documented, see example in Haryana book, chapter 5 & 6 on in- and output (ready June 15)
3. Technical coefficients (crops) verified for current and for relevant alternative future activities (ready September 15)
4. Technical coefficient generator (for crops) developed and the technical coefficients for Omon (i.e. inputs and outputs for main crop production systems) documented (ready 1 October)
5. Data for main animal production systems collected (i.e. fish, chicken, pig., etc. from specialists (website for pigs, chicken; Dr Phong, Cantho university)) and the technical coefficients for Omon (i.e. inputs and outputs for main animal production systems) documented (ready begin November)
6. FHM (without risk) fully developed and documentation in draft form (see e.g. documentation of DLV project Mali by G. Kruseman & R. Ruben (1998)) (ready end May)
7. FHM (incl risk) developed (output documentation depends on data quality – biophysical & economic) (ready begin November)
8. FHM with reasonable output (ready end November)
9. Extended abstract of Paper (ready 15 Dec) on model development and results for May 2005 conference
10. Data (time series of yields for specific technologies at farmer field and experimental fields; time series of prices for crop and livestock output over 5-10 years or more; survey data on adoption of technologies) for special study on technology adoption collected and analysed (10 farmers by 1 May ; rest by 15 November)
11. Submission of 3rd Annual Scientific report (ready early December)
12. District MGLP developed (ready end December)

2005

13. Financial report 3rd year (end January 2005)
14. In-country workshop together with NISF at Hanoi (end January 2005)
15. Full paper on Omon case (end Feb 2005)

8. Summary of progress made

Table 8.1 lists the individual workpackages, responsible contractors, time allocated to carry out the required activities and number of deliverables. The current status (8 June 2004) with respect to the various deliverables (completed; in progress, started, not yet tackled) is summarized in Table 8.2.
Work on packages 1-4 and 6 is ongoing and a number of deliverables has been produced in line with the proposed schedule. Work on package 5 will start in month 31.

Table 8.1 Description of workpackages, contractors, start and end of workperiod, and deliverables for the different workpackages within the IRMLA-project

WP no.	WP title	Contrac-tor no.	Start month	End month	Deliver ables
1	Regional analysis of conflicts in resource use	1	2	10	D1-5
2	Analysis of yield gaps and climate-induced risks	6 & 5	3	15	D6-7
3	Technical coefficient generation	8 & 2	6	30	D8-13
4	Farm household model development	7 & 3	13	36	D14-21
5	Multi-scale optimization and analysis	1 & 4	31	42	D22-25
6	Project management and dissemination	1	1	48	D26-28

Due to high research capacity and academic ambitions of some teams, specific in-depth studies have been defined. That means, additional deliverables can be expected (see, e.g. IRMLA Second Annual Scientific Report). On the other hand, high interest of individual scientists (and participating institutions) in mastering the complete set of methodologies and tools has led to extended investment in training activities (e.g. the specific training in LUPAS methodology, held September 17-21, 2002 at Beijing, and on 30 September to 5 October 2003 at Wageningen).

Table 8.2 Status of the deliverables from the different workpackages within the IRMLA project at present (8 Juni 2004)

No	Deliverable title	Status (at month 30)
	WP 1 Regional analysis of conflicts in resource use	
D1	Land evaluation and resource supply and demand analysis carried out for study area : Pujiang county, Zheijang province, China.	**Land evaluation (GIS) carried out**
D2	Regional model output on resource use analysis generated and documented for study area: Batac and Dingras municipalities, Ilocos Norte Province, Philippines.	**Batac is completed, Dingras in progress; output available for province as a whole**
D3	Regional model output on resource use analysis generated and documented for study area: Omon district, Can Tho Province, Vietnam.	**output available for province as a whole; Omon analysis requires refinement**
D4	Land evaluation and resource supply and demand analysis carried out for study area: Tam Duong district, Vietnam.	**Complete set of output available**
D5	Major resource conflicts and constraints for the four study regions identified, interpreted and documented (project report).	**Documentation; draft report is largely realized ->editing**
	WP 2 Analysis of yield gaps and climate-induced risks	
D6	Potential and actual production levels for relevant production systems in the four study regions assessed and their temporal and spatial variability quantified (database).	**For 3 out of 4 regions data on actual prod. available (farm surveys); temp. variability quantified for rice**
D7	Main yield–limiting factors (bio-physical) under prevailing climatic conditions identified; frequency analysis of adverse climatic events carried out and farmers' adjustment. strategies to climate-induced risks assessed.	**Yield-limiting factors identified for all; frequency analysis carried out for Batac/Dingras and Omon**
	WP 3 Technical coefficient generation	
D8	Pujiang county: Input–output relations for actual production systems (and average farmers' practices) established and farm types identified; models, data structure and algorithms for generating technical coefficients for future, alternative (crop & livestock) production systems and techniques identified/developed.	**Input – output database for current systems established; a few checks on data quality required**
D9	Batac /Dingras: Input–output relations for actual production systems (and average farmers' practices) established and farm types identified; models, data structure and algorithms for generating technical coefficients for future, alternative (crop & livestock) production systems and techniques identified/developed.	**Input – output database for current systems established for Batac/Dingras; checks done with several sample farmers**
D10	Omon district: Input–output relations for actual production systems (and average farmers' practices) established and farm types identified; models, data structure and algorithms for generating technical coefficients for future, alternative (crop & livestock) production systems and techniques identified/developed.	**Input – output database for current systems established; still data checks required**
D11	Tam Dao (Tam Duong district) : Input–output relations for actual production systems (and average farmers' practices) established and farm types identified; models, data structure and algorithms for generating technical coefficients for future, alternative (crop & livestock) production systems and techniques identified/developed.	**Farm survey on input – output relations carried out; documentation in progress**

