Sustainable FARMing at the RURal-URBan Interface An integrated knowledge based approach for nutrient and water recycling in small-scale farming systems in peri-urban areas of China and Vietnam

Program and result for the RURBIFARM Workshop and Training

March 9-19 2003

Participants

Institute of Soil Science, Chinese Academy of Sciences

Vietnam Environment and Sustainable Development Institute (VESDI)

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Multiple Cropping Center, Chiang Mai University, Chiang Mai

Thailand

Program for the RURBIFARM Workshop and Training in Chiang Mai, Thailand, March 9-14 2003

Saturday 8
Arrival to Chiang Mai International airport. Representatives from Multiple Cropping Center (MCC), Chiang Mai University (CMU) will pick up all participants. Check in at the Chiang Mai Hill Hotel (20 minutes from the airport).

Sunday 9
Participants will be met at 8.30 a.m. at the hotel lobby for sightseeing in Chiang Mai area

830-1600	Sightseeing: Botanical garden
1600-1700	Afternoon Tea / Snack at the sightseeing
1830	Dinner time

Monday 10

830-1200	Welcome address (Phrek Gypmantasiri, Ingrid Oborn). Reports of the work carried out within WP 1 since we met in Nanjing (all partners prepare) (Coffee break 1030-1045)
1200-1330	Lunch (MCC)
1330-1700	Work Package 1 - Cont., Discussions in groups (Coffee break 1530-1545)
1830	Dinner time
Evening	Preparation for next day.

Tuesday 11

830-1200	Work Package 1 Cont. Discussions (Link over to WP2-3). How to generalise and present the outcome from WP1 (Fergus and others)
1200-1330	Lunch (MCC)
1330-1530	Protocol for crop product quality and food safety criteria (International and national guidelines). (Britta with contributions from partners from the different countries (WP 3)).
1545-1700	Introduction to the Farmer Field School in Ping Noi and MCC experimental station (Prof. Phrek and co-workers)
1830	Dinner
Evening	Preparation for next day.

Wednesday 12

830-1200	Visit to Farmer Field School in Ping Noi
1200-1330	Lunch (MCC)
1330-1600	Visit at MCC Experimental Station, Chiang Mai (management of small scale pesticide free vegetable production and consumer-farmer interaction)
1600-1730	Ban Tawai Cottage Industries
1830	Dinner at Hean Ka Chao Restaurant (Northern Thai Performance and Food) hosted by MCC

Thursday 13

830-1200	Planning of WP2 (Laxman and others) and WP3 (Dr Ha and others)
1200-1330	Lunch (MCC)
1330-1500	Cont. and summing up the WP2 and WP3 planning
1500-1700	Some experiences of participatory modelling and systems modelling (Fergus and others) (WP4) Presentation of experiences from campaign for consumer and producer/farmer interaction (Phrek, Kuson and Nong) (WP.5B)
1830	RURBIFARM Party hosted by Coordinator

Friday 14

830-1200	Planning of WP4 (Karin and others) and WP5 (A. Prof Can and others; and B. Prof Phrek and others)
1200-1330	Lunch (MCC)
1330-1500	Cont. and summing up the WP4 and 5 planning
1500-1700	Final session. Work Plan to the next workshop (May 2004). Discuss and agree on 'Principles for data sharing and publication'. Publication plan. Guidelines for Preparation of Annual Report.
1830	RURBIFARM Party hosted by Coordinator at Sib Song Panna Restaurant (Northern Thai Performance and Food)
2000-2200	Visit to Night Market in Chiang Mai

Saturday 15

1000-1200	Introduction. Concepts for element balances in agro-ecosystems (Ingrid and others)
1200-1330	Lunch (MCC)
1330-1700	Cont. (coffee break 1530-1545)

Sunday 16

830-1200	Modelling states and flows of water and nutrients at field level-exercises (Coffee break 10.30-10.45)
1200-1330	Lunch (MCC)
1330-1700	Cont. (coffee break 1530-1545)

Monday 17

830-900	Summing up GLEAMS modeling exercise (Karin and Faruk)
900-1000	Introduction: Quantification of element flows and pools. How can we make quantifications of inputs (manure, fertilizer, irrigation water, atmospheric deposition etc) and outputs (harvest, run-off, leaching etc)? (Ingrid and others)
1000-1200	Some practice at the MCC filed (groups)
1200-1330	Lunch (MCC)
1330-1700	Reflections and discussions from the field experience. Introduction: Sampling strategies-where to take samples? How to take samples? How to treat the samples? (Coffee break 1530-1545) preparing for field studies in Ping Noi (different tasks for different groups)
1830	Mid Training Party (MCC, Organised by the Vietnamese team with cultural contributions from everyone)

Tuesday 18

830-1200	We carry out field studies in Ping Noi
1200-1330	Lunch (MCC)
1330-1700	Reflections and summing up from the field study. Prepare a report from the field study (some participants). Cross country planning for WP3 (Key scientists) (coffee break 1530-1545)
2000	Farwell, we meet at a pub/bar

Wednesday 19

830-1200	Decision support tools. As an example we assess the risks for nutrient (P) losses at field and catchment scale (coffee break 1030-1045) (Faruk)
1200-1330	Lunch (MCC)
1330-1700	Final session. How to implement the knowledge gained during ToT2 at the RURBIFARM sites? What's the next step when we come home? Planning of Wp3 (field work, laboratory analyses, data evaluation) in country groups. What should be included in ToT3? Evaluation of the ToT2 (coffee break 1530-1545)

Day 1 Sunday 9 March 2003
Site seeing

Day 2 Monday 10 March 2003
Objective of meeting workshop
Schedule of the workshop and training
Name of participants
Morning file
- Presentation file of Vietnamese and Chinese groups
- Other additional files

Afternoon file
- the discussion output from 2 groups

Discussion on Similarities and differences
- Group 1 : Wuxi, Than Tri
- Group 2: Nanjing , Tu Lieun

Criteria	Wuxi	Than Tri
Methods		Irrigation system
Socio-economic	- main sources of income - hh economic -farmer homogeneity	- type of farming communities
Farming management system - cropping system - crop management - use of chemical fertilizer		
Marketing opportunity	Vegetable types	
Problem severities		
Level of analysis - land degradation		
Influence from cities - distance from city - use of urban waste - hh waste - pathway		
stakeholders		

Rate of change in land use/activities
- pollution pressure
- farmer knowledge, education
- consumer awareness
- ecological characteristics
- land elevation
- soil types
- institutional organization (farmer, local)

Criteria	
1. farming system management - irrigation	Farm size Management Use (flow of waste)

2. Socio-economic -type of farming community (contribution of vegetables production on hh economy = rate of change; such as land use (population movement)	
3. Natural condition - climate - soil - water	
4. Environment conditions - pollution, source of pollution and severity - waste management and pathway - risk assessment	
5. farmer characteristics - settlement history (local, immigrant) - farmer education & knowledge - farmer homogeneity	
6. consumer-producer interaction - consumer awareness - market opportunities	
7. Institutional aspects - farmer organization - external supports; policy - stakeholders structure and institutional aspects	

Criteria group 2

Mapping
Interview
In-depth farmer interview
Pathway analysis of flows; manure, waste water, fertilizer, input form industrial sources, pesticides
crop rotation
soil sampling
Type of farming systems
Nutrients and inputs ; quantity at the farm gate level, types; chemical and organic, cow manure, human manure
Pesticide 'in Najing limit by government

Day 3 Tuesday 11 March 2003

Methodology

- Mapping (use secondary data)
- Field survey ; PRA, RRA under key informant, formal survey
- Laboratory analysis
  - Soil
  - Water
  - Sediment
  - Cow manure, organic waste

- input-output analysis
- pathway analysis
-

Methodology	similarity	differences	
		Wuxi	Thanh Tri
1. secondary data		- air photo 1:3000	-
2. mapping		- detail mapping with aerial photo	1:25000
3. field survey	RRA, RRA, key informant-HH interview		Formal survey
4. lab analysis -soil -water sampling technique		-water (N,P) -heavy metal in veg./water -use existing data from other for organic manure analysis -solid + water samples being taken for lab. analysis	Existing data use from other project
5. input-output agricultural inputs (as source) township at country level - city (urban waste) - agricultural activity waste	Descriptive analysis		Focus on water waste - waste water - analyze at Hanoi's level
6. path way analysis industrial waste	Descriptive analysis -N, P heavy metal and organic manure - Water quality at (up-middle-low)		

Group discussion: Group 1

	similarity	differences	
		Wuxi *	Thanh Tri
1. Farming system - farm size	Small commercial farm	Backyard farming (0.5 Mu. For vegetable production/hh) 1-2 mu for rice	Upland is more chemical fertilizer
- diversify	Diverse spp., year round production	-common vegetables	Upland more water, type of veg.
- nutrient input	Chemical fertilizer	chemical fertilizer animal manure (Chinese cow, goat, pig)	No human manure No goat Waste water, sediment
- vegetables			onion, cabbage, tomato, cucumber, celery, lettuce, bean <u>Water vegetable</u> Water celery, morning glory
- pesticide		More pesticide based on pest incidence application depend, Herbicide (migrant) on price of vegetables (no detail information on pesticide use; types, dosage, frequency of application	More pesticide but for water vegetable no pesticide used
2. socio-economic	Rate of industrial growth and urbanization	Very fast	Fast
-contribution of veg. Economy		Local = 0-10% Migrant =>80%	50% of agricultural cash incomes from veg. (20% of total hh income from veg.)
3. farmer characteristic	Small farm	- Local farmers' produce for hh only - migrant farmers' commercial veg.	Local farmers for commercial production
-settlement		- 2-10 yr. For migrants (conventional of rice-land to veg.)	>100 yr (rice-fish, rice-veg, rice-fish-rice-veg., rice-rice-veg) flooded area
-type of veg. That produce depend on	- homogeneity	- local ; old man and lady	- woman more than men in commercial

market produce		migrants; young migrant family	veg. production
4. Natural conditions	Rainfall	- 1057 mm - temp =15-4 C - spring, summer, autumn, winter - 7 dry, 5 wet months	- 1800-2300 mm - temp =10-35 C - spring, summer, autumn, winter - 6 dry, 6 wet months
- minimum data	Soil (minimum data)	- paddy soil	- fertile soil
- water resource	Irrigated, pumped, government system (water &electricity fee)		
- distance from city		10-14 km	- 6-12 km affect of marketing potential
5. Environmental			
- source of pollution	- heavy metal, micro-organisms	- local factories	- inside community - domestic sewage/solid waste - neighboring factory - outside community
- severity	- high concentration at critical level		
- waste management	- management system	- not being analyzed	Hanoi city - solid waste collection & disposal - waste treatment
- risk assessment	- based on secondary information		under city municipality “Hanoi city Environmental office” (HCEO) (URENCo)→ (DOSTE) - Urban Environmental Co.
7. institutional			
- farmer organization		- independent grower	- cooperatives for resource use - irrigation - electricity - credit independent social organization recognize by government

- external support		-technical advice (fertilizer, pesticide, new varieties) - extension at the village level	- extension system
- stakeholder major stakeholder - extension agents - farmers - local traders - consumers - local government - NGOs - Civil group; consumer protection group, women group, religion group - Private companies - Super market - flow of information - technical information - marketing information		- GOs	-GOs, NGOs project

***** local people that purchase for their subsistent is out of order

special area for 'clean' vegetable production, quality control system not well established

wp3; quantify of the input use: chemical fertilizer, pesticide and spatial variation

After break

Generalization

1. production of RURBI Farm report
2. major partway the result of WP1 the useful of WP1 is the use of others wp
3. type of publication will produce?

Before lunch consolidate the output between Vietnamese and Chinese

Plan for publication (PowerPoint presentation copy file…Dr. Slinclare)

Chinese
The plan of publications in wp1 for ISSAS Team 4 paper in English will publish

- Farming system
- Spatial analysis: distribution of metal
- Identify the heavy metal and other residual effect
- Find out the Source of heavy metal
- The characterization of the small farming system in the data of Yangtze river relation to the development of

Vietnamese

1 Participation characterization of peri-urban focus on methodology and comparing how it is function into two sites wp1 and wp3 (Vietnamese and English)

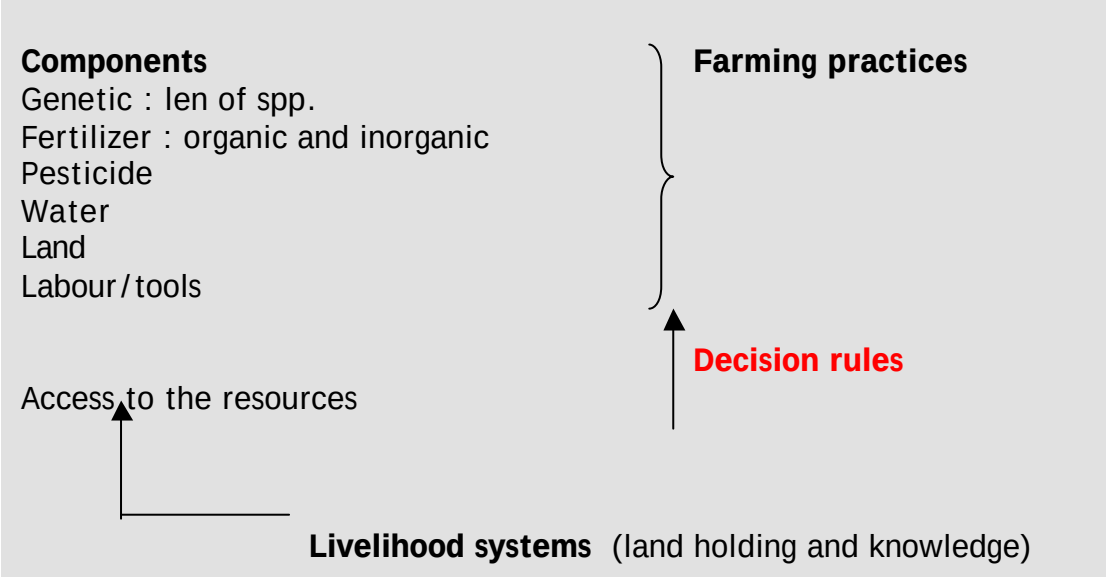
- Introduction
- Objective
- Process
- Tools
- Description of method use
- Output from two sites
- Usefulness of two site of farming system in both two sites

How to interpret of the qualitative data

Largely qualitative information about farming systems and the food chain.

- be explicit about scale and systems
- retain and embrace variability, use methods of presentation that reveal it
- 'typify' and discuss variations rather than 'average'
- classify by underlying 'driving force' rather than resulting 'performance'

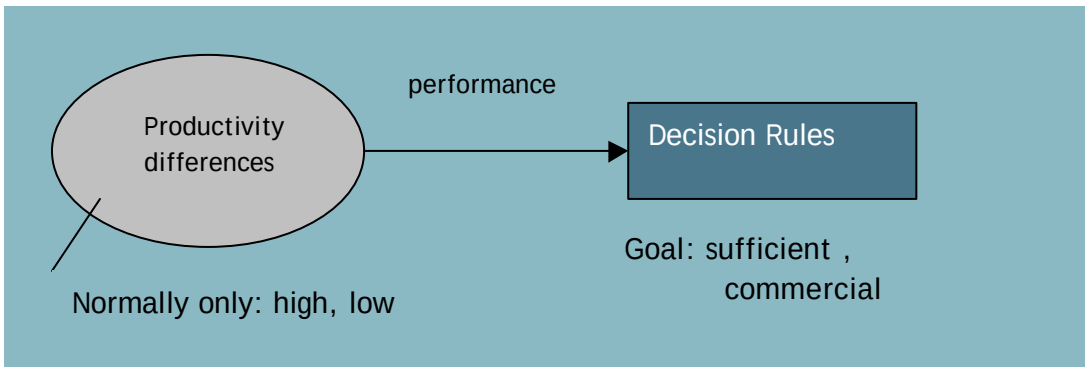
scale and complicity



- Different land type have different land potential
- Typically farming practices
- Embrace variability
- Driving force that make different in farming practice (economic benefit, labor productivity)

China

Waste --→ Nanjing-city waste
--→ Wuxi –factory waste } Not solid waste



Part II

More on risk assessment and food safety aspect

- use of urban waste in vegetables production

Emerging food safety concerns:

1. Environmental contaminant: -heavy metals
    a. Risk assessment (form field/water to where?)

2. residue from agricultural production
    a. pesticide
    b. other residues
    c. characterization, exposure assessment
    (who ? estimate of residue levels? – prediction of daily intake?)
    d. risk communication
3. waste related pathogens
    organic cause most waterborne infections
    a. bacteria
    b. viruses
    c. parasites

Decision making level associate with the livelihood system it depend on their knowledge and farming practice. The livelihood that will effect to farmer decision making.

Paul Richards : Determinant factor that may effect farmer decision making eg. Socio-economic , biophysical, labor etc.

Embrace variability
Slide insert
- description of qualitative and quantitative information showing heterogeneity

Typify rather than average

After lunch

RURBIFARM Decisions to make (slide Britta)

Consumer producer

1. Safe vegetable?
Stakeholder view on quality criteria?
What wp? What method?

2. What to review? (review utilization practice?)
Toxic organic chemical (Cd, Pb, Cu, etc.)
Pesticides (which ones?)
Microbial contaminants (e-coli, parasite, etc.)

3. Any laboratory analysis of food? If so where?
What methods?

4. What the level of analysis?
Compare to national land CODEX safe limits, approximate daily intakes?

5. Diagnosis with farmer on practices and possibilities?

comments
- Look at the of farmer make use of data or use information of high risk or hazard of heavy metal
- Work package 1 between package 1-5

Group 3 excercise

Safe vegetable

- fresh
- no pesticide residual esp. DDT, organic phosphorus
- no antibiotics
- pathogens, microbial, virus, bacteria, nematode
- good taste
- meet national standard
- traceability: where it is produce and how?
  Locally vs remote place
  Labeling

getting the idea

- wp1 to wp2 how to match between local knowledge and measure the method Indicating analysis

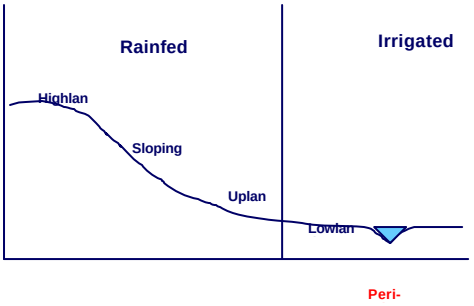
Scale and Stakeholder

- landscape level
  - list stakeholder groups: village/group
  - key issues
- farm (HH)
  - list stakeholder groups: also who does work ?and who makes decision? (about cultivation and investment)
- market
  - list of markets
  - list of stakeholder groups
    - consumer individual: gender, age
      business: restaurants, factories
    - seller: farmers
      dealers: small local surrounding (hotel), large external
    - quality controllers, market managers, officers

Brief on FFS of Northern Thailand by Phrek Gypmantasiri

Overview of vegetable in Northern Thailand

Vegetables in the North



Highland vegetable system (picture)
Sloping upland vegetable system (picture)
Upland vegetable system (picture)
Lowland vegetable system (picture)
Lowland vegetable system (picture)
Peri-urban vegetable system (picture)

Lowland vegetable ecosystems

- Vegetables on the elevated rice land
- Vegetables on the converted rice land

Vegetables on the elevated rice land

- Elevated land patches in the rice field, consisting of well drained soils, are favorable for production of rainy season vegetables and tobacco
- The patches are small but are important for generating cash for rice farmers during rainy season, when rice is grown for subsistence

Vegetables on the elevated rice land (cont.)

- Important vegetables are: Chinese cabbage (Pak Choi), chili pepper, pumpkin shoot, sweet potato, and staking crops such as cucumber, yard-long bean, angled loofah

Promising sites selected by private companies to introduce new species or varieties: snap-bean, bitter gourd

Vegetables on the converted rice land

- Urbanization and land speculation during the late 80s has encroached traditional rice land
- Conversion of rice land to fruit-tree based has increased land value
- The absentee landlord allowed nearby farmers to cultivate vegetables to benefit fruit trees
- The 1997 financial crisis offered opportunity for the landless farmers to rent the land for vegetable farming

Vegetables on the converted rice land (cont.)

- Agricultural Restructuring Program (ARP) during the mid-90s has converted rice land into integrated farms and fruit-tree based land use system
- Vegetable crops are important components in the land use transformation
- Fruit crop,such as *longan,* and vegetables replace traditional lowland rice along the Ping river

FFS approach

- Concept was developed in 1989 for farmer training on IPM in rice farming systems in Indonesia
- Seeks to capacitate farmers to solve problem and create initiatives by fostering participation, self-confidence, open-dialogue, joint-decision making and commitment
- Group learning based on field observation and inference and on experimentation
- Adult education

- Knowledge intensive and location specific

Objectives

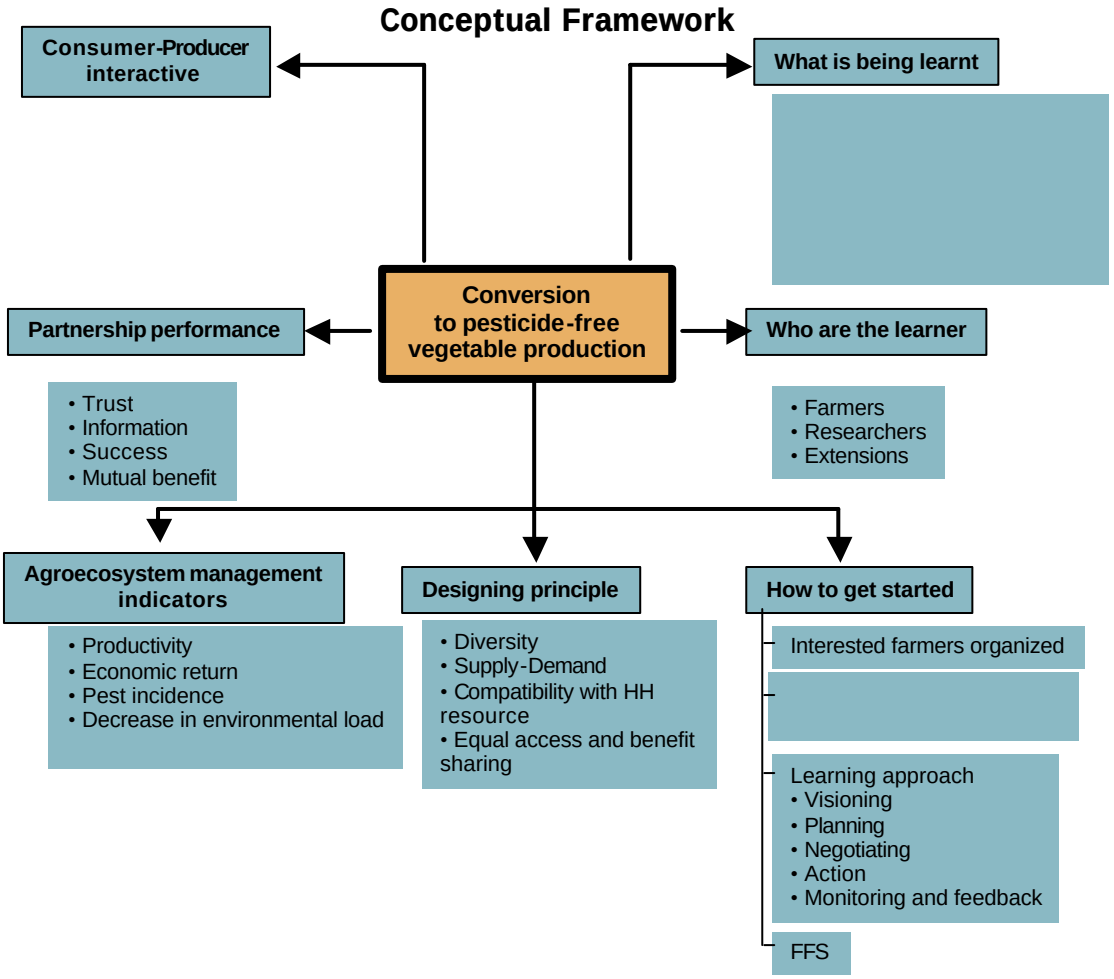
- To introduce FFS as a platform for developing an integrated management of pesticide-free vegetable production in the peri-urban area of Chiang Mai province
- To capacitate farmers' knowledge and skill in PFV production and marketing
- To assess farmers' performance on agro-ecosystem management and partnerships

Context

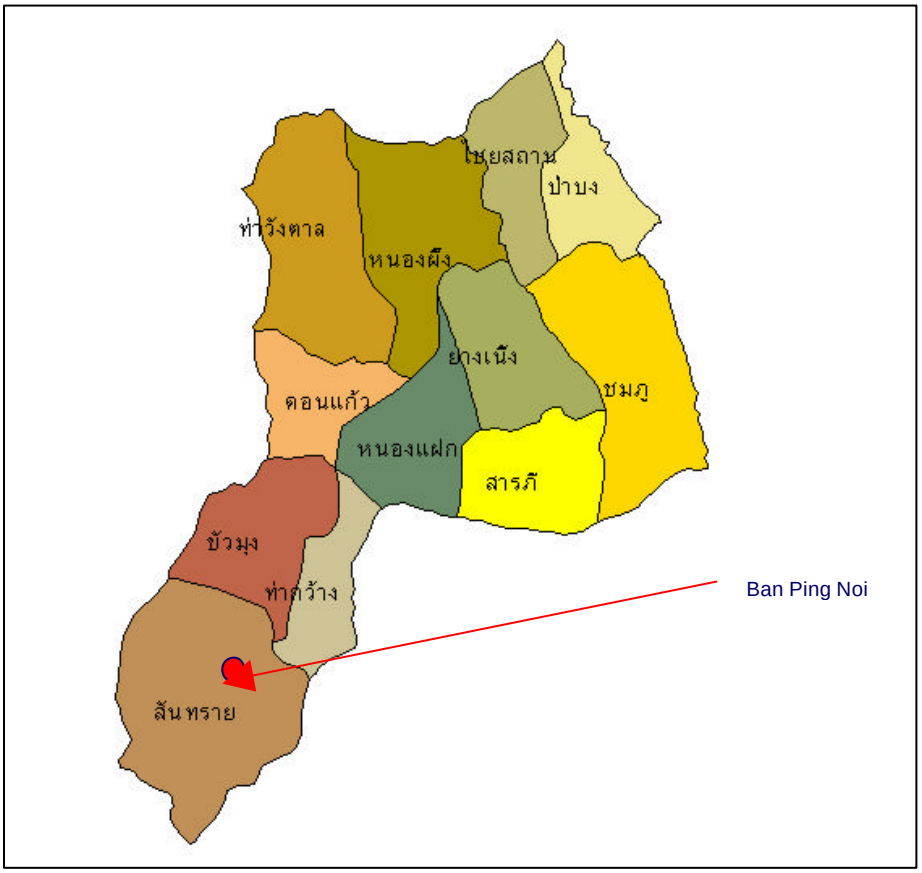
- Commercial vegetable farmers whose daily income are from sale of vegetables
- Commodity is perishable and vulnerable
- Production stability and market opportunity have to be integrated

Conceptual Framework Studied site

- Ban Ping Noi, Tambon San Sai, Saraphi district (40 km. from Chiang Mai)
- Flooded plain, irrigation serviced by Mae Ping Kao Project
- Traditionally, rice producing area
- Today Tambon San Sai is the largest vegetable producing area of Saraphi district
- Land use change : factors and consequences
  - urbanization,
  - agricultural restructuring program of DOAE
  - economic pressure,
  - commercial production strategies
  - field crops to fruit crop and vegetable integration



Studied site (cont.)



existing farming system management

- Vegetable system (with and without fruit tree (Longan) integration)
- Pak Choi 5-6 cycles per year
- Chili pepper – long maturing
- Egg plant – medium maturing
- Intercropping Pak Choi or Chinese parsley with Chili pepper or eggplant

Existing farming system management (cont.)

- Wide raised bed
- Irrigation trench, watering by spraying with pump
- Mulching with rice straw
- Over use of chemical fertilizer : urea
- Over seeding by broadcasting directly to the production fields
- Pest control by chemicals
- Limited use of compost and animal manure

Farmers' vision on future agro-ecosystem management

- Complete conversion to PFV
- Anticipating premium price for PFV
- Allowing set-aside plots for regenerating soil fertility
- Transforming aged, less productive longan orchard to PFV production
- Improving efficiency through higher return per unit planted area and per personday
- Healthy environment

Resource, services and support needed

- Technical advice for production plan and planting design
- Maintenance of productivity through better management practices (ICM)-target yield
- Marketing information and arrangement
- Establishing farmers-corporate partnership

The initial planting design (first cycle-December-February)

The planting design was based on the following principles :

- Use of agro-biodiversity
- Supply meets demand
- Compatibility with household resources
- Equal access and sharing benefits

The initial planting design (first cycle-December-February) cont.

- Six species with maturity ranged from 32 to 45 days
  Pak Choi, Water convolvulus, Chinese amaranths, Kale, spinach, Hong Te
- 18 members were divided into 6 groups of 3
- Each member allocated about 800 sq.m. to plant 6 species

6 species of vegetables

The initial planting design (first cycle-December-February) cont.

- To planting designs
  - Each group planted each species differently at 5 day intervals
  - Each member divided 800 sq.m. into 6 equal parcels, and planted 6 species simultaneously in each parcel at 5 day intervals.

Farmer assessment of the first cycle

- 6 species were not diverse enough to provide marketing stability
- Design 1 not effective to provide equal benefit
- Yield variation across farms
- Farmer heterogeneity: resources, goals, skills, and exposure to outside sources

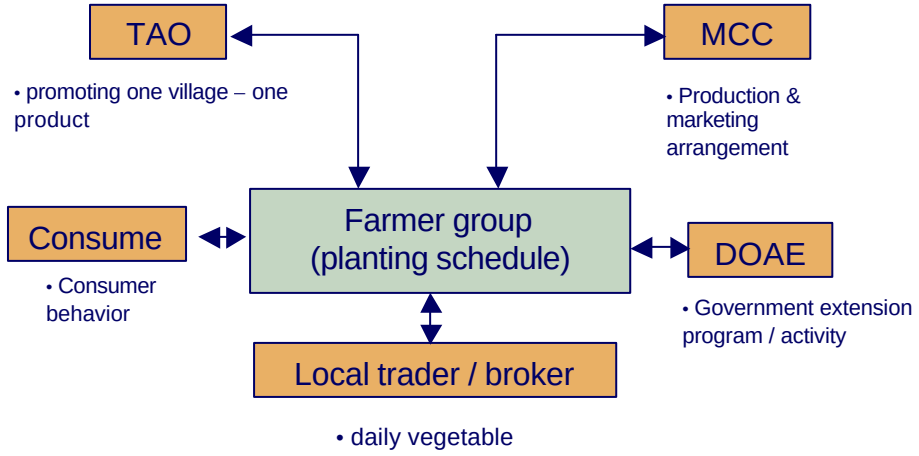
Farmer assessment of the first cycle (cont.)

Change in income	%
- 10%	14
- 20%	14
0	29
+ 10%	29
+ 20%	14

Farmer modification for 2nd cycle

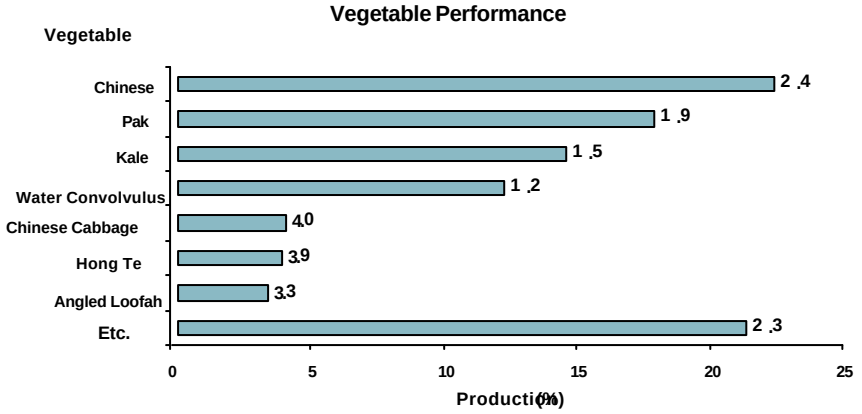
Vegetables	Production risk	Price	Market demand
1. Water convolvulus	1	Moderate	Unlimited
2. Chinese convolvulus	1	Moderate	Small
3. Coriander	1	Good	Unlimited
4. Leaf lettuce	1	Moderate	Small
5. Onion	1	Good	Unlimited
6. Pak Choi	5	Good	Unlimited
7. Sweet corn	2	Good	Unlimited
8. Kale	5	Moderate	Unlimited
9. Loofah	1	Good	Unlimited
10. Snap beans	2	Not known	limited
11. Cauliflower	3	Moderate	Unlimited
12. Pak Pang	1	Moderate	Unlimited
13.basil	1	Good	Unlimited
14. Mint	1	Moderate	Unlimited
15 Apium (chrysanthemum)	5	Moderate	limited
16. Celery	2	good	Unlimited

Flow of information

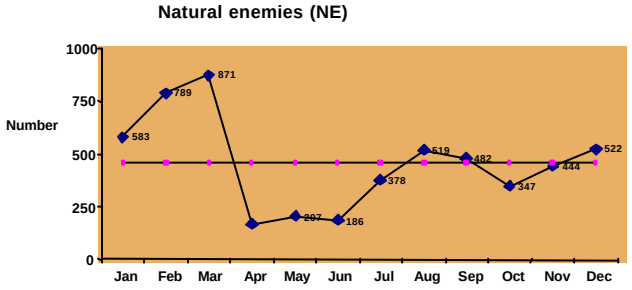


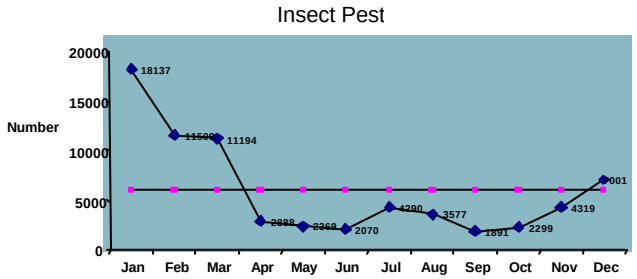
Vegetable Species in MCC Experimental Station

Production

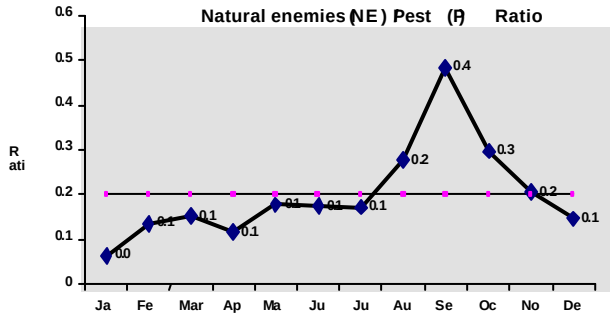


Distribution of pests and natural enemies





Pest and natural enemy relationship



Vegetable production system

- Market driven
- Mono-cropping, strip-cropping and confined to a few species
- Chemically-based
- External seed resources
- Contracted to local traders without price guarantee

Cultivation practices

- Cultivation on raised beds with surrounded trench to facilitate irrigation management
- Rice straw for mulching
- Compost broadcasted as basal application, followed by top-dressing with chemical fertilizers (urea)
- Application of pesticides is based on personal judgment and experience
- Broadcasting seed directly in the production plot is more preferable than transplanting

Cultivation practices (cont.)

- Over seeding
- Over watering
- Over fertilizing
- Soil resource regenerating practice is minimal
- Continued cultivation of same species is commonly practiced
- Productivity is maintained by application of fertilizers and pesticides
- Use of compost is limited

Marketing

- Contract
  - With minimum price guarantee when trader provides seed materials
  - Without price guarantee, trader as broker, price varies from day to day
- Wholesale price is about 2.5 times higher than farm gate price

Institutional support

- Extension service is confined to nutrient and pest management
- Bio-fertilizers, plant extracts, bio-pesticides
- IPM: principles and practices. Key pests and natural enemies, pest life cycle, cage-rearing of natural enemies
- Introduction potential buyers to farmers
- Local extension office is not capable of handling marketing arrangement

Farmer knowledge

- Limited on seed resources and varietal selection
- Proper use of chemicals for pest control is not adequately practiced
- Nutrient management is not well understood
- Good knowledge on vegetable adaptation over seasons and sites
- Good knowledge on pest incidence
- Little experience on marketing arrangement

Organic agriculture and safe food -good health movement

Organic Agriculture Initiative

- NGOs led development, links to national sustainable (alternative) agriculture network
- Farmers' initiative: New Theory/ Integrated Farming Groups

Organic agriculture initiative (cont.)

- DOA- OARD 1 (Office of Agricultural Research and Development Region 1)
  - Sustainable Agriculture Development Project(SADP)
  - Sustainable Agriculture for Environment (SAFE)
- Universities and Educational Institutions

Market and distribution of organic and safe agricultural products

- Contract
- Non-contract
  - Community market-daily/weekly
  - Target group delivery system
  - Selected distributing sites
  - Central market for wholesale and retail (*in progress*)

Product differentiation

- Labelling
- Packaging with fixed price at Baht 5-10
- Source of production
- Certification by DOAE

Constraints

- Public awareness on safe products is not widespread
- Public uncertainty on the products with no label
- Anticipated higher price limits the distribution of product in the wholesale market
- Wholesale market pays little attention to organic and safe products
- At present, organic and safe products work best in retails and contract market, but demand is still small

Question
What is incentive for farmer join in the program?
Do they get benefit from the PFV?
Is it the price?

- The conventional the price different 2.5 time different
- Develop new way of packaging
- Convenience of way marketing

How long prepare before starting FFS?

- start talking on October but because Of flooding
- start at September
- start first planning on 25 December

Pest incident

What plan for tomorrow?
Meet farmers

How to convince the consumer the buy the PFV in high price? (Problem competition safe vegetable high price and high quality other market safe)

- not so much competition between other place
- price farmer based on MCC price

Question
What is your goal of PVF production to increase of the producer?

- We don't set that but consumer get hardly to find the product so we try to establish meet between consumer and producer and as the same time of the government Try to promote 'safe food' .
- Hope to establish CSA like Europe.

Time table for tomorrow :
8.15 - pick up at the hotel direct to farmer field (less than 1 hr.)

- talk with farmer
- lunch at MCC
  station
  cottage industry
  dinner outside will hosted by MCC

Present the outcome of working package 1

Day 5 Wednesday 12 March 2003

Field Trip at Ping Noi

Day 6 Thursday 13 March 2003

Objective of Sustainable farming at the rural -urban interface

- to contribute the development of more sustainable interaction in the peri-urban interface through effective recycling of by products, waste
- High profitability for farmer
- Food quality and food safety low environmental impact and high
    - What need to be done in wp1
    - profitability for farmers
- group discussion Tu Lien, Than Tri, Wuxi, Nanjing (WP2) and Ping Noi (bio-physical, flow planning)

Session

8.30-10.45	To identify the key issue and hot spot publication
10.45	coffee brake
10.45-12.00	Group Discussion
12.00-13.30	Lunch
13.30-17.00	Afternoon Session
19.00	RURBIFARM party

vision

- recycling water natural effect SAFE

Ping Noi

Analyzes Farming system
Management practice nutrient, physical

- Pattern and identify the hot spot and to identify the key issue to work from stat until reach the vision
- The wp 2-3 following the wp1
- How the overall plan is possible to do? What would you like to do eg. Ping noi in term of characterization of farming system

Suggestion for the plan this morning

- Clear in objective

Comment: work package and output will different depend on different objective of each wp

Minh Ha Methodology

- Site is representative for the large area
  The pattern can be extrapolate of the one or two pattern
- Transparent in methodology
- Hypothesis what is right and wrong

Vietnam suggestion

- Interaction between urban and rural
- Policy issue
- Farming system
- Socio-economic issue

Laxaman

- We dialing with the Demonstrate potential farmer knowledge, modeling , farmer approach.
- Many other aspect in the issue : policy, economic that is the bottleneck

Minh Ha

- what is the urban and what is the rural? The dynamic we need to look?
- We do not solve the whole problem? Emphasize what is possible to do?