D12	Technical coefficient generators for Pujiang, Batac, Omon and Tam Dao developed, tested and applied; input-output database generated.	**Technical coeff. generator for Batac developed and tested for other case studies**
D13	Technical coefficient generators for Pujiang, Batac, Omon and Tam Dao documented with detailed description of theoretical background and application for one case, Batac/Dingras (Technical Bulletin).	**Technical coeff. generator for Batac/Dingras; documentation completed (QASA report)**
	WP 4 Farm household model development	
D14	Pujiang county: Farm household modeling framework developed for different farm types, required data collection and analysis for model development completed .	**Simple FHM modelling framework available (not strictly a deliverable)**
D15	Batac and Dingras municipalities: Farm household modeling framework developed for different farm types, required data collection and analysis for model development completed.	**Work in progress; prototypes exist for both Batac and Dingras**
D16	Omon district: Farm household modeling framework developed for different farm types, required data collection and analysis for model development completed .	**In progress; base model Omon is available**
D17	Tam Dao : Farm household modeling framework developed for different farm types, required data collection and analysis for model development completed.	**No**
D18	Different farm types, Pujiang county: Objective functions defined, resource availability and quality quantified, additional technological options defined and integrated, socio-economic environment defined, and FHM results generated under current policy.	**No**
D19	Different farm types, Batac municipality: Objective functions defined, resource availability and quality quantified, additional technological options defined and integrated, socio-economic environment defined, and FHM results generated under current policy.	**Yes, prototype and first applications/results available (a.o. used for IEMSs paper)**
D20	Different farm types, Omon district: Objective functions defined, resource availability and quality quantified, additional technological options defined and integrated, socio-economic environment defined, and FHM results generated under current policy .	**Yes, prototype and preliminary results available**
D21	Different farm types, Tam Dao : Objective functions defined, resource availability and quality quantified, additional technological options defined and integrated, socio-economic environment defined, and FHM results generated under current policy.	**No**

D28	Project progress reports (annual), technical reports, brochures, research reports and case study synthesis report published; scientific papers (2-3) submitted.	**1st and 2nd annual report available, 1 planning workshop proceedings, 1 technical report, 4 papers submitted, IRMLA website completed, two 6-monthly progress reports; 2 posters)**

Available tangible outputs (associated with deliverables 1-5, 6, 8-10, 12-13, 16 and 28) include:

- Documentation on conflicts in land use objectives and resource use for Ilocos Norte and Cantho Province and presentations for Batac, Omon and Tam Duong
- Spatial (GIS) databases and maps on resource availability and quality for Pujiang, Tam Duong, Batac/Dingras and Omon
- Climatic databases for all and daily weather databases for Pujiang, Batac/Dingras and Omon
- Potential yield estimations (crop simulations) for Batac/Dingras and Omon
- Databases (in Excel) on actual yields and input – output relations for Pujiang, Omon (series of years); raw data (farm surveys) for Tam Duong and Batac/Dingras
- Soil databases for Batac/Dingras (Ilocos Norte), Omon and Tam Duong
- Prototype technical coefficient generator (TCG) and documentation for Ilocos Norte
- Prototype regional IMGLP for Pujiang and Tam Duong and regional models for Ilocos Norte and Cantho (programmed in XPRESS-MP)
- Prototype farm household model for Omon (programmed in GAMS).

- Scientific Papers published during reporting period:
  1. Van Ittersum, M.K. et al. A systems network (SysNet) approach for interactively evaluating strategic land use options at sub-national scale in South and South-east Asia. Land Use Policy 21, 101-113.
  2. Roetter, R.P. et al., Integration of systems network (SysNet) tools for regional land use scenario analysis in Asia. Environmental Modelling and Software, in press.
  3. Wassmann, R., et al., Sea Level Rise affecting Vietnamese Mekong Delta: Water Elevation in Flood Season and Implications for Rice Production. Climatic Change, in press.
  4. Roetter, R.P. et al., A multiple-scale modelling approach to integrated resource management in E and SE Asia: challenges and potential solutions (CD-ROM proceedings, iEMSs Biennal Meeting, 14-17 June 2004, Osnabrueck, Germany)

- Scientific Papers in preparation :
  1. Ponsioen TC et al., TechnoGIN, a Tool for exploring and evaluating resource use efficiency of cropping systems in East and Southeast Asia (submitted to Agricultural Systems)
  2. Berg, MM van et al., Marrit van den Berg, Wang Guanghuo, and Reimund Roetter (in prep.), Decreasing the use of agrochemicals in rural China: setting priorities for research and policy in Zhejiang province. Presented by Marrit van den Berg at international seminar on Economic Transition and Sustainable Agricultural Development in East Asia, Nanjing, P.R. of China, 20-22 October 2003. (status: project internal review and expansion)
  3. Hengsdijk HH et al. (in prep.), Consequences of technologies and production diversification for the economic and environmental performance of rice-based farming systems in East and South-east Asia (to be presented at WRRC 2004, Tsukuba, Japan)