The early phase :
- research oriented : to complement the science report to different language
- Extension the implementation and the outcome important to develop the implementation

Individual Note (Budsara)

Strong point	Week point	Further develop
- MCC-producer supporting - FFS - Consumer behavior	- the interaction between consumer and producer - the wilder of market of PFV	- seek the relevance partnership - the linkage between MCC, other organization eg. Provincial health, TAO, etc.

Group Discussion

What we learn from two days workshop? What does it help to improve our work?

1. site characterization: inclusion
    1. water quality
    2. Sediment quality : nutrient replenishment
       Flow of water: inlet and outlet
       Both issues is important resource for cultivation
    3. farmer knowledge on resource quality eg. Water sediment and soil quality farmer are not familiars with.

Peri_urban is not only vegetables which we emphasis on vegetables, (Do we need to integrated vegetables and fruit crop?) but do not neglect fruit crop

Land use is strong fruit crop interaction but emphasis on vegetable production

2. characteristics of vegetable
strong link to market
perishable crop
intake per capita still low (target 0.5 kg/day/capita)
diversity of vegetable : leave type, fruit type, root type etc.
late of maturity
implication : need more skill and knowledge intensive
- Agro-ecological knowledge

- market distribution

3. Farmer characteristic
    1. livelihood analysis: who is doing what? Output reach to strength and weakness of farmer

Further development

1. Special distribution of central and community market
    - special information map
    - distance map
2. platform establishing for consumer and producer dialogue
3. partnership eg.
    - environmental: water quality (provincial health)
    - local government: TAO, Municipality

Example of work on environmental health
Target: PFV in irrigation system
Methodology: stakeholder workshop
Partnership: TAO, Municipality, industrial company, health department

- low environmental impact : agriculture and environment
- high profitability
- food quality, food safety for consumer

How to link with wp 2 : farmer knowledge

Principle

1. Natural condition: soil, water, and climate
2. Crop diversity
3. Nutrient management and nutrient cycling
4. Pest and natural enemies (principle of co-existing)
5. Marketing:
    - knowledge about consumer
    - Marketing and distribution
    - Pricing : price setting (cost, competition)

Farmer knowledge about price setting

- distribution channel
- post harvest handing
- grading
- value added: mix cooking ingredient, repacking,
- package
- quality control

Target : user, output of diversity, type of Journal

Topic:	End-user	Type of journal
Consumer and producer behavior in peri-urban of		
Farming and ecological		
FFS		
Pricing ability change from the conventional to pesticide free vegetable		

Transformation of chemical vegetable		
Farmer Characterization and farming characterization		

Hypothesis
Is it possible to use this pattern in other area?

After Lunch

Group Discussion with Karin and Ingrid

Low environmental impact
High profitability
Food quality, food safety

Swps: Modelling,
Case studies
FFS
Stakeholder analysis

Type of output
- International journal
- Others (depend on institutional capacity)

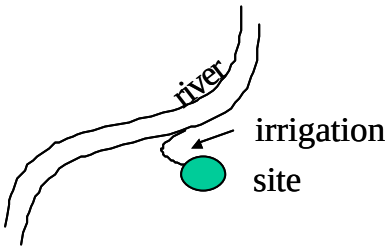
Wp 1 characterization
- resources for 'vegetable production'
  - water quality
  - sediment quality

  } Effect crop production in case of contaminate
- Farmer knowledge on resource quality
  - Poor FK in Ping Noi case
- spatial distribution of central and community market
- farmers livelihood system

Peri-urban agriculture
1. strong fruit-crop vegetables interaction
2. fruit and vegetable consumption
3. emphasis of vegetable crops
   - strong link to market
   - perishable crops
   - intake per capita is still low
   - target consumption about 0.5 kg/kg per capita per day
   - diversify : leave, fruit, root tuber, range of maturity, nutrient value
   - knowledge intensive
     - ecological
     - market distribution

Work Package 2
1. Natural condition soil, water, and climate

2. Crop diversity
3. Nutrient management and nutrient cycling
4. Pest and natural enemies (principle knowledge of co-existing)
5. post harvest handling and value added, quality control
6. pricing : How farmers think about price setting (is it local knowledge?)



Stakeholder:

1. Royal irrigation Dept RID
2. Department of Environmental Protection
3. Health
4. Industrial promotion
5. Provincial agriculture
6. local government : NGO

May related to farmer livelihood

Objective : To increase awareness of the stakeholders in possibility and constraints of current nutrient and water recycling in farming systems.

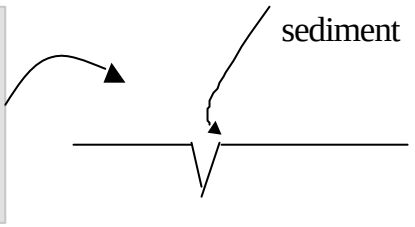
Ingrid comment

1. How the site represent the whole picture? How the site related to overall picture? (similar soil type)?

Compare soil data with the standard eg. Main element

input

- organic manure : how much, what type?
- chemical fertilizer
- straw mulch
- bio-fertilizer



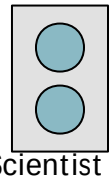
Comparing element of china and ping Noi

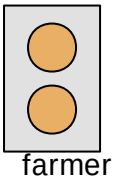
	CM	Nanjing
Ph	-	
Om	-	
Zn	1	2
Cu	2	1
Soluble Cu		

Note:

- Parent material ca on top soil the soil profile of the system, how the water move, root move or the water level: badly area and good area
- 80 cm depth see
- root pattern
- N, P modeling how much intake, leaching, lost
- minimum data set for modelling

soil profile


Scientist


farmer

Good area

Bad area

Issues	good	bad
1. biological indicator		
2. physical indicator		
3. soil depth make assessment		
4. cultivation		
- rice-garlic-Logan vegetable		

Future plan

Production aspect		
1. FFS in second cycle		
2. How Farmer make use MCC's marketing information?		
3. sustainable of this system? Convert to PFV Production, Social relationship, group commitment?		

Vietnam

- water and sediment
- solid/material flow: to the city, plant sample for analyze method
  - soil analysed according methods prepared by ISSAS/SLU
  - water and plant analysed
- review literature to compare the current reports

China

Wp1: work gap between present and further work

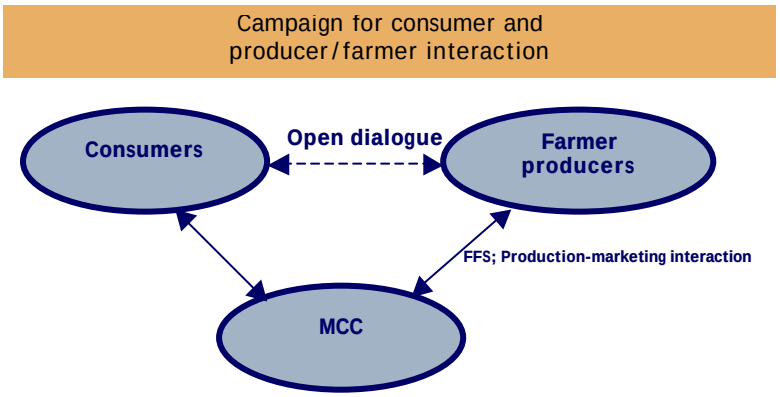
- investigate the detailed pesticide use, type, amount and time schedule etc.
- information flow among different stakeholder (methodology?)
- how to link wp1 …..wp5?

Wp2

- interviewing the group of key stakeholders (3 or more depending on the stakeholder analysis)
- certain of knowledge bases (farmer and market) with the supervision of Laxman and Bright (msc. Student from UK) + Chinese collaboration
  - specification
  - complication
  - verification and valuation
- Explore LK, involve broad group
- Verification for other site
- Decision making

Thailand
Research focus:

RURBIFARM : FFS, Campaign, farmer experimentation



MCC-Farmer interaction

- Farmer Motivation
- Farmer awareness
- Health and environmental hazard of over use of chemicals
- Ecological principles that work
- Production and marketing integration
- Farmer capacity building

MCC -Consumer interaction

? Consumer behavior

? Consumer awareness

? Consumer services

Consumer-Farmer interaction

Weak link
Facilitating role of MCC
Establishing platform for consumer-producer dialogue

Consumer

❖ Type of consumers before campaign
Almost are working in GOs
Number of samples

Consumer survey

Age year
Education level
<bachelor
bachelor
>bachelor
Income
< Baht Month
– Baht Month
> Baht Month

Perception on PFV

Regular buyers
Occasional buyers
Non-PFV buyers
No response

Frequency and Value
Frequency of buying
per month
Value baht month

Farmer interested in PVF

Very high
Moderate
Low not interested
No response

Type of vegetables

Organic vegetables
Pesticide-free vegetables
Safe-use of pesticides
No response

Reasons of consumers for not buying SV PFV OV

Not easy to access
Required product not available
High price
Uncertain about quality
Others

Consumers' Decision Criteria on Buying PFV

Source of production
Certification from GOs
External appearance
Trust on sellers
Others
No response

Perception on Standardization Certification of Product

Necessary
Moderately
Less
No response

Consumer interested in CSA

Interested in membership
Free buyer
Not Certain
No response

Market distribution from the consumer perspective

1. Convenient sites
   - Government office canteen
   - Convenient stores in the housing estates
   - Convenient stores in the gas stations
2. Diverse vegetables, regularly supply
3. Price should not be higher than normal vegetables

Conclusion

Data collection Consumers did not provide full information Consumer survey

- High demand of PFV but certain constraints marketing, diversity, price, etc
- Certification of safe product will promote market expansion and increase consumption of certain groups
- Pricing at the affordable level
- Consumer-producer linkage should begin with consumer groups who are regular PFV buyers

Promoting public awareness

- Campaign at City Central Tapae Gate picture
- MCC Safe Food Good Health Fair
- Farmer and Consumer Awareness
  - Experimental station session
  - Poster Session

Farmer and Consumer Awareness
- Farmer-producer-trader dialogue
- Group Discussion

Farmer – Consumer Interaction
Test for Chemical Residues
Fostering Consumer-Producer Linkages

Promoting consumer awareness and expanding market distribution for PFV

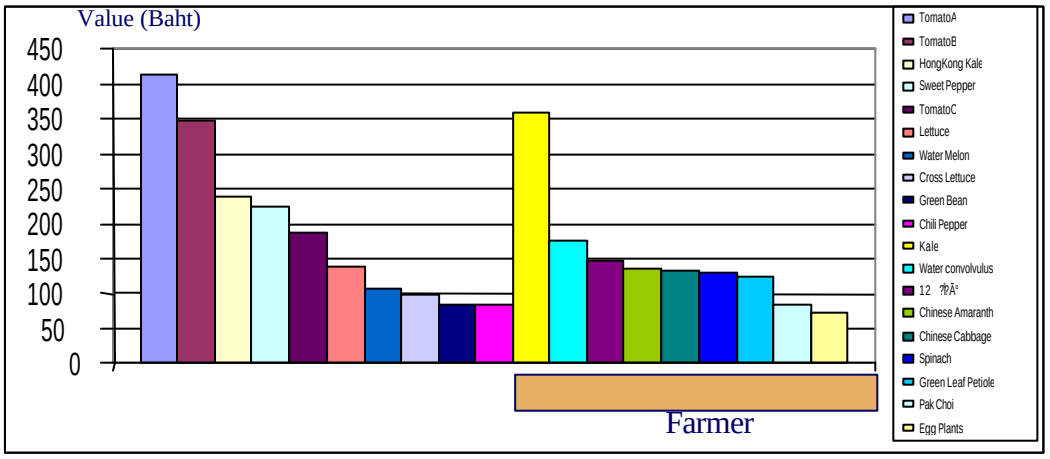
Faculty of Science
Faculty of Medicine Hospital
Faculty of Human Science

Maejo University Exhibition

General View on PFV

Consumer-Producer Interaction

Monthly Market



Functional Roles

MCC Technical support, information provider, facilitating consumer producer partnership

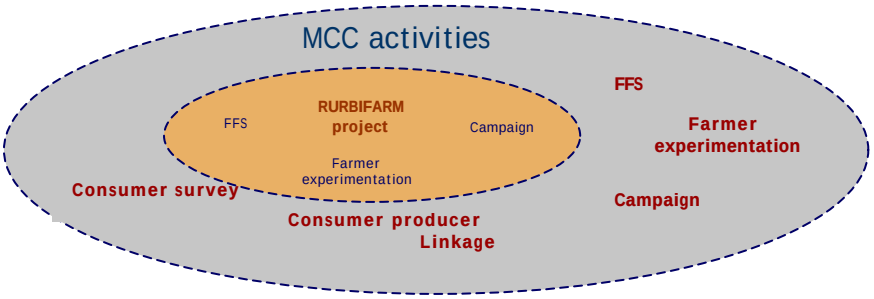
Producer Develop quality product,

Establish 'brand' name

Group strengthening

Consumer Community supported agriculture

Research Focus



Consumer survey

consumer preferences
- consumer perception
- perception on standardization /certification of the product
- Consumer interested in CSA
- Market distribution: from consumer perspective
- Market distribution

FFS

- Site characterization: farming practice, water management, nutrient management, pest and natural enemies
- Characteristics of vegetables
- farmer livelihoods

Campaign

- information
- Selling vegetable

MCC activities

Farmer experimentation

- **Promoting consumer awareness**
- **expanding market**

Consumer- Producer Linkage

- fostering consumer-producer linkage

(Agricultural fair, market)

WP characterization

1.Resources for 'vegetable production'
- water quality
- sediment quality
- other inputs?

2. Farmer knowledge on resource quality
Spatial distribution of central and community markets
Farmers livelihood system

2 Peri-Urban Agriculture

strong fruit-crop vegetables interaction
Increasing fruit and vegetable consumption
emphasis on vegetable crops

2. characteristics of vegetables

strong link to market
perishable crop
intake per capita still low target kg capita day
diversity of vegetables leave type, fruit type, root and tuber-type
range of maturity

implication skill and knowledge intensive
· Agro-ecological knowledge, market distribution

Work Package

1. Natural conditions soil, water, and climate
2. Crop diversity
3. Nutrient management and nutrient cycling
4. Pest and natural enemies principle of
5. co- existence
6. post harvest handling and value added, quality
7. control
8. pricing

Stakeholder

Royal irrigation Dept RID
Department of Environmental Protection
Health
Industrial promotion
Provincial agriculture
local government TAO

- organic manure how much, what type?
- chemical fertilizer
- straw mulch
- bio-fertilizer

Plan for round-table discussion with potential stakeholders whose involvements are related to the environmental effect on agriculture and vice versa in the studied site Ping Noi

Question

How to interaction between development the watershed management and water quality issue?
- invest 70,000 baht to develop the ping river,

comment
we have project in Sweden : divided between
- attitude question
- behavior question

what the heavy metal ?
insignificant the immediate impact we do not looking and less industrialize

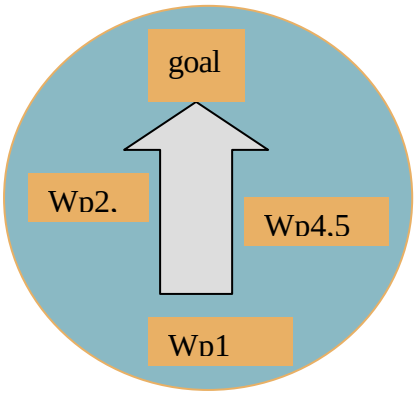
Nitrate issue?
Farmer use less chemical fertilizer.

slinclare
What you can about the classification of consumer and group type of consumer?

Day 7 Friday 14 March 2003

Morning
Ingrid : Information issues

Karin :Planning for wp4 and 5



WP4:
System identification
Key issue
Modeling

Linkage between wp4-5

Morning session
Short presentation of wp4
Short presentation of wp5-A :
Plan for next meeting
Slide Sinclare

Lunch
Cont. Sinclare

Presentation of WK5-A by Dr…. Vietnam File
wp5-A : knowledge exchange about actor, identification where the gap can fill up on existing knowledge,

Decision making process:
- access to market
- demand of consumer: improve crop production, quality and price
  urban demand: peri-urban agricultural production response and industrialize
- policy orientation and demand

Decision making process: Factor influencing on farmer decision on … (top-down)
(2) market (information, price, accessibility)

↓

Urban market (Hanoi)

↓

Rural market (Commune and neighbor)

(3) demand (product quality, quantity, price)

↓

urban demand

↓

rural response

↓

utilization and industrialization

↓

reducing vegetable land area (rural expedition & industrial development)

Introduction to participatory modelling (Sinclare)File…..

A decision support and incorporating local knowledge : database use simulation models
Making and simple model
What model do you want?
Diagram tell Key variable
Steps in model design and implementation concept, diagram and qualification
A indicator and levers at the different scales

Ex: link Water flow: landscape

Tree- a decision support tool for tailor extension advice to farmers
- in the hill of Nepal farm heterogeneity in high and farmer use a wide range of tree fodders and scientifically evaluated (what the local knowledge mean in term of biology,
- case of system
  - a biological model of ruminant product
  - an interpretation of local knowledge value and

- databases of local farmer evaluation of different tree fodders and scientific information on tree management

French model: how much milk you get extend to gut fell (important in animal production, gut full: how much food in rumen of the cattle)

Specify location and objectives

Basic of decision support system : location, set the altitude
Need to know: local parameter eg:
- Altitude
- Soil color (FAO classification of soil type)
- Aspect: object facing direction
- Julian calendar

amount of input and the graph will relate to the data table
scale is less than 40: not sensible of location and objective
graph tell standard fodder for lacking cow per day
manure quality for fertilizing the crop, if the low quality effect the of farmer use

chart:
propagation
punning

assimilation knowledge into the decision model

Discuss aspect
Local knowledge
Exercises group discussion

Vegetable : station, farmer
Elevation:
Month:
Harvesting:
Price:
Soil:
Soil fertility:
Water:
Temperature:
Labor:

Q how station vegetable help to plan for modelling?
Pest, vegetable, price

Example :
- February what price and temperature and other requirement that need

Output: help farmer in make decision
- Variability of Amaranthus in the whole year and put the input like rainfall, temperature, price

Feed back
China :
Scientist is about: biophysical data

Farmer: economic data, pesticide and fertilizer effect to the soil, water, food quality,

- planting date,
- kind of vegetable is need to grow
- control the water quality

Thailand:
Data base: local knowledge production management 36 spp of vegetable some spp farmer continue cropping each: data from mcc station
Help farmer make decision

- management practice
- pest problem
- price fluctuating
- what spp is suitable to grow

5 spp. Constitute a large output highest production using planting date the whole year

Vietnam:

- stakeholder knowledge: scientist, farmer
- wp1 to simulate for modelling

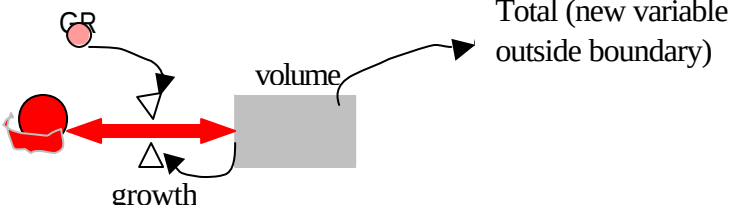
Slinclare :

- using participatory in modeling involving farmer in validation of the testing
- gap of knowledge: different source of knowledge complementary like local knowledge can fill with the scientific knowledge
- how to interpreted farmer knowledge is difficult and how to interpreted qualitative to quantitative data?
- **Aggregated** is important: like feeding cattle : local knowledge from farmer aggregated from other aspect
- Scientific and local knowledge is different in term of **Capability**
- Concept of wp-5, using for interact with farmer
- Set boundary of the model, model cannot do all

Purpose:

- show how easy model that develop model
- build volume,
- growth
- growth rate: weather condition, genetic
- flow

compartment flow: simulate 2 times



Run model: STELLA program factor effects in GR

- seed coming in the outside
- mortality
- migrate seed

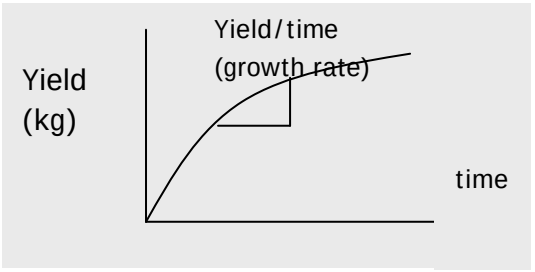
Object based programming : tree (rally pop)

- specify the growth rate relation to time
- model : program stellar
- visual option: size of the tree volume at different growth rate
- advantage: have population from initial population, mortality, living
- condition and the control the process, eg. size 15 cm, growth rate in the condition of mortality

Discussion

- ex. Ping noi case: rate of growth of vegetable, Vegetable different farmer and different condition : soil type, fertilizer rate, etc. will come with different growth rate.

- growth rate: average of production growth per unit of time



Name	yield	age	rate	why different?
	(kg/m2)	(days)		
Sanit	2.5	30		
Inta	2.8			

- accuracy of model depend on the input that you put in the model
-

cont. slide Sinclare

Steps in model building
- concept –vision
- diagram
- quantified model

After Lunch
what sort fo thing that we would like to see? What do you want to see in the 5 years time ?
- Objective: safe vegetable , food quality
- articulate vision to model
- quantify model by diagram

shared vision 2 stages

Articulating: getting people what it is ?
- people say what they want
not every people have the same aspect in the vision that bring to share vision, to identify the share common goal

Negotiation
-diverse different people's perspective and interest

Identifying the building blocks of vision

- context : lead to the priority, key issue and different stakeholder, clear about the key aspect
- Actors: who is the main actor? Or stakeholder, who influences the process? Including the project eg. People who key influences the project.
- Indicators and levers: you want to have an output from the model, how change, eg. The amount of illness, amount contaminate water
- **Lever:** thing that cause change in the system, or control the change eg. Policy, price and subsidy, tax of fertilizer that lever can be many scale
- **Indicator** : measurement, performance indicator or indicate eg. Amount of contamination in water
- Subsidy for fertilizer, it may change or the regulation that may change the effect the system, or external like climate: the impact of the climate
    - Key resources
    - Key influence

  Useful what importance resource: like manure, labor, human

- Strategies: what source of thing need to done? What type of intervention? Can you increase fertilizer? What strategies will effect the key issue.

Ex 1. Computer: Zimbabwe: non timber product, boom grass, basket (resource)
Develop diagram
Translate diagram to a model
Local live in close to forest and make the broom grass
Resource: how much is available to collected?
The amount of broom grass

when allow to harvest? What method that allows to use in broom grass harvesting?

Identify the process
Factor:

- Climatic factor: to much rain (climatic problem) effect the broom grass
- Harvesting : the way to harvesting, effect the regeneration of broom grass
  The diagram mean the influence on the thing and the arrow mean the link between problem

Ex 2 What is the key issue? Key resource?
amount of **pollution trend to decrease** of pollution

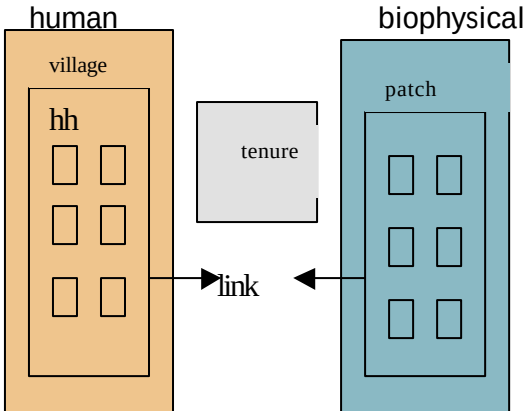
Convert participatory to formal form

- translate the paper diagram
- diagram '**simili'**

Converted model:

- type of nature model red model to black model : go to the relationship and put some value, by putting mathematic equation or scatting

Scale and indicator



Scale : ident Policy Levers and indicator
Landscape m eneral model
Interact in field like forest , water etc (different land type) they have forest , soil in landscape scale model people interacting the patch of land
What is the major of interaction, govern by who control over the land
and individual hh, the interaction made in decisions in different model

decision sub-model,
yield perception action: apply fertilizer
perception: input of decision according they see they may apply pesticide when they spray ?and how much of pest ? when they going to spray ? (that may different between farmer).

Strategic decision will different ? continue use land or converted land? People can make decision
Operational decision: weekly time step, whether or not farmer apply manure? How much labour available?

Temporal decision scale to model: for example the cm case frequency of spray or apply fertilizer

Multiple scale
Plug and play
- Sub-model
- parameter

People and sub-model
basic populating model :how many type in hh: death, birth, etc ex. In AID-HIV in HH: useful is to education people
- run in first :individual people: age, die time,
- sarcastic running in the 2 time: different result from the number of run
- 100 months , third running: individual people old when the HIV come when they going to die go down number of year.

-socio-economic indicator

case Thailand : useful such as to show chemical residue on health

Indicators and Leavers
- landscape
- farm

So need to identify indicator and leaver to running in what scale

Exercise : case ping Noi
Indicator: output
At Farm Level
1.pest-predator
- Pest occur: no., type, frequency of occurring, total population,

- natural enemies: no., type, frequency of occurring, total population
- damage percentage:

2.chemical indicator: how much apply of nitrogen fertilizer?

- N content: indicator of quality

3. Income of farmer
-output/input
4. Nutrient balance

Levers: market, price,

Landscape level

1. water: quality of water (irrigation)
2. organic manure: quality of manure
3. price of chemical fertilizer:
4. policy: export policy

lever: policy

Ingrid and Karin:

Final session: What to achieve
Next workshop : Saturday 22-28 May 2004 (22 May arrive pick up at Stockhome Airport) and excursion 23 May 2004
TOT3: How to organize? Content?
Communication within the RURBIFARM

- from coordinator : partner(both directions)
- within the research team
- between partners (eg. WP coordinator-partners, partner-partners)

Email, Fax, web-site, visits: www.mv.slu.se/projekt

Work plan : (March 2003-May 2004)

- who is doing what? Update list
- Time plan for wp1-5 (planning start, collecting data, data analysis, reporting etc.) wp- coordination to the minutes
- Activity plan (travel between partners, students)
- Publication
- Presentation (workshop and conferences)
- Evaluation of the workshop in CM

Evaluation:

Reflection:
Organization:
Content:
Participant
Suggestion:

Time plan for Wp 5

Activities	2003										2004											
	Mar	Apr	May	Jun	jul	Aug	Sep	oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	jul	Aug	Sep	oct	Nov	Dec
WP-5A																						
1.Y1 report																						
2.Start communication with leading agencies																						
3.Completion of draft 5.20, 5.21, 5.22																						
4. 3nd planning workshop																						
WP-5B																						
1. y1. report																						
2. FFS																						
-2a Completion of FFS (3 cycles)																						
-2b Establishing 2 site																						
3. Annual Fair																						
4.CSA																						
- Consumer studies																						
- Consumer producer studies																						
-alternative marketing system																						
5.Seminar/workshop With outside agencies																						

Note: Wp-5B responsibility

1: phrek et.al, 2: Phrek, Budsara, Chorpaka (yai) and Jaturong 3: Jaturong 4: Kuson and Prathantip 5: phrek, et.al.

Day 7 Saturday 15 March 2003

TRAINING March 15-19

Sustainable FARMing at the RURal-URBan Interface

An integrated knowledge based approach for nutrient and water recycling in small scale farming systems in peri-urban areas of China and Vietnam

Program for the training of Trainer 2 (ToT2) 'Element balances and modelling' in Chiang Mai, Thailand, March 15-19, 2003

During the ToT2 we will discuss and explore some principles and Methodology for assessing element (nutrients and heavy metals) flows and balances/ imbalances in agro-ecosystems. Some general concepts in modeling bio-physical systems will be introduced. We will start to model states and flows of water, nutrients and pesticides at field level, and also discuss and try a decision support tool for P losses at catchment scale

The ToT2 will take place at the Multiple Cropping Center (MCC), Chiang Mai University (CMU). The RURBIFARM project will provide lunch and coffee and the participants will have to cover the costs for accommodation (including breakfast) and dinner.

10.00-12.00	introduction concept for element balance in agro-ecosystems (Ingrid and others)
12.00-13.30	Lunch at MCC
13.30-17.0	concepts (continues from the morning). Case studies in peri-urban farming systems (coffee brake 15.30-15.45)

Presentation and introduction

- Presentation of participants and facilitator
- Short presentation of the RURBIFARM project
- Presentation of the overall course (ToT2)

Objective

- Reflection about the individual goals and expectation for the ToT
- Discussion about goals and expectations
- Agreement of the detailed plan for the ToT

Sustainable FARMING of the RURal interface for integrated knowledge based approach for nutrient and water recycling in small-scale and Vietnam

Objective

- To contribute to the development of more sustainable interaction in the rural-urban interface trough effective recycling of by-products, wastes, and water in peri-urban farming systems
- This should be based on sound risk assessment and policies related to human health and environmental impact
- To combine the goals of food safety, low environmental impact and high profitability for farmers

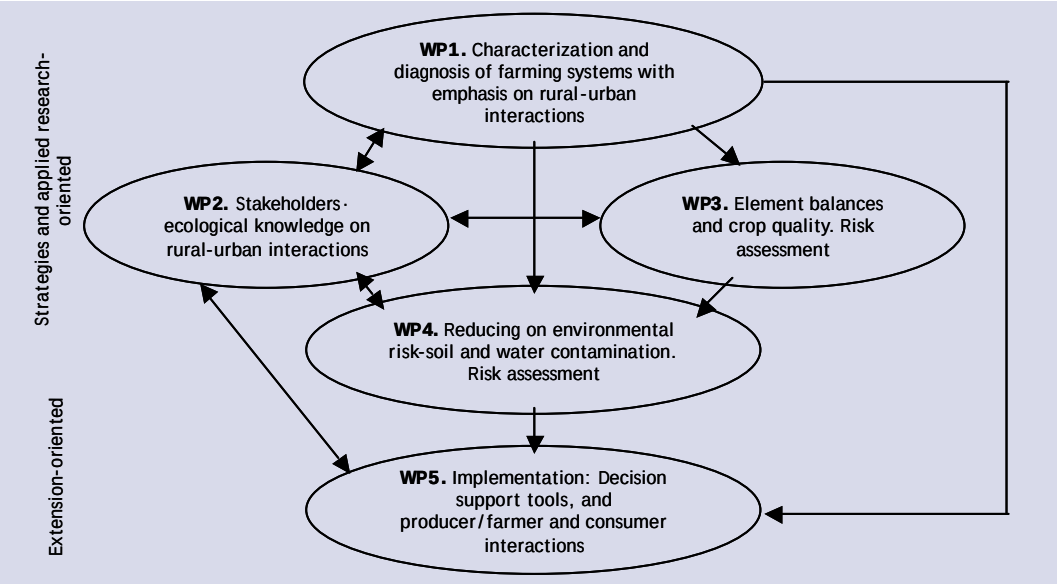
Hypothesis: Sustainable option can be developed through merging scientific and local knowledge and perceptions

RURBIFARM study site
Vegetable based peri-urban farming systems in China (Nanging, Wuxhi) Vietnam (Tu Liem, Thanh Tri) and Chiang Mai (Ping Noi)

Methodology

- participatory method : for characterization farmer, market, local knowledge
- field measurement
- soil survey
- database development
- simulation model
- FFS

Flow chart of project work packages and their relationships



Overall objectives for the training course (TOT2)

- to discuss and explore some principles and methodology for assessment
  element (Nutrients and heavy metals) balances in agro-ecosystems
- to give an introduction to some general concepts in modeling bio-physical systems. We will model model starts and flows of water and nutrients at field level and demonstrate a decision support tool for loses and catchments scale
- The course (ToT2) aims at advantage and wondering our knowledge and skill through experience from

Summary expectation

concept	project
Methodology How link local knowledge with the modeling tool and decision support tool. software	Nutrient balance Link nutrient balance with modeling (7) How to link wp1 to others wp

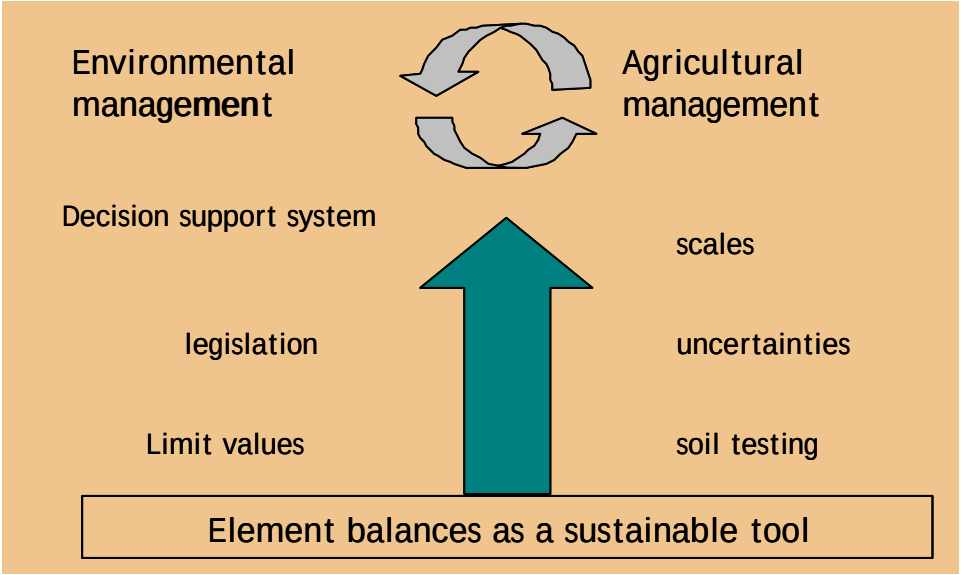
Concepts of ToT

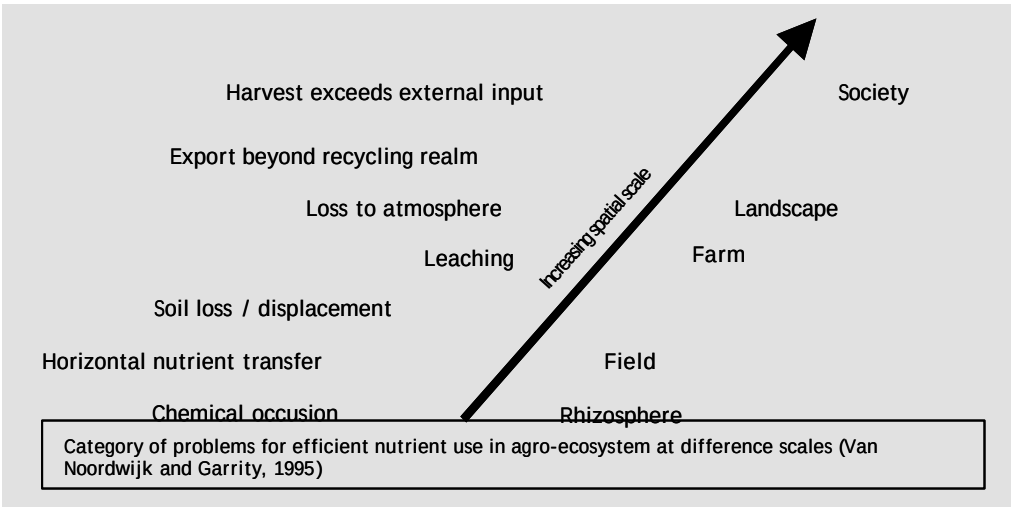
•Nutrient balances link with modelling

- –Methodology, collecting data
- –How to use LK in modelling and decision support tools
- –How to write report
- –software

Element balances-some concept

Balance-budget-accounting system
Flow (inputs and output)=? (+/-/?)
Pool : how much we have at the beginning eg. Soil, water
Change in pool=(input-output) /pool
Define the system





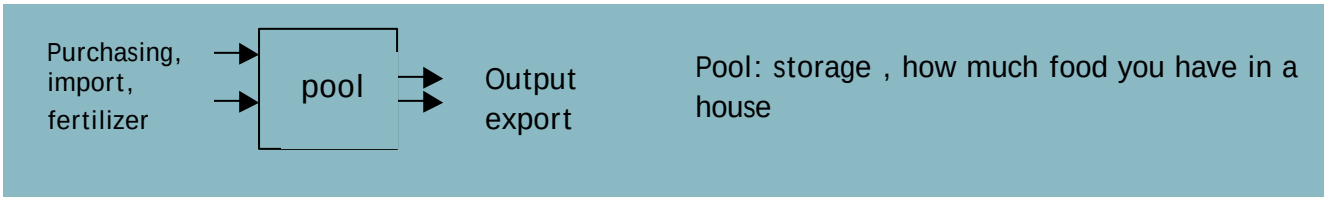
Element balances with different approaches

1. Input-output balance 'black box' , eg farm gate balance, village balance

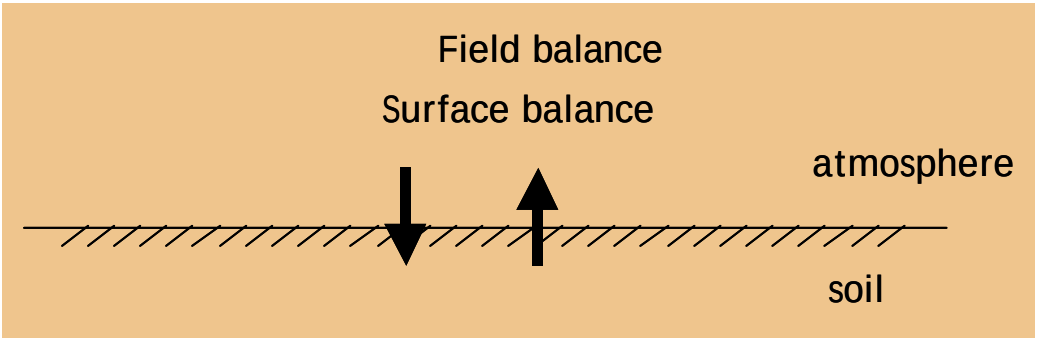
2. Soil surface balances eg field or catchment balance
   soil surface balance :include everything that go into the soil, management practice, nitrogen fixation (identify as input not quantify

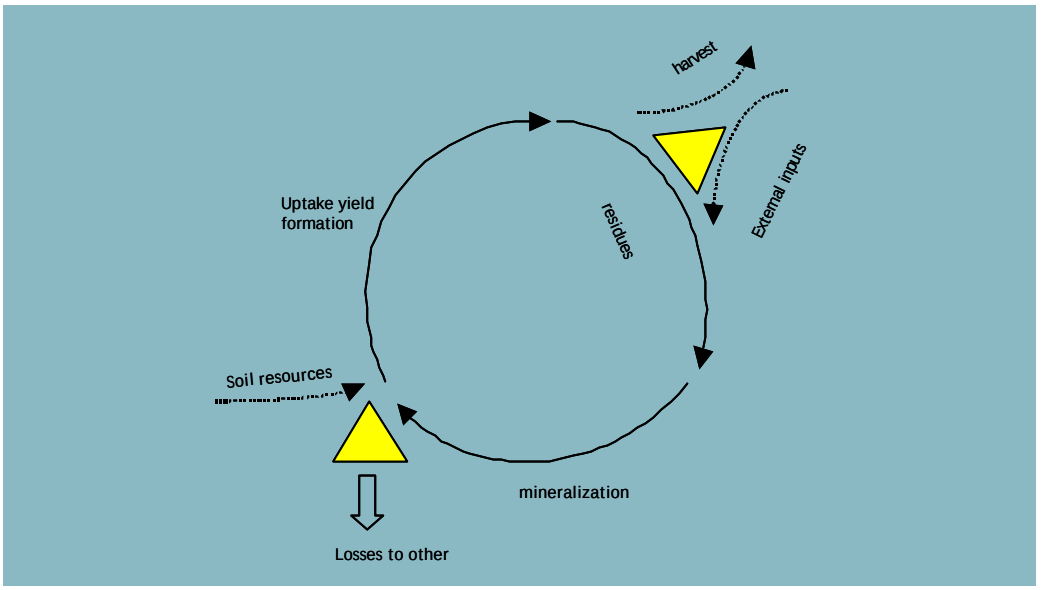
3. System balance analyses , eg farm systems balance
   sub-system balance, eg feed-animal-manure animal product balance

1.Input-output balance



2. Soil surface balance





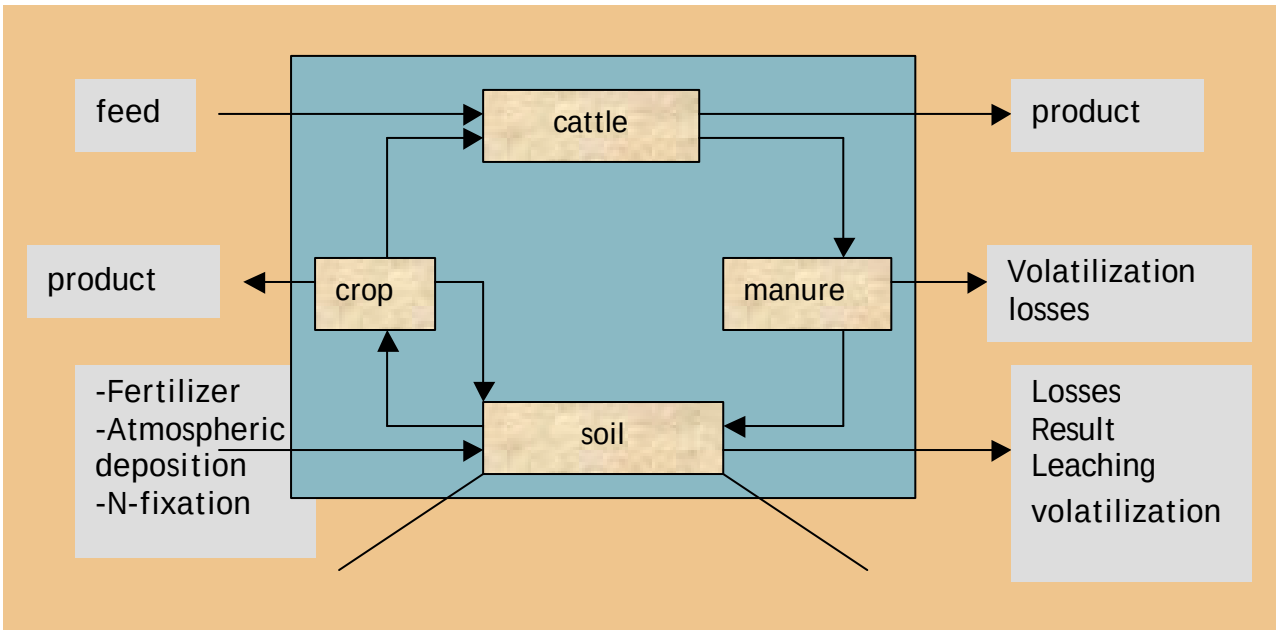
How is the element and flow of the element? How is the water and how is the water contaminate?

Nutrient cycling of traditional system in South of Sudan: snake game
Book: smile et.al p….

Element balance with different approaches

- input-output balance (black box) eg. Farm gate balance, village balance
- soil surface balance eg. Field or catchment balance
- system balance (analysis) eg. Farm system balance
    - o sub system balance eg. Feed –animal manure/animal product balance

System balance Farm balance



Group discussion 1

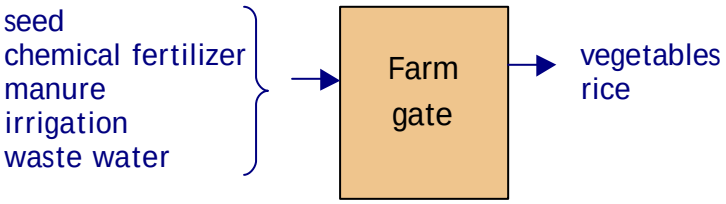
Tu Lien and Nanjing (start here)
Use the input-output balance approach
- make village balance
- make-farm-grate approach: sell vegetables at the market, what people are doing

Tranh Tri and Wuxi
Use soil surface approach
- make catchments balance
- make field balance

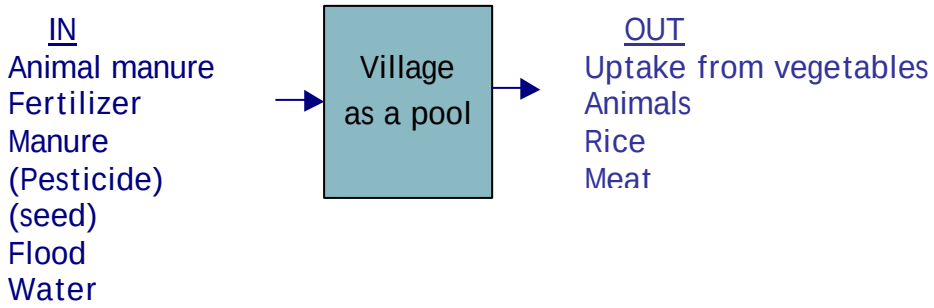
Note:
Village element concept element flow
many hh are different each hh are doing different thing and it is heterogeneity village performance

identify material flow first
to evaluate sustainability to identify it can be ….. to evaluate sustainability.
-Identify the major flow
- combined with soil water and farming system into the wp3

exercise



TU Liem case : intensive system in this village ex. N-balance



Catchment
- flat area
- loss of N is not significant like in upland area
- high population ….> arable land …..>

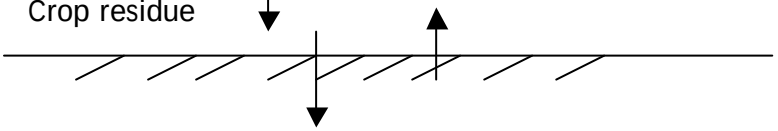
Field level:

IN
- irrigation
- fertilizer
- rain
- N-fixation (soil)
- Water
- Crop residue

Harvest

uptake from crop production

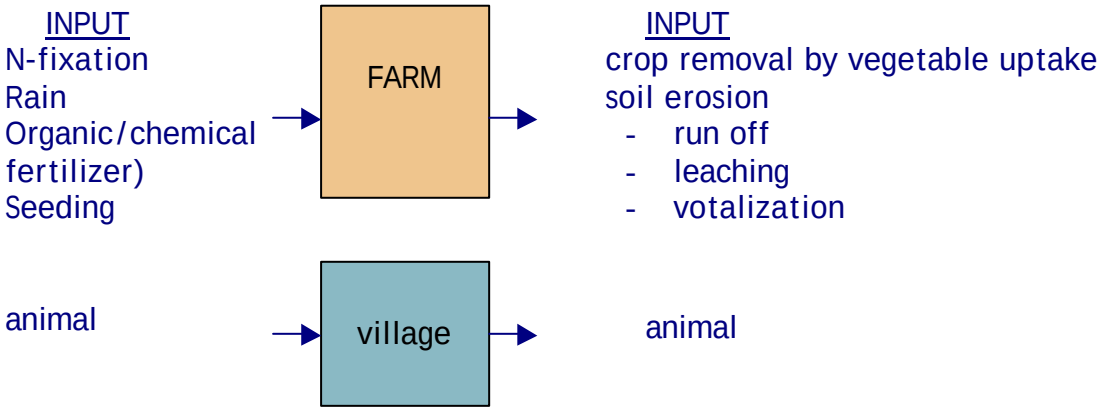
run-off



OUT
- leaching
- votalization

Nanging case

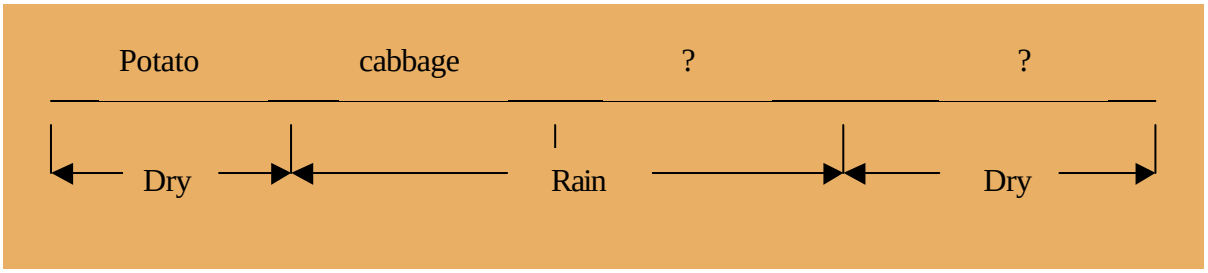
N- balances in farm gate balances:



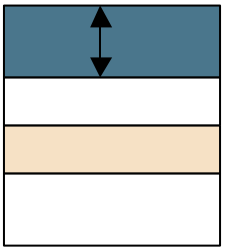
Ajarn phrek comment:

	ecological	economic	environment
field	√		
Farm (HH)		√	
village		√ (material flow, money)	
catchment			√

What take out from the crop and turn back to the field?



Soil profile



AP To evaluate N-pool in the filed

B If N in AP profile, useful for plant

C B-------→ leaching

Day 8 Sunday 16 March 2002

8.00-12.0 Modelling states and flows of water and nutrients at the field level- exercises (Coffee brake 10.30-10.45) (Karin and Faruk)
12.00-13.30 Lunch at MCC
13.30-17.00 Cont.(Coffee brake 15.30-15.45)

General concept of models and on the use of models
Agenda today

- introduction (Karin)
- description of the RURBIFARM) model (Faruk)
- Modelling exercise

Calculated by C Iæ *w,n,t* both biophysical model and human behavior model

- Cd (cadmium) uptake model
- biomass uptake model

what is the model

: - picture of reality, showing a small, simplified part of reality
- simplify of the picture and clear picture of the reality

why use model

- to instruct and clarify our knowledge of a system
- to set our current understanding of process and interactions between process and system
- to get common language for communicating the study system
- to make prediction for the system

Mechanistic model/ Empirical model

- explicit accounting for the mechanism in the studies process
- relation between factors are based on observation without accounting for the mechanisms behind the relation (put a lot of detail information in different : eg.the capture of cabonmonocide, photosynthesis
- presumes that a certain set of event
- To understand the system

Deterministic model/stochastic model

what happen when the soil is wet?(Deterministic model) , Drive farmer what water farmer have to buy (stochastic model)

Dynamic model /statistic model

Includes time history as an important factor for the status and interaction of different states and flows in the system doesn't include a dynamic interaction between different variables

Pool, state

Flow

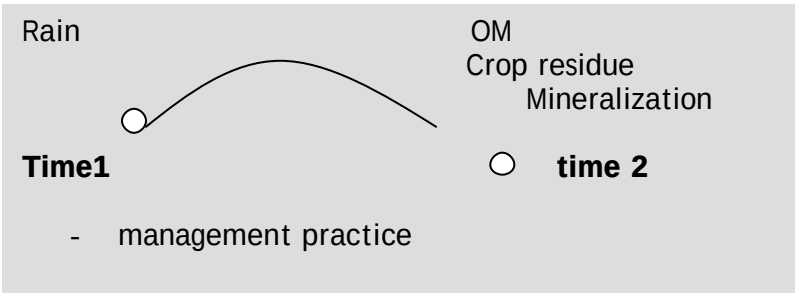
Parameter : constants in the system affecting the flow

Variables: factor that varies in value during the period of modeling and which affect the flow in the model

Validation : testing the validation of the model and the model result

GLEARMS model :
Ground water Loading Effects of Agricultural Management Systems

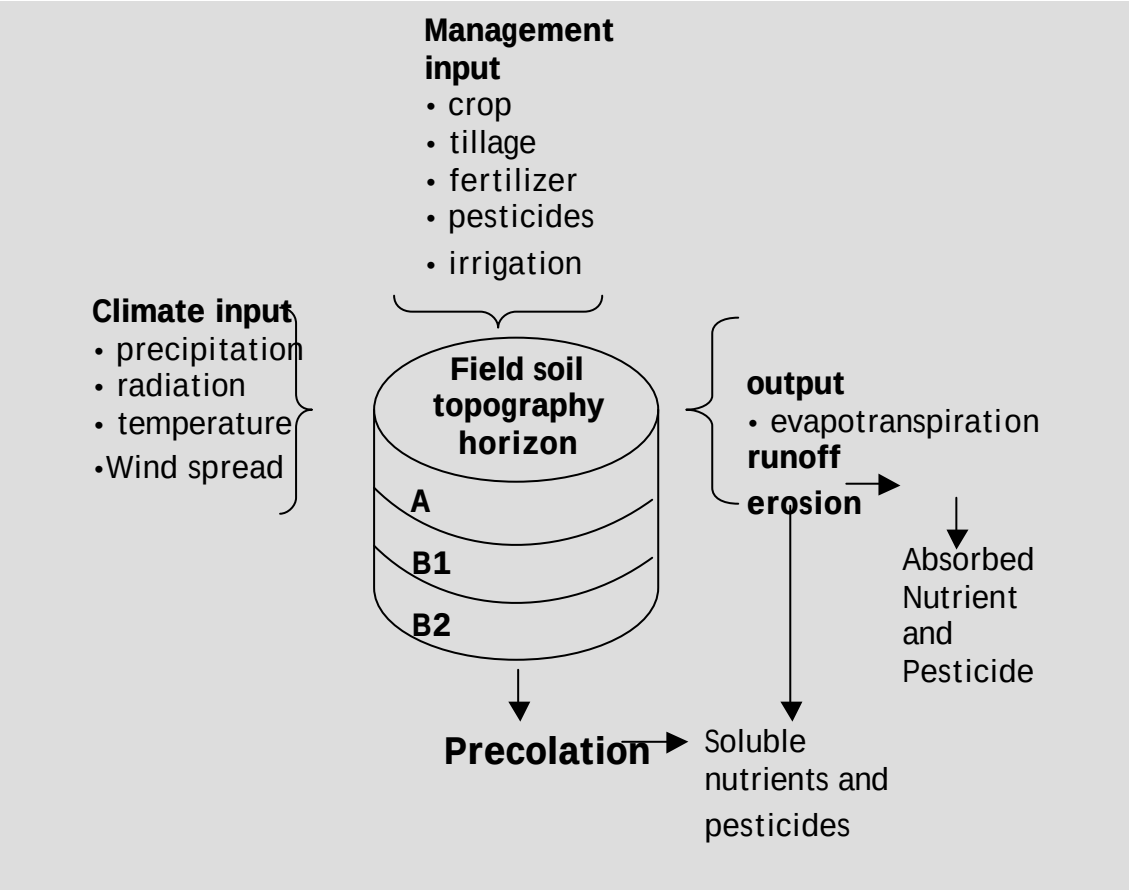
Dynamic Model



- management practice

The GLEARMS model: field model and hydrological unit

Groundwater Loading Effects of Agricultural Management systems



http: www.wiz.uni-hassel.de/model_db/mdb/gleams.htm

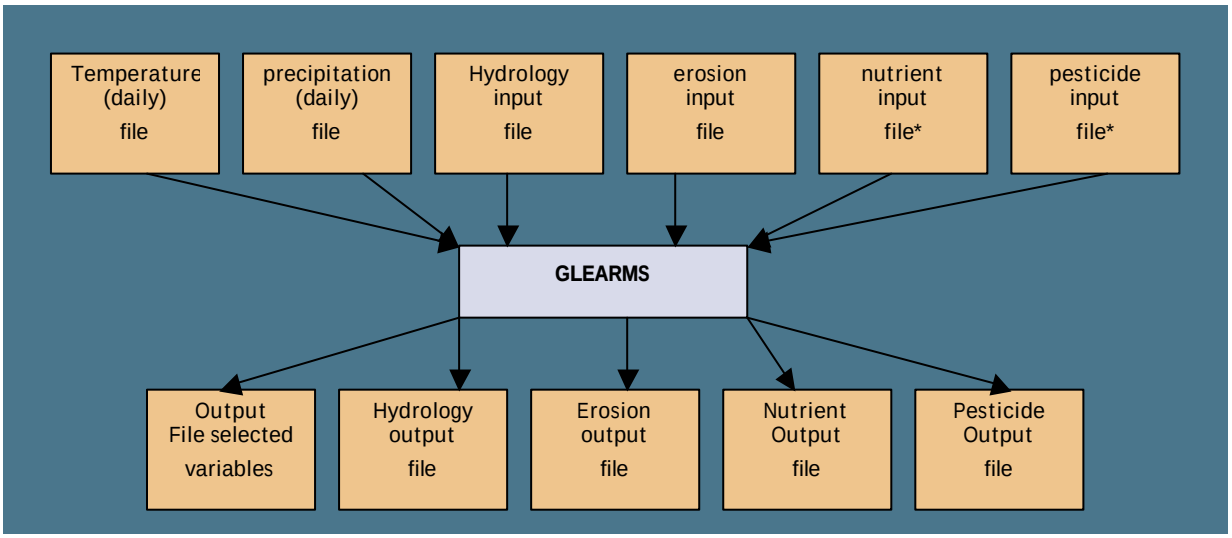
- field as a hydrological unit regardless where farmer put a fence
- Notify the management aspect of GLEAMS model

Faruk
Identify the system what is the input

GLEARMS is the Decision model and testing scenario eg. What will be the output result if using a lot of pesticide on the water quality, evaluate the erosion (property important for erosion, using universal soil lose equation)

Structure of the model
Define important parameter in hydrology unit

Groundwater Loading Effects of Agricultural Management Systems



Hydrologi input file

drainage area
- **soil saturated conductivity**
- **soil texture**
- **slope on the field**
- **rooting depth**
- **run off area number**
- **soil physical properties**
  - porosity
  - field capacity
  - willing point
  - OM content

Soil chemical properties
-ph
-base saturation
CaCo3 content

Crop rotation
-planting date
-harvesting date
-leaf area index

Nutrient input file

- **crop residue**
- **NP concentration in rainfall and irrigation**
- **Total N and P percentage in different soil type**
- **No3-N concentration**
- **Mineralization N**
- **Labile O concentration**
- **Organic P content**
- **Crop**
- **Fertilizer/ manure application-date, rate, method**
- **Tillage operation**

Lab-exercise
Modelling of nitrogen and phosphorus losses in a pepper-cabbage-lettuce crop rotation under two different fertilization regimes

Purpose: The purpose of the exercise is to test a process based modeling approach for nutrient and water flows at the field scale.

From the exercise you will get an idea about the model demand of inputs, parameter groups and output variables. Further, also advantages and limitations of the selected approach and the modeling scale will be discussed during the exercise.

Background
During the exercise we will use the GLEAMS model (the Groundwater Loading Effects of Agriculture Management Systems model (Knisel et.al., 1999) to stimulate losses of nitrogen and phosphorus through surface runoff and drainage from a field with different vegetables in the crop rotation during a 11-year period.

GLEAMS is a process based model, where the major processes for water, sediment, pesticide, nitrogen and phosphorus transformations, storage and flows are described by a mixture of empirical and semi-mechanistic approaches, since element flows at the field level to a great extent are affected by different management practices, such as fertilization, irrigation and pesticide application strategies, application of different types of organic material and tillage methods, are include in the simulations.

Data collection and parameterization of the model was done in accordance with objectives above. General data available from various sources was collected and adapted for model use without the site –specific information about management practices and field and soil properties. Therefore, the exercise is not site-specific even though a possible scenario was build with Najing climate data, soil properties, and management options to test model performance for this area. Much more site-specific measured input data is to be used to stimulate water, nutrients and pesticide dynamics for site included in RURBIFARM project.

Input parameter files for description of the hydrological, erosion and climatic conditions of the simulated site are needed to be able to run the model. Parameter files for description of tillage methods, pesticide application and nutrients dynamics, respectively, are optional depending on choice of simulation target. The input files are produced by the use of parameter editor supplied with the model (already for task1 and 2 in this exercise).

Exercise 1:
In exercise 1 you will do a simulation to study losses of N and P. The following instruction will guild you through the modeling procedure.

Model set up and parameterization
The model performance is totally dependent on how processes are chosen in the model and how parameters are set. Therefore, it is very important to check the validity of parameterization to be able to interpret the simulated results.

How to open the parameter editors programs and look at the parameter values: Open Windows Explorer and **GLEAMS map**, and then double click on **Hyd.exe** for the hydrology parameters. Press **Alt-F** to open the File Menu. Chose Load and press Enter: Choose the wanted parameter file by writing the name of the selected **(hnjv.par** for hydrology parameters).

Use the up and down arrow to move **up and down** in the file, and the **Tab and Shift +Tab** to move to the right and left, respectively. For some of the parameters there is a help provided if pressing **F1**.

At this stage of the exercise, please don't make changes in the parameter files. If you do not it accidentally, don't save the file. After studying the parameter values, exit the file by **Alt+F** and Exit.

To look at the nutrient parameters follow the same procedure as above, but select Nut.exe in Windows explorer as the editor program and **Nnjveg.par** for the parameter values.

Questions:

- Is the parameterization relevant for the selected RURBIFARM sites? Are the parameter values valid for our study sites?
- Will it be able to have information on all the parameters form the study sites?
- Which will be most crucial parameters for describing the hydrological, erosion and nutrient conditions in our study sites?

Start the model and run the first simulation

1. start GLEAMS by double-clicking at the **GLEAMS** symbol at the Window desktop. *Select 1* and press *enter* to start loading parameter input files.
2. Load parameter and output files by writing the following parameter file names and press *Enter*:

- Daily rainfall parameter file name: precnj.text
- Hydrology parameter file name: hnjv.par
- Erosion parameter file name : enj.par
- Nutrient parameter file name : nnjveg.par
- Hydrology output file name : hnjv.out
- Erosion output file name :enj.out
- Nutrient output file name: nnjveg.out
- Selected output variables file name:snjv.out

Pesticide are not simulated in this exercise

3. when all files are loaded, press *Esc.* To start the simulation. The model is now running and the simulated results are stored in the selected output files, which are placed in the GLEAMS directory at the hard drive.
4. when the simulation is executed, shut the GLEAMS window and go back to Windows Explorer. It may be needed to press Refresh under View menu.
5. study the output files for hydrology (hnj.out) and nutrient (nnjveg.out). Double-click the selected file and scroll through it to see the output values.

4	Begin year 80	90	0	1	1
	0=No, P, N balance 1=output			No. of user in a rotation crop	Load of input of N&P balance at the end of year
5	Crop residue (kg/N) Rang 0-100000	N. conc. In rainfall (ppm) Range 0-100	Conc. Of No3-N In irrigation range 0-100 (ppm)	Nitrate –N in irrigation 0-100 ppm	0-N-N-P balance output
6	Total N, % in Soil horizon "J" rang =0-10				
7	Nitrate concentration (in soil horizon) rang 0-1000				
8	Potentially mineralized nitrate (kg/ha) in soil horizon rang 0-1000				
9	Organic nitrogen (from animal waste), content, percent in soil horizon eg. 0-40 R. 0-10				
10	Total P% in				

13	Date that following parameter are valid yr. Of the rotation cycle and Julian day (tillage operation before) eg. 1091 rang 1001-0				
14	No.of fertilzer and animal waste application, during the cropping period, between planting and harvest, eg. 4 Rang 0-10 (411195)= 4=number of applied, 1= no. of fertilizer, 1195 =rotation yr.				
15	Identification No. of the crop during this cropping period eg. 7 rang =1-90				
16	Date of fertilizer application range 1-50366 1=yr of rotation 2=Julian day for the yr.	Code for method of fertilization 0=inorganic 1=organic			
17	Fertilizer nitrate (No3), kg/ha eg. 115 range 0-1000	ammonia	Phosphorus kg/ha		
18	Application rate for animal waste, if liquid: rate: rate is equivalent depth, cm eg. 0.50 If solid waste rate is t/ha eg. 8.5 rang 0-50				
19	Date of tillage, yr. Of rotation plus Julian date	Code to designate the tillage implement rang 1-50	Depth of tillage, cm, eg. 7.5 rang 0-150		
13	Date that the following parameters are valid, yr. Of root				
14	Num. Of fertilizer and animal waste application during cropping period				

Continue file from paper modeling exercises:

TOTAL NUTRIENT LOSSES AND TRANSFORMATIONS

	NITROGEN	PHOSPHORUS
	(KG/HA)	(KG/HA)
RUNOFF	5906.70	157.00
SEDIMENT	.00	.00
UPTAKE	5279.13	715.89
YIELD	3264.81	442.32
MINERALIZATION	18329.48	9843.15
LEACHED, TOTAL	13012.95	2.19
NITRATE	13012.95	-------
AMMONIA	.00	-------
RAINFALL	137.05	-------
IRRIGATION	.00	.00
FERTILIZATION	36300.00	1485.00
DENITRIFICATION	19115.99	-------
AMMONIA VOLATIZED	497.14	-------
NITROGEN FIXATION	.00	-------

Reduced input

SES AND TRANSFORMATIONS

NITROGEN	PHOSPHORUS
(KG/HA)	(KG/HA)
618.40	19.86
.00	.00
4789.53	689.69
2948.10	425.38
5768.48	1756.78
316.63	2.20
316.63	-------
.00	-------
137.05	-------
.00	.00
3850.00	.00
1000.45	-------
84.49	-------
.00	-------

yield : harvest Note: Add fertilizer into the system
N 3265/11 =300 kg/ha/yr
297 x 2 =600 kg N./ha/yr

P. 442/11 =41 kg P/ha/yr 40x2x2 = 82
Manure 16 % of total P
-5.1 t manure = 82 kg P

Manure 246 kg N
354 kg N/5 accumulate
= 70 kg N/ha

600-246=354 kgN/ha

Comment
- total P leached is the same
- GLEAMS does not explain well the process of P leaching
- The leaching data are from the fourth horizon

Structuring of simulated data
The selected output variables have to be organized to fit the Excel-format enable an easy way of analysis and diagram drawing.

1. Open the file snjv.out from the GLEAMS directory at the hard drive . Snjv.out includes the output variables selected in the hydrologic input file. Open the *Edit* menu and choose '*select all'* (Ctrl A short command). Copy the content with *Edit*: Copy (or Ctrl C).
2. open an Excel document and paste copied data with *Edit*-Paste (or Ctrl-V). Delete the first two rows. Activate column A. Open the Data menu and choose '*Text to columns'* and thereafter 'Fixed –width columns'. Press *Next*. Adjust the separator line by moving it to the left so that it separates the first column, beginning with year and day number (80001) from the rest. Press *Next* again and then *Finish.*
3. Select and activate A and B columns. Open the *Data menu* and choose "Sort" and OK. All variables are now sorted and grouped according to the different selected output variables.
4. select Column A. Open the *Insert menu* and choose 'Column'. Write 1-1-1980 in A1 cell and press Enter. Go back to cell A1 and grab the lower right corner of the cell and with pressed mouse button extend the datum info to the row nr. 4018.
5. Now we just have to move variables in new columns: Select cells B4019 and C4019. Press simultaneously Ctrt Shift and the Down Arrow. Press Edit: Cut (or Ctrl X) to remove all cells. Select cell D1 and paste cells with Edit: Paste (or Ctrl V).
6. Select cells D4019 and E4019 and repeat the Cut and Paste procedure until all 5 variables are in new columns.
7. Now we can assign new variable names instead of variable numbers according to the table beneath, and draw diagrams in Excel.

Selected output variable number:	New name:
900	Runoff loss, NO3-N (kg/ha and day)
905	Runoff loss, NH4-N (kg/ha and day)
910	Runoff loss, PO4-P (kg/ha and day)
925	NO3-N leached (kg/ha and day)
935	PO4-P leached (kg/ha and day)

Look at simulated results:

1. Draw diagram on losses of NO3-N, NH4-N and PO4-P, both as surface runoff losses and leaching losses in the Excel-file.

2. Summaries the losses for the 11-year period.

Questions:

- Are the results reasonable?
- If not, in way?
- which processes and/or parameters can be most important to change the simulated result?

Exercise 2

In exercise 2 you will do a new simulation with a changed parameterization. The amount of the applied nutrients in form of organic manure and fertilizer is reduced, and you will study the effects on N and P losses compared with the results from the basic simulation you did in exercise

1. To determine the amounts of applied nutrients in the new parameterizations we used the replacement method, which is based on the amount of nutrients that are taken off the filed with harvest. In order to secure the yield, we will apply double nutrient amounts as compared to amounts removed with harvest.

To load input files, run the model and processes the simulated results you follow the same procedure as in exercise 1, but with the following file names:

- Daily rainfall parameter file name: prcnj.txt
- Hydrology parameter file name: hnjv.par
- Erosion parameter file name: enj.par
- Nutrient parameter file name :nnjvbmp.par

- Hydrology output file name : hnjvbmp.out
- Erosion output file name: enjbmp.out
- Nutrient output file name: nnjvbmp.out
- Selected output variables file name: snjvbmp.out

1. Load the files and run the model
2. structure and study the simulated results.
3. compare with the results from exercise 1.

Questions:

- How did the new parameterization change the simulated N and P losses?
- Why?
- Is the result realistic?

Exercise 3

In exercise 3 you will be able to change the parameterization from your own choice. Depending on what process and parameter you like to change you have to edit one or several of the input files.

Edit the input files

GLEAMS is supplied with parameter file editors to facilitate the development and editing of parameter files. The file editor contain information on the parameters, as described in Exercise 1, and several help tables,

The following parameter file editors are available:

- Hyd.exe for editing the hydrological parameter file
- Ero.exe for the erosion parameter file
- Nut.exe for the nutrient parameter file

Select the proper file editor depending on which parameter you are going to change (see information in exercise 1 on parameters) in Windows Explorer. Start the editor by double clicking on the exe-file and then Return. Select one of the parameter files used in exercise 1 and 2. Make the changes you want to do and save the file with a new name (Alt + F to open the File Manu, Chose Save and give a name by your own choice, for example (Test.par).

Run the model

Follow the same procedure as in exercise 1 and 2 to load input files, run the model and process data. Look at the results.

References:

Knisel W. G., and F. M. Davis. 1999. GLEAMS: Groundwater Loading Effects of Agricultural Management Systems, Version 3.0, Users Manual. USDA-Agricultural Research Service, Southeast Watershed Research laboratory, Tifton, GA.

Process: exercise 3:

If change nut parameter

1. GLEAMS2	
2. Double click-	Nut.exe
3. Alt-F	
4. Load and Enter	
5. nnjveg.par then save ‘test.par’	

Edit Nitrate : num 17

No. of fertilizer 14

Application of rate of animal waste

1. GLEAMS2	
2. enter	Nut.exe
3. load parameter	
4. Esc	
5. refresh : double click * output file	

Day 9 Monday 17 March 2003

8.30-9.0	Summing up GLEAMS modeling exercise (Karin and Faruk)
9.00-10.00	Introduction: Quantification of element flows and pools. How can we make quantifications of inputs (manure, fertilizer, irrigation water, atmospheric deposition etc.) and outputs (harvest, run-off, leaching, etc.)? (Ingrid and others)
10.00-12.00	Some practice at the MCC fields (groups)
12.00-13.30	Lunch at MCC
13.30-17.0	Reflections and discussions from the field experience. Introduction: sampling strategies-where to take samples? How to take samples? How to treat the samples? (Coffee break 15.30-15.45) Preparing for field studies in Ping Noi (different Tasks for different groups?)
18.30	Mid Training Party (MCC, organized by the Vietnamese team with cultural contribution from everyone)

GLEAMS model :

- build scenario to improve management system
- small parts to assess risk and loss not a goal (not everything)

certain step:

- calibrate
- validation
- sensitivity

Element balances – differences approach

- Simple input-output balance 'black box' , e,g, farm household 'farm-gate' balance, village balance Purchased and sold products 'cash flow'
- Surface balance, e g filed or catchment balance Biophysical flows
- Systems balance analyses , e g farm systems balance include flows within the system sub-system balance, e g feed-animal-manure-animal product balance

7 steps for using the Element Balance approach from a scientific perspective

- Define your objective purpose users What do you want to know? How to use the outcome?
- Define and describe your system Type the balance? Scale? Timeperspective? Which element s ?
- Describe methodology; what are the data sources, what is the method are frequency of data collection?
- Describe the state pool of the system decide about method
- Identify the inputs decide how to quantify
- Identify the outputs decide how to quantify
- Check the consistency, completeness, correctness Gaps? Uncertainties? Review

Use the 7 steps…

1. Do we have an accumulation or depletion of the nutrient heavy metal pool in the top soil Ap at the MCC expstation? different 'farming systems' groups
2. Type surface balance, Scale Field level, Time months, start with material flows
   - Describe the system – Use the PRA tools – Make a cropping seasonal calendar and a time line
   - Discuss step - and plan for doing a field balance study over years main focus on quantification
   - Present your plan for the group after lunch

LUNCH

Quantification of Flows in a Soil Surface Balance

Group 1 Vegetables system

J F M A M J J A S O N D

<----------->-----> tomato

Pak Coy

<--><---> Amaranths

<--> Kale

Group Budsara,Huang,Hiep,Ha,Faruk

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Yield t/ha
Kale													10
Tomato													10
Morning glory													12
Pak Choi													12
Amarantus													12

Area 30 m2	Amaranths	Kale	tomato	M. glory	Pak Choy
Water: sprinkler	30 litter	30 litter	30 litter	30 litter	30 litter
Chicken manure: composite 16-16-16	30 g/30m2	30 g/30m2	30 g/30m2	30 g/30m2	30 g/30m2
46-0-0	40 g/30m2	40 g/30m2	40 g/30m2	40 g/30m2	40 g/30m2
46-0-0	40 g/30m2	40 g/30m2	40 g/30m2	40 g/30m2	40 g/30m2
46-0-0	-	40 g/30m2	40 g/30m2		
16-16-16 (5 g/plant)	-	400 g/30m2			
yield	40kg/30 m2	32 kg/30 m2	28 kg	35-40 kg/rai	35 kg/rai

Application

Basic: 16-16-16 : Chicken manure 50:50 (1600 kg/rai)
Urea: 46-0-0 : 40 g/30 m2 16 kg N/ha
Urea: 46-0-0 : 40 g/30 m2 16 kg N/ha

Urea: 46-0-0 : 40 g/30 m2 16 kg N/ha

Note:
- Composite compost
- Concentration of irrigation water
- Crop product: contamination
  - composite of chicken manure

Comment:
From the group 3 presentation
- work out the element balance based on cropping pattern
- identify the 'know information gap' and the design the data collection
- make one balance for each crop

Make one balance for each plot: Ajarn Phrek

Source of element

Nitrogen source :

- urea 46-0-0 40 g/ 16 m2

100 kg urea = 46 kg
40 g of urea 46 x 0.004/100 = 184/100 = 0.0184 kg N/16 m2

- 16-16-16 250 g/16 m2

100 kg 16-16-16 kg = 16 kg
250 g. 16 x 0.25/100 x 1000 =4/100 x 1000 = 0.04 kg N/16 m2

- chicken manure

16 kg/16 m2 = N 4.5 % = 0.72 kg N/ha
P 3.5 % = 0.56 kg P/ha

- residue 20 kg from the crop

N= 20 x 1 % = 0.20 kg
P= 20 x 0.1/100 (10 % of N) = 0.02 kg

total N: 0.0184 + 0.04 kg N/16 m2 = 0.0584 kg N/16 m2 + 0.72 = **0.7784 kg N**
total P: 0.56+0.04 **= 0.6 kg P/16 m2**

Efficiency

N = 0.20/0.7784 = 26.9 %
P = 0.02/0.564 = 3.54 %

Uncertainties in nutrient budgets due to biases and errors-problems and solutions

Approach in nutrient balance studies
Fig from Oenema et al, in press

Bias and Error

Sources of uncertainty Bias and Error

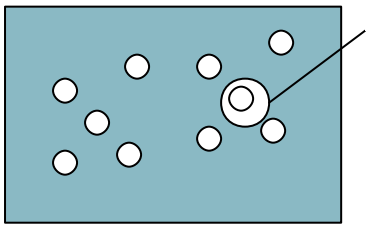
Bias systematic deviation

Error random variation

Large bias means bad accuracy

Large error mean bad precision

Sample Techniques



Running all variable of samplings 5+ 2

Sources of biases

Personal bias Two scientists use different assumptions or guesses

Sampling bias Skewed sample, eg Only the largest farms are selected

Measurement bias Uncalibrated equipment

Data manipulation bias Guestimation? Removalof outliers?

Fraud–conscious introduction of biases, eg hiding information

Sources of errors

Two types of random errors

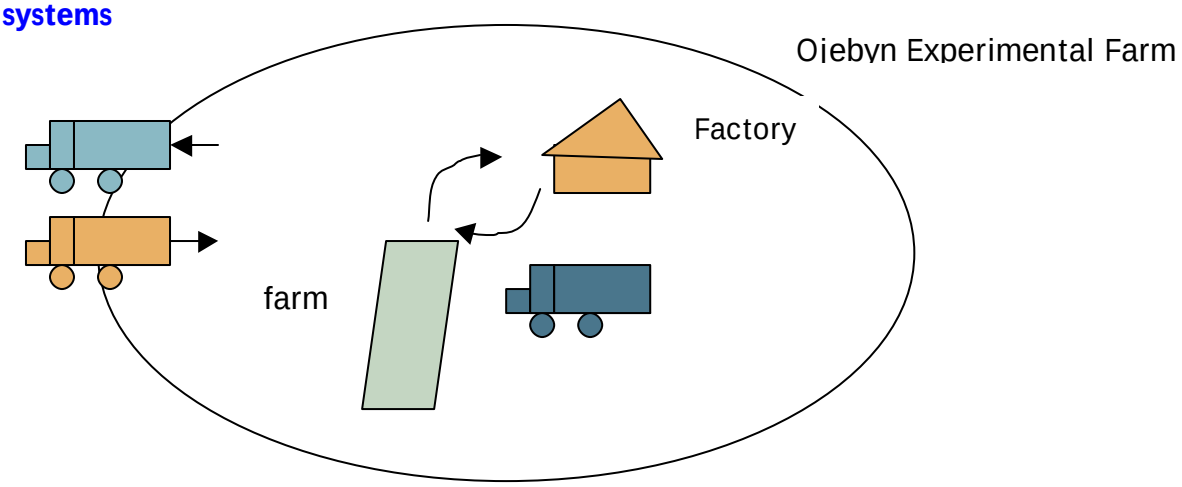
Sampling error Random selection implies random variation

Measurement…

Summery

- Errors air inherent in the variability of nature
- There are a number of possible sources of biases and errors
- Prevention of errors requires proper sampling and standardized measurement procedures…

Fluxes and balances of nutrients and trace elements in different farming systems



Food , Crop production picture

- Two different farming systems, organic and conventional dairy farming, have been practiced since
- The organic system has ha arable land and cows
- Two cowsheds and manure and urine from each farming system is kept separated
- Crop rotation Forage crop oats and pea with under sown ley
- Ley , Ley , Ley , Barley, Potato Forage

Input and output flows at field level

Input

- Manure and urine
- Mineral fertilizers
- Lime
- Atmospheric deposition

Outputs

- Harvested crop
- Water
  - Leaching
  - Surface run-off

Picture

- Soil Crop Field balances for cadmium and zinc-annual variations
- Cd conc in harvested crops in the organic system for two years Different letters between years indicate significant differences p<
- Cd conc in cow manure in the organic and conventional system for two years Different letters between years indicate significant differences p<
- Field balances for K for the crops in the organic system Crop rotation; forage crop oats pea , years of ley grass clover , barley, potatoes

Helena Bengtsson, mfl SLU,JTI and Lund University

Sampling strategies

crop, soil, water, sediment, manure etc

WP and

- Where to take samples?
- How to take samples?
- How to treat samples?
- What to analyze?
- How extraction methods, analytical method?

5 Group division

G Soil profile and mineral N profile for modeling in each country team

G Village sketch Thai team?

G Sampling calibration Key persons for sampling and analyses in each country team
G - Input output PRA team members of each country, and for those who want to learn faming system and interview techniques

Who joins which group?
- What key role do you have in your team?
- What experience do you have?
- What do you want to learn?

Group activity: Minh Ha

1. Background and Objectives
- What did you do?
- Why did you do it?
- What was your expectation/hypothesis?

2. Materials and Methods
- Activities; when, what, by whom?
- Description of methods
- Materials

3. Findings
- Methodology (good, not very good)
- What have we learned (know, unclear)

4. Recommendations
- Planning for the activities

Day11 Wednesday19 March 2003

Sampling analysis protocol
ToT2-Day 5
- the report from the field studies in Ping Noi (give the file to input)
- RURBIFARM protocol for sampling and Analyses' (small group of key scientists)
- DSS

After lunch
- site specific planning, how to implement the knowledge gained during ToT2
- Evaluation of the ToT2 what should be include in ToT3

Decision Tool (Faruk presentation)

DSS for P management: Faruk, Department of Soil Science, Division of water quality, SLU

DSS is a (computer based) tool developed to facilitate decision making activities. It help to:
- retrieve data
- overview data
- summarize data
- analyze data
- standardize

Exercise:

My friend who is now a farmer, harvest daily tomato. A dealer offer him to buy Farmer harvest daily kg Tomato A dealer offered him to buy everyday kg At a price BHT per kg The rest local farmer could sell at a local market during ü day Farmer salary is BHT per day However, prices at a local village market vary between to BHT per kg

Other alternative for my friend is to take all his product to the city situated km from him He actually has a sister who live in town and she could inform him about daily prices, which on city market vary between and BHT per day In this case, he has to work the whole day and he also spend money on gasoline l at price of BHT per l

My friend ahs to make this decision everyday and ask for your help Please discuss and make suggestions or provide the tool which may help him to make the right decision Otherwise he will be forced to go back to research and wrestle with GLEAMS

Assume that he will be able to sell all of his products everyday

Ex. Group 3 peoples : How to help farmer to making 100 kg to local market 20 kg to market

Channel

Who	**price**	**pay**	**total**
1. **Local :** Dealer 100 kg	17 baht		1700 baht
Local market ½ day	200		200
The rest 50 kg	10-20		500-1000

Total 1700+ 500 = 2200 baht/day-200 = **2000-2500**

1700+1000=2700 baht/day-200

equilibrium

Price(bath)	50 kg	+1700	Benefit (-170)
10	500	2200	2000
11	550	2250	2050
12	600	2300	2100
13	650	2350	2150
14	700	2400	2200
15	750	2450	2250
16	800	2500	2300
17	850	2550	2350
18	900	2600	2400
19	950	2650	2450
20	1000	2700	2500

2. City: Sister 100 km 15-25 baht/kg 170 2250-4250
(whole day) (150 kg)

gasoline : 2250-170= **2080-4080** baht-400 = **1680-3680**

			profit
equilibrium price	16 baht = 2400	= 2230 (-170,-400)	= **1830**
	17 =2550	= 2370	= **1970**
	18 =2700	= 2530	= **2130**
	19 = 2850	= 2680	= **2280**
	20 = 3000	= 2830	= **2430**
	21 = 3150	= 2980	= **2580**
	22 = 3300	= 3130	= **2730**
	23 = 3450	= 3050	= **2650**
	24 = 3600	= 3430	= **3030**

Decision support system for P management

Key word	problem	objective	boundary	rules
Price variation	Insomnia	Highest profitability	Village and city market	If: profit (city market) > Profit (dealer local market) Then: sell on city market Else : sell to other

Important step in DSS development

- Define the problem – pollution, sustainability, economic losses, toxic emissions
- Define the boundaries
- Define the objectives
- Define the rules within DSS

Risk assessment - BMP?

Where is the catchment in the highest risk for Plosses?
Why are these parts of the catchment so sensitive– what is the possible cause behind the P loss?
What is the proper cure?
How much will over BMP help?

Decision support system for P management

Key work	problem	objective	boundary	rules
DSS for P management	Lose of p	management	Watershed scale	

Risk assessment -BMP?

Where in the catchment in the hug
Why
How

How much

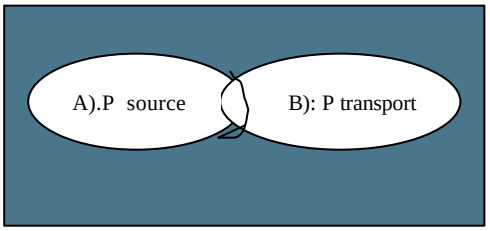
Risk assessment - where ?

A.) P source

- soil P content
- rate and method of P fertilizer /manure application

B.) P Transport (potential loss)

- erosions sensitivity
- surface runoff
- drainage close leaching potential
- surface water proximately



PINDEX = A X B where?

Minimal recommendation of sapling :1 Sample: ha
Multiple is better than additive better in knowing what effect from field A and field B
ex. Field A Field B
20+30= 50 : 20 x 30 = 600
45 +5 =50 : 45 x 5 = 225

GIS map (problem variation in time of GIS)

- slop
- crop elevation (universal soil loss equation)
- p index calculation of p index use p index that has been use in Marie Land (USA)
- transport

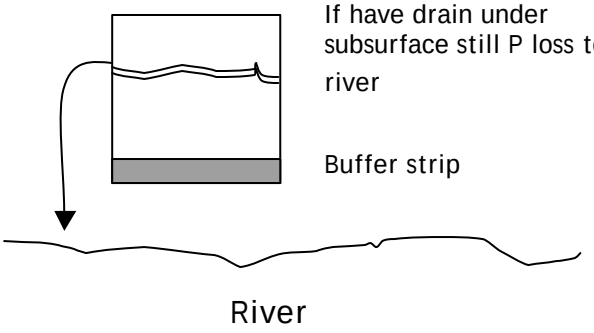
- Topography Elevation slop
- Water course texture P, AL org. management
- P index

High erodibility
LS>
K>
C>
P source
Characteristics> Why?

Probable causes

- High P level in Soil
- Excessive P fertilization
- Subsurface drainage
- Stream proximity

Map



leaching
runoff

Leaching rate > runoff " buffer strip not success"

If assume that no tillage, reduce erosion and P losses

High erodibility TRUE
Slope<
Risk for leaching FALSE

Best Management Practices
- Reduced P fertilization
- P fertilizer incorporation
- Riparian buffer strips
- Use GLEAMS model to test scenario in different BMP

Map and Run the scenario by the simulation Model

Overview, analysis and process spatially variable data
- solution oriented
- Knowledge shortcoming
- Holistic view of the watershed scale
- Dynamic system

Knowledge which can improve system
? Reference system? : try to validation system, compare calculation
? Adjustment for specific conditions
? catchment –DSS Filed model
? Suitable models?
To describe the process
User friendly?? How's a user friendly is it?

Factor Index Computer Program for decision model
a) P Source
b) b P transport

P Index a b

How to use the program for meet the good decision and nutrient recommendations?

- Choose the Nutrient
- Choose the month
- Choose the amount of fertilizer application
- Choose the management options
- Computer will show the result
- Fill the value in the P transport

Exercise and define one problem where a DSS may be used as a useful tool?
- Discuss and define one problem where a DSS may be used as a useful tool
- Define objective and boundaries of your system
- Define few rules for a DSS dealing with alternatives to achieve the

objectives or list the information needed to develop the rules

- Erosion mitigation
- Nutrient fertilization recommendations
- Nutrient balances on field scale
- Choice of crop rotation system
- Recommended though that DSS may be used both to retrieve data and to give support to decision making

More to read: Journal of Environmental Quality May-June 2002 31: 937-945

Exercise: DSS in management practice in vegetable production

Key word	Objective	Rules	boundary	problem
	To Develop better management alternative for vegetable farmers in Ping Noi	- apply chemical fertilizer = output	Ping Noi village No. of hh 209 hh, area 400 rai (12 ha)	Inappropriate fertilization in vegetable production
Risk information				
input and output analysis for information lists and make a rule approach = make a diagnosis--→alternative solution---→set rule				
Diagnosis - farm level : farm element balances approach - input – output /crop Ex. cropping system: pepper, pak choi, cabbage, at farm level: input-output - amount of fertilizer -→ output				
Source of fertilize - organic, inorganic - rice straw - water quality - hormone - crop residue Element balance: how farmer use input in each farmer Diagnosis: farm element approach to get the efficiency of fertilizer use				
Inputs field level: measure the source of nutrient content - rice straw - water sediment - water residues - crop residue : 20 % in the soil 3200 kg harvest x 20 % = residue				

1. N, P – Farm element balances approach
2. Field element balances for estimate source of nutrients
   - Measure field level

crop choice for planted: need information
- Yield (potential yield/per area
- maturity,
- nutrient requirement:

1. Rule
- diagnose where the loss taken?
  1. first, Diagnose farm level element balance
  2. element balance at the filed level
     i. determine input-output deficiency from amount of purchase nutrient and nutrient in vegetable yield + var

Identify of input to 2 sources of nutrient : purchase and non-purchase :

Perches nutrient input = organic, inorganic fertilizer, rice straw, crop residue
non-perches nutrient inputs= crop residue, water, soil

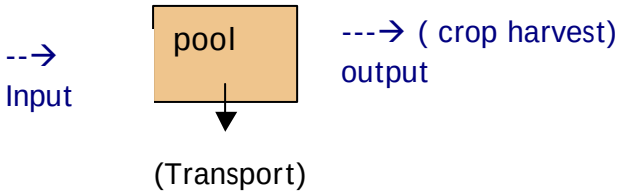
Balance:

Input	Output
Non-purchase nutrient Purchase nutrient +var (representation of total farm)	Crop harvest + losing var fixed var that represent to total farm

Farm level:
source of nutrient
- soil
- water
- sediment

- chemical fertilizer
- organic fertilizer
- rice straw/crop residues

Transport: crop, leaching, erosion, drainage, runoff



2. source of non-purchase of nutrient input in the system for each field
3. choices of crop rotation system
- farmer increase vegetable crop species totally 8 in response to marketing risk
- determine vegetable crop requirements
4. Identify heavy metal absorption ability in each types of vegetables

Further Work plan

ToT 2: Wuxi and Nanging

- stakeholder analysis (PRA)
- Identify main farming system (Data base farmer knowledge database and market database)
- Soil, water and plant sampling within WP3 all ordering to the protocol agreed on in ToT2
- Work plan for Wp3 synchronized with other partners within ToT2
- Nutrient balance calculations at field scale in accordance with guideline in ToT2
- Modelling at field scale (GLEAMS)
- Risk assessment for product quality and environmental impacts according to national standard for soil and environment quality

Ping Noi

DSS in management production in vegetables production

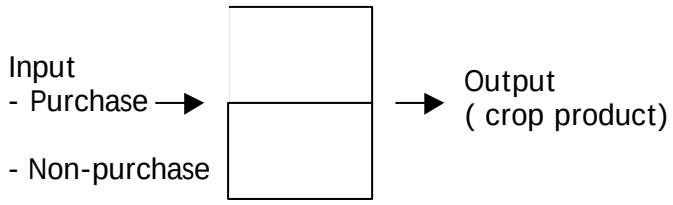
Problems – production and marketing uncertainty
- inappropriate fertilization in quality of vegetables production

Objective – To develop better management alternative for quality vegetable production in Ping Noi

Boundary - Ping Noi Village No. of HH= 209 hh, 40 rai (7.2 ha)

Rules : Input nutrient : determine input/output balance from purchased nutrient input

Farm Level: Determine purchase nutrient input and nutrient composition in vegetables yield



Rule of DSS
- Determine input-output
- Source of amount
- Farmer profile
- Choice of crop rotation system
- Determine vegetables crop requirement
- Nutrient requirement and identify best farm yield
- Identify heavy metal absorption ability in each type of vegetables (from literature)

Rapid Report of the Field Study in Ping Noi Village, Chiang Mai

RURBIFARM Training Course (ToT 2), March 18, 2003

Content

Group 1. Soil profile description in the Ping Noi village, Chiang Mai, Thailand

Group: Faruk, Shi, Hiep, Budsara, Tuan and Karin
Farmer: Saguan, (village leader)

Background and Objectives

We identified two areas where to do the profile descriptions according to the farmer's recommendations. We selected one good soil (Site 2) and one bad soil (Site 1).

We did the soil profile description to standardize and exemplify the soil survey methods between the different country groups. We were also interested to see how the Ping Noi soil profile looks like.

We assumed that we could get a lot of information on soil properties, such as soil structure, horizons, water conditions, porosity etc, but also about soil quality in terms of fertility. Our hypothesis was that we from the soil profile descriptions could see differences between a good and a bad soil.

Materials and Methods

The investigation was performed between 9 and 11 a.m. March 18, 2003.

Activity table			
Activity	Who	Method	Output
Contact the farmer	Professor Phrek		Mr. Saguan
Identification of good and bad soil	the farmer	interview	
Identification of exact spot	the group		
Dig the soil pit	the male part of the group	shovels, knives,	two profiles
Interview with the farmer	Karin and Budsara. Budsara translated	semi-structured interview	information about soil history, land use, soil management and irrigation
Description of profiles	the group	study by using knives, fingers and eyes	
Sketches of soil profile and its locality	Karin	Drawing	maps and picture of the bad soil profile (Site 1)
Showed the good soil profile for the sampling group			

Criteria for selection of good and bad soil:
The farmer criteria for the bad (Site 1) and the good soil (Site 2) were:

- crop performance
- land use and soil forming process
- use of pesticides and chemical fertilisers ?
- ?

Criteria for selection of exact spot:

- far away from the trees to not disturb the tree roots
- direction of solar radiation
- in the middle between the ditches (only for the bad soil, Site 1)
- in the middle of the plot (the crop bed, see the map) (only for the good soil, Site 2)

The depth of the pits was determined by the ground water level. It means that when we got water in the bottom of the pits we stopped digging.

Findings

Methodology:

- Soil profile description gives an estimate of the soil types and soil quality in the study area.
- Soil profiles can visualize soil properties for farmers and can easily be discussed with farmers
- Soil profiles indicate the spatial variation in the soil, both horizontal and vertical variation. This will give an indication of how to sample the soil in a representative way.
- Too short time for doing good descriptions.
- In some cases we needed better equipment, for example a better measuring stick.
- We only did a little bit of the description, due to lack of time.
- We didn't use a common manual for the description

Findings:

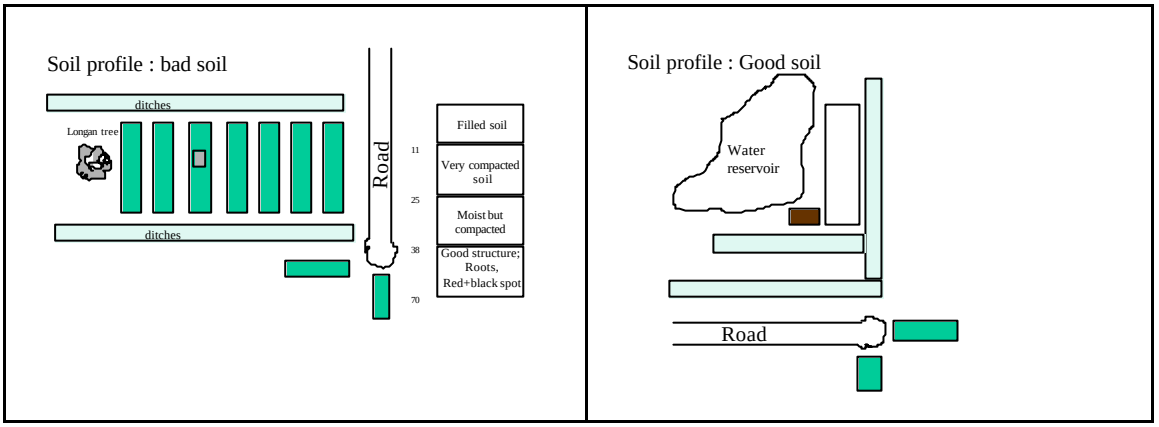
- The topsoil was not the original soil. Sediment from the ditches was put on top of the original soil when the ditches were constructed.
- The water hydraulic conductivity is probably low, since the ground water table was lower in the pits compared to the water level in the ditches and in the pond.
- Depending on the actual use and treatment of the soil we got deviations in the profile description, e.g. at Site 1 the soil was used as a path while at Site 2 the field was newly re-cultivated.
- Granular soil structure deep in the soil.
- We could see cracks at the soil surface, but they were only a few cm deep.
- We found compacted horizons in both pits. This could be due to the former land use for paddy rice, and/or due to the tillage practices with a small tractor on moist soil.
- We found red and black spots in both profiles. In the first profile (the bad soil) they started at 38 cm depth, in the second profile we didn't measure the depth.
- We found clay coating in the root channels and at the soil aggregates, which could indicate internal erosion
- We think it was clay soil at both sites
- We think that the organic matter content increased deep down in the profile compared to the OM content in the middle horizons.

- Very fine roots were found through out the soil profile down to the ground water level.

Recommendations

Methods:

- One day for each profile is needed to make a proper description.
- A common manual should be used for the soil description, e.g. the FAO soil profile description manual.
- We need information from farmers to set up the farmers' criteria for good and bad soils and to choose where to make our profiles.
- Use the same criteria for selection of pits at the different sites
- Soil profile description can be used to as a good methodology to get an estimate of the soil types and soil quality in the study area.
- Soil profiles can be used as a good indicator of the spatial variation in the soil, both vertical variations within horizons and horizontal variations between horizons, and could be used as an indication of how to sample the soil in a representative way.
-



Planning for coming activities in the RURBIFARM project

How to make the soil and soil profile characterisation? What do we need to do and how should we do it? How to identify horizons for sampling – regular depths or from the genetic horizons?

Group 2. Village sketch of Ping Noi village and water flows to the village from the surrounding areas

1. Background and objectives:

This field study was a part of the Rurbifarm ToT 2. The Rurbifarm ToT2 focus on the methodology of conducting element balances and introduction to using LISEM model.

The site we visited this morning named Ping Noi site, Ping noi village, Sansai subdistrict, Saraphi district, Chiang Mai province, Thailand. Ping Noi site is site of Farmers Field School (FFS) on Pesticide free vegetable. The site belongs to MCC, Chiang Mai University. The FFS activities are in village 8, where we conduted our study.

Our short-term objectives is to:

- Make a village sketch, in order to get a overview picture of the whole village, including where houses, important institutions, roads, fields and irrigation channels, local name of the fields, and draw it in relation to each other.
- the link of the village to the sounding areas.

The village sketch and flows are buid based on both science and local knowledge.

These sketches will later be used to

- Design the sampling of water and sediment in order to understand the factors that may affect the quality of vegetable, growing in the village.
- Be used when communicating with the farmers about their village, with will make it possible for researchers and extension workers to get a clear picture of the area when conducting further research and identifying problems that farmers talk about.

Team member:

Thai team, MCC	**Vietnam team, NISF and VESDI**	**Swedish team, SLU**
Jantana Wongkeawchan	Tran Kim Hoan	Kristina Kvamme
Chorpaka Muangsuk	Pham Thi Nhung	Minh Ha. Fagerstrom
	Vu Thang	

2. Materials and Methods

2.1. Activity

Time			Who		Outputs
			Team	Farmer	
9.30 – 10.15a.m.	Gathering basic information of Ping Noi Village	Tambon Administration Office	Team	Rattana Boonkam (administration official)	San Sai Sub-district administrative map Map of irrigation canal in San Sai Outline of village sketch
10.15 – 10.30	Surveying Ping Noi area	Farmer Field School area	Team	Sanit, Sanguan	Mapping of FFS area
10.30 – 11.30	Interviewing key person	Farmer Residential 97/1 Village No.8 Ban Ping Noi San Sai Sub-district Saraphi District, Chiang Mai	Team	Tawatchai Promsit (assistance of village heading)	Land area, No. of farmers, No. of house-holds and farming systems in Village No.8 Irrigation canal pathway through in village No.8

***Materials*:** We have gathered the following maps, with the support by Tambon Administration Office:

- San Sai sub-district administrative map
- Map of irrigation canal in Village No.8
  - Muang Rong S Tan
  - Muang Sai Nguey
  - Muang Siey Nam
  - Muang Pe Rai (mid-Pe Rai, Muang Hang, Muang Luang))
  - Muang Pa Ya Kham
  - Muang Tung Poo Chiang
  - Muang Chao Maha Wong

Methods:

We followed the process as follows:
Step 1: Gathering the relevant maps to understanding the irrigation system/water flows leading to the village.
Step 2: Get a picture of the distribution of different land use kinds available in the village, with focus on the irrigation system within the village.
Step 3: Get a picture of the distribution of different fields.

1. Observation was done both by car and by walk, starting from the field house close to the FFS fields, to the southern part of the village and turned to the east, to the residential land part of the village.
First, we went to the Tambom administration office to look the overview of Ping Noy village then we move to survey around the areas (looked at the field) to make the important remark and made an outline of village map. Finally, we visited assistance of village heading to interview the background, scope and land tenure in this village.

2. Drawing village sketch using open-ended interviews

2. 1. Water flows sketch:

-Put all canals from different map into one sketch.

-Identify the outlet, where water comes into the village from the canals system.

-The following questions were asked:

-Asking for detail of map that use for village sketching

-Name of the place of the outlet, where water from the canals came into the village

-Name of all canals in the surrounding areas.

2. 2. Village sketch:

-Make the first sketch for village 8, taken from the administration map of the sub-district.

-Identify places where we had been, on the maps.

-Ask the knowledgeable farmer to draw different canals and different fields.

The following questions were asked:

- Where are we on the map?
- Where does your field in the map? Whose fields in the surrounding areas of your field?
- The name of the area (Call by land tenure)
- How many farmer groups in this village?
- How many households
- What is the average farm size?
- What are cannel pass through the village? And how?
- The crop which farmer planting?

3. Findings

3.1.Methods used

Good:

- We found the key informant, who is in charge for irrigation of the village. Te key informant knew all fields and all canals in the village. He was interested in being involved in the interviews.
- The team was flexible in searching information based on the situation. We should not to have to set picture of how the survey should be conducted, since during the time often one have to find new solutions, i.e. when the village leader was not available we got in contact with the assistant, who had a lot of knowledge about the irrigation channels and different land units names
- The method allows us to interact with the villagers, being in the area that makes it easy to get a good picture of reality.
- Through interaction with farmers at this stage, they will be more interested in further work and collaboration.

Not good:

The first farmer did not know much about the village
No checklist was prepared in advance. That made the interviews not structured and difficult for the English speaking Thai member in the team to help us to interact with farmers.

3.2.What we have learned

3.2.1. The general picture of the village (sketch 1)

Bounders:

To the north: village 9th (Bann Pak Klong)
To the west: village 1st (Bann San Sai Lam Chang)
To the east: village 7th(Bann Ping Luang)
To the south: village 1st (Bann San Sai Lam Chang)

Water flows to and within the village: (sketch 1)

Water in: Small canal from Muang Paya Kham and Muang San Sai Maha Wong
Water out: Muang Sia Nam
The main source of irrigation water comes from the Ping River. Two different levels of canals within the village, including (1) water lead to and from the village and (2) small canals to and from the fields

There are 6 canals in the sub-district areas. They are: Mong Sia Nam, Muang Chao Maha Wong, Muang Rong Pong, Muang Paya Kham, Muang Pa Rai, Muang Pa Rai (Muang Klang)

Village sketch (sketch 2)

The total area of the village was reported to be 460 rai (about 76 ha). 186 households are in the village (according to Tawatchai), and 100 % are farmers'. The main livelihood structure: there are 3 different farmers groups in the village, (1) Orchard and vegetable, (2) handicraft, (3) chicken group.

The residential land is mainly situated in the southeast of the village.
Most of the fields situated in the northwest of the village.
Orchards of longnhan is mixed with vegetable fields. The most common vegetables are: tomatoes, chili, cabbage, salad etc. In the orchard there was longnhan, mango etc.

Most of the farmers live along the road to the east of the village. One group of houses located to the west of the village, along the road, which cross in the

middle of the village. Good infrastructure and nice houses with flowers. We do not know about the drinking water sources.

4. Recommendations

4.1Methods:

Preparation before the PRA work: A careful preparation is needed, including:

- a checklist of the questions for the interview is recommended to prepare in advance.
- A based map, based on all maps available, including the GIS land use map, is recommended to complete before going to the field.
- Key informants, i.e. knowledgeable farmers, need to be identified.

4.2The works needed to be completed:

4.2.1.Complete the villages sketch, in terms of:

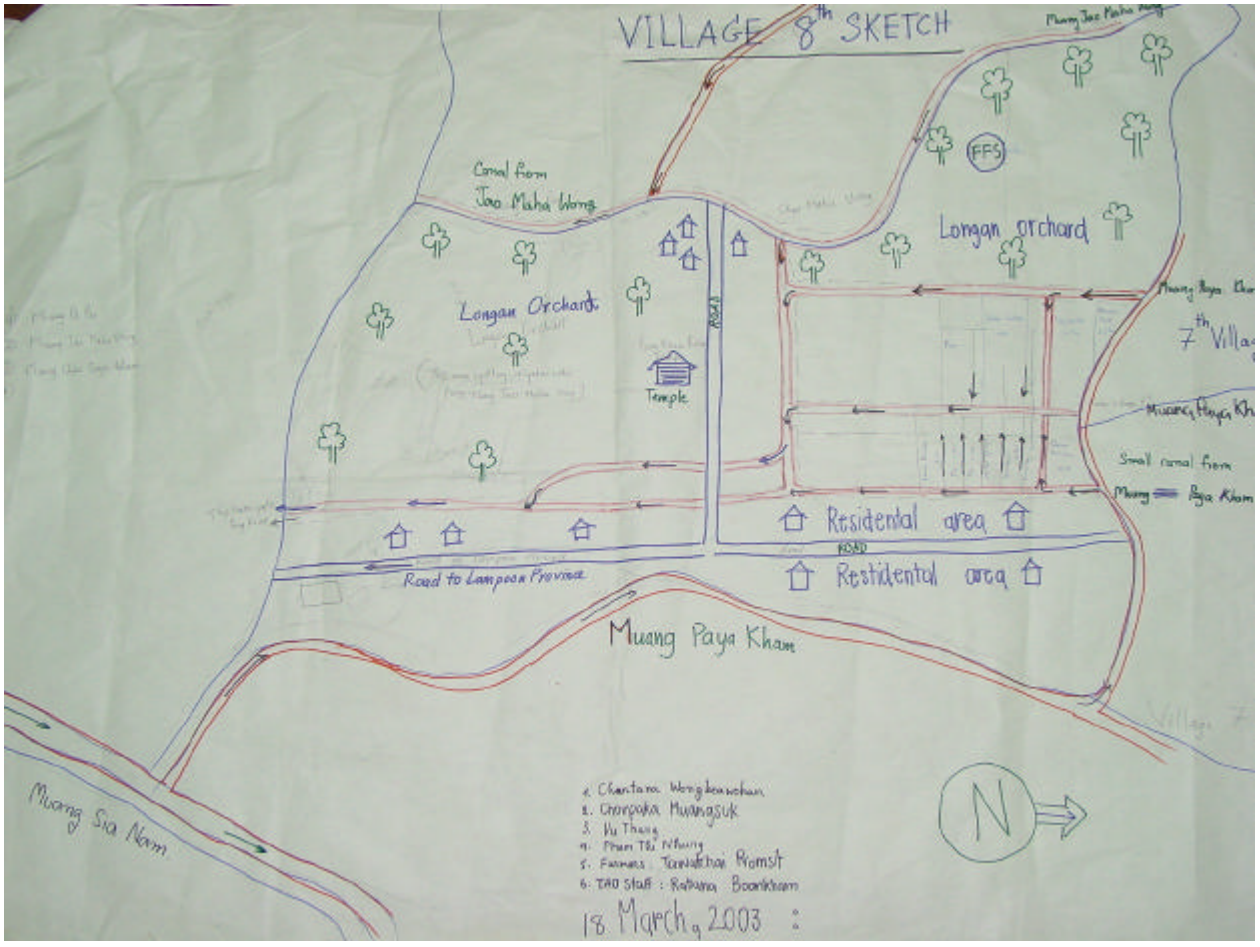
- Get all fields with owners' names in the sketch.
- Use the sketch with owners' names (in Thai language) to discuss with farmers, who have their field in each area, to know about the situation of soil, and water in each area in the village.

4.2.2. Draw a village sketch map with focus on flooding and soil quality.

Appendix 1. Materials for the fieldwork

Paper, pen, pencil, erase, rule, camera…

Appendix 2. Village sketch



Group 3. Sampling methodology (incl sample treatment) – crop, soil, water, sediment, manure etc for WP1 and 3.
Objective: To develop the **sampling protocol** for WP1 & WP3 in RURBIFARM PROJECT.

Why? Not a common understanding how to sample in different input-out put materials for WP1 & WP2; Different condition of works from partners (human resources & facilities)

Expectation: A common understanding of sampling in WP1 (complement data) and for Monitoring in WP3 for different partners

Who participate: PQHA, Huang Biao; Phrek, Ingrid, Hung, Zdung

Materials & methods
- participatory way (in discussing and site visiting)
- When: 030318 : 9-10 : discussing & 10-11 site visiting for different cases; 14-16 (discussing & reporting)

Findings
- What to analysis? What samples; How to sample for what purposes (to know the quantity yielding, general ideas, or for element balance? Site specifics (nutrient or heavy metals (degree of contamination)
- Links with WP1 ➔ cropping systems ➔ How to choose crops (representative; about quality ➔ Key (hot issues; consumers concerns (survey); scientific data (literature review), quality of vegetables (WHO, national standards)
- We decide what crops, where we will work

	Soil	**Water & sediment**	**Vegetables**	**Fertilizers & manures**
Secondary data (What we have)	X			
Preparing (equipment)	Map, GPS, Cropping calendar, sequence (WP1) List of: Sampler equipment (auger, bag, shovel, maker….) Contact with farmers	List of water sampling equipment	Cropping calendar, sequence (WP1)	WP1
Detail work procedure (taking sample (quantity), labeling)	Random samples Hot plot Paire-samples (soil/crop)		Pay attention about (row spacing planting or broad casting; edible part (quality); whole for balance➔ kind of vegetable Leaf, root, fruit Monitoring or general data	Pay attention to the kinds, composition (ratio(dung/other) from what animals & what plan residues, from (degree of compostages (water content)
How much is enough (WP1) Number Quantity	It depends but (5-7 for every cropping systems) or type of soils 0.5 kg dry		circular sample sizes (3-5) sampling units/crop	
Storage & transportation	Pay attention for chemical or microbiological analysis (Cool Fridge, 4 centigade degree)…. Easily affected by Temperature (NH4, NO3,)		not plastic bags (paper bag or cloths bag) washing???	
Where analysis	Should know before sampling? By you or by other (if other should know the exact methods➔ ref.)			
What analysis	Should know before sampling? It depends on the exact purpose Ex: N, P, Heavy metals (sampling the same way but not same for soil preparing)			

Recommendations:

- Receiving reactions from others (WP1, WP4)
- Difficulties of partner(s) (What need more specify)➔ mainly for human resources and facilities➔ concrete cases (reaction from partners)

- WP1 & WP3 Coordinators write the sampling protocols ➔ sent to Projects coordinator and Partners (before 5 May)

Group 4. Report of Field Survey on Input-Output Flows in Vegetable Fields

I. Background

Ping No is the study area of MCC Rurbifarm project. It is far from the Chiang Mai University, about 40 km to the South. In the past, rice was considered as the main crop. In 1982, crop transformation was to be changed, rice was changed shifted to fruit tree cultivation (Logan). Recent years, Ping Noi is known as the main area of vegetable and fruit planting. Theses vegetables have been transported to Chiang Mai City and other provincial market.

Table 1. Survey information

Group interview (subgroups)	PRA/RRA by	Farmers	Address
G 4.1	Tan, Phoeng, Dr Tran yam, Tien	Pipop	Ban Ping Noi, Tambon, Sansai, Saraphee district, Chiang Mai
G 4.2	Aey ,Tuan, Tum	Phan	
G 4.3	Charlotte, Yu and Nong	Inta	

The Objectives

The aim of our activities was to practice the input and output balance of vegetable at the field level that we have learned in class (theory).

What we did: To find guider farmer, name of farmers (see Table 1).
To find and select vegetable plots for input and output balance analysis.
To go around the vegetable plot
To interview with framers
To collect data that related to input and output materials

The expectation of the case study

Expectation: want to know how farmers manage their vegetable farm, especially,
To explore the material flows and quantify the inputs and output in their farm.
Learn and practice

2. Material and methods

1. Material

No map
No equipment
No questionnaire
Large paper, pens

2.The methods

The following methods are applied in the practice
RRA (semi-structure interview) open question was employed in interview process
Key person
Observation (landscape, soil characteristics and vegetable, water resources)

Landscape: Drawing the transect or map
Land/soil: clay loam, topsoil layer with good soil moisture

Activity

Time	who	activities or Description of method:	output
18, march, 2003	Group4	Take look at filed	Field map
		Interview with farmer	Crop calendar
			Farming system
			Input output balance

Questions

	what	when	how much	how to	where	why
Input						
Seed						
Fertilizer						
Pesticide						
Water						
Manure						
Crop						
Others						
Output						
Harvest						
crop residual						

Finding results

Methodology: This is considered as a suitable method for identifying the input and output materials in the farm
We have to combine with other methods like: measure the primary data (Input and output flows) from each cropping system.
The limitation: big biases because farmers provided the information some time are not accuracy. So data not correct, statistics,

Crop cycles (sub groups 4.1, 4.2, 4.3)

GI		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
G4.1	1												
	2												
	3												
	4												
G4.2	5												
	6												
G4.3	7												
	8												
	9												

Crop calendar 2002/2003 (15 March 2002 –16 March 2003)

GI		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
G4.1	1												
	2												
	3												
	4												
G4.2	5												
	6												
G4.3	7												
	8												
	9												

Notes;

1. Big chili: crop/ year (life cycle about 210 days)
2. Water Convolvulus: growing around year (life cycle 28 days)
3. Spinach: 2 crops/year (life cycle 45 days)
4. Hong Te: 5 crops/ per year (life cycle 45 days)

5,9 Pakchoy (45 days)

6,8 Cabbage (75-100 days)

7. Chili pepper (7-10 months)

Input materials		Output materials	
		Yield	Crop residues
Crop 1	(Big chili 1 rai)	1000 kg/rai	
Seed:	250-300 gr		
Fertilizers	15-20 kg/rai (16-20-0) after 7 days planting. 25 kg/rai		
Water	????		
Pesticides			
Herbicides	100cc/ 20 lit		
Input materials		**Output materials**	
Crop 2	(Water Convolvulus 33 m^2)	94-120 kg/rai	
Seed:	48.5 kg/rai		
Fertilizers	3kg (Urea 46%)		
Water	????		
Pesticides/her	Free		
Crop 3	(Spinach 33 m^2)	2909.0 kg/rai	
Seed:	12.12 kg/rai		
Fertilizers	3 kg/ rai (20-20-0) for two time application		
Water	???		
Pesticides/her	Free		
Crop 4	(Hong Te 33 m^2)	3393.9 kg/rai	
Seed:	4.8 kg/rai		
Fertilizers	3 kg/ rai (Urea 46)		
Water	????		
Pesticides/her	Free		
Crop 5	(Pakchoy 2 rais)	1500 kg	
Seed:	0.5 kg/rai		
Fertilizers	50-60 kg/rai for two time application		
Cow manure	1000 kg/ rai		
Rice straw	150 kg		
Water	???		
Pesticides/her	250cc/rai (Padan)		
Simulated growth	500ml/rai		

	Input materials	Output materials	
Crop 6	(Cabbage 2 rais)	3000 kg/rai	
Seed:	0.6 kg/rai		
Fertilizers	60 kg/rai (20-20-0) 50 kg/rai (13-13-21)		
Cow manure	1000 kg/rai		
Rice straw	150 kg		
Water	?????		
Pesticides/her	250cc/rai (Padan)		
Simulated growth	0.5 lit		
Input materials		**Output materials**	
Crop 7	(Chili pepper 1 rai)	136.1+... kg/rai	
Seed:	0.3 kg/rai +...		
Fertilizers	65 kg/rai (20-20-0) +... 50 kg/rai (13-13-21) +...		
compost manure	500 kg/rai		
Rice straw	-		
Water	?????		
Pesticides/her	250cc/rai (Padan) +...		
Baccillus Thuringinensis	720 cc/rai +...		
Extract	600 cc/rai +...		
Simulated growth			
Crop 8	(Cabbage 1 rai)	720 kg/rai	
Seed:	0.3 kg/rai		
Fertilizers	90 kg/rai (20-20-0) 50 kg/rai (13-13-21)		
Extract	900 cc/rai		
Baccillus Thuringinensis	720 cc/rai		
Water			
Crop 9	(Pakchoy 1 rai)	1300 kg/rai	
Seed:	1 kg/rai		
Fertilizers	80 kg/rai (46-0-0)		
Pesticides/her	0.4 kg/rai (Nadan)		
Water			

What we have learned: How to make interview
Farming management
Method of conducting the input and output balance

Recommendation

Method:

1. Bring a calander when meeting the farmer as a help for the farmer to remember but it's important to be aware of that the farmers year can be have a different beginning than the calander.
2. Discuss the method with the translater before the interview to avoid method mistakes.
3. Be well prepared with the detail guideline / Questionnaire on input and output balance for participants/ learners so that the farmer wont be ocupied longer than nessecary.
4. Should introduce other methods on input and output in more detail
5. Data processing: How to carry out
   Statistic
   Analysis
6. Simple and effective method of determination some elements in input and output, system balance, movement of heavy metal in the soil
7. Have to know background of research area before do PRA, such as crop cycle, kind of plants (from secondary data or RRA)

Annex. Method for Rapid Report Writing from Field Survey
(Presented by Minh Ha)

5. Background and Objectives
- What did you do?
- Why did you do it?
- What was your expectation/hypothesis?

6. Materials and Methods
- Activities; when, what, by whom?
- Description of methods
- Materials

7. Findings
- Methodology (good, not very good)
- What have we learned (know, unclear)

8. Recommendations
- Planning for the activities

ANNEX : List of participants

Name	Team
Ingrid Oborn	SLU
Faruk Djodjic	SLU
Karin Blomback	SLU
Britta Ogle	SLU
Minh Ha Fagerstrom	SLU
Fergus Sinclair	UW Bangor
Laxman Joshi	ICRAF
Le Thac Can	VESDI-VN
Pham Binh Quyen	VESDI-VN
Tran Yem	VESDI-VN
Nguyen Duc Tung	VESDI-VN
Tran Khac Hiep	VESDI-VN
Pham Viet Hung	VESDI-VN
Nguyen Xuan Dung	VESDI-VN
Tran Thi Kim Hoan	VESDI-VN
Nguyen Tu Loan	VESDI-VN
Pham Quang Ha	NISF-VN
Bui Huy Hien	NISF-VN
Thai Phien	NISF-VN
Vu Dinh Tuan	NISF-VN
Vu Thang	NISF-VN
Nguyen Thi Hien	NISF-VN
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Prathanthip Kramol	MCC
Vorraveerukorn Veerachitt	MCC
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