Research Scope in Indonesia & Some Issues Related to the RIHN Project

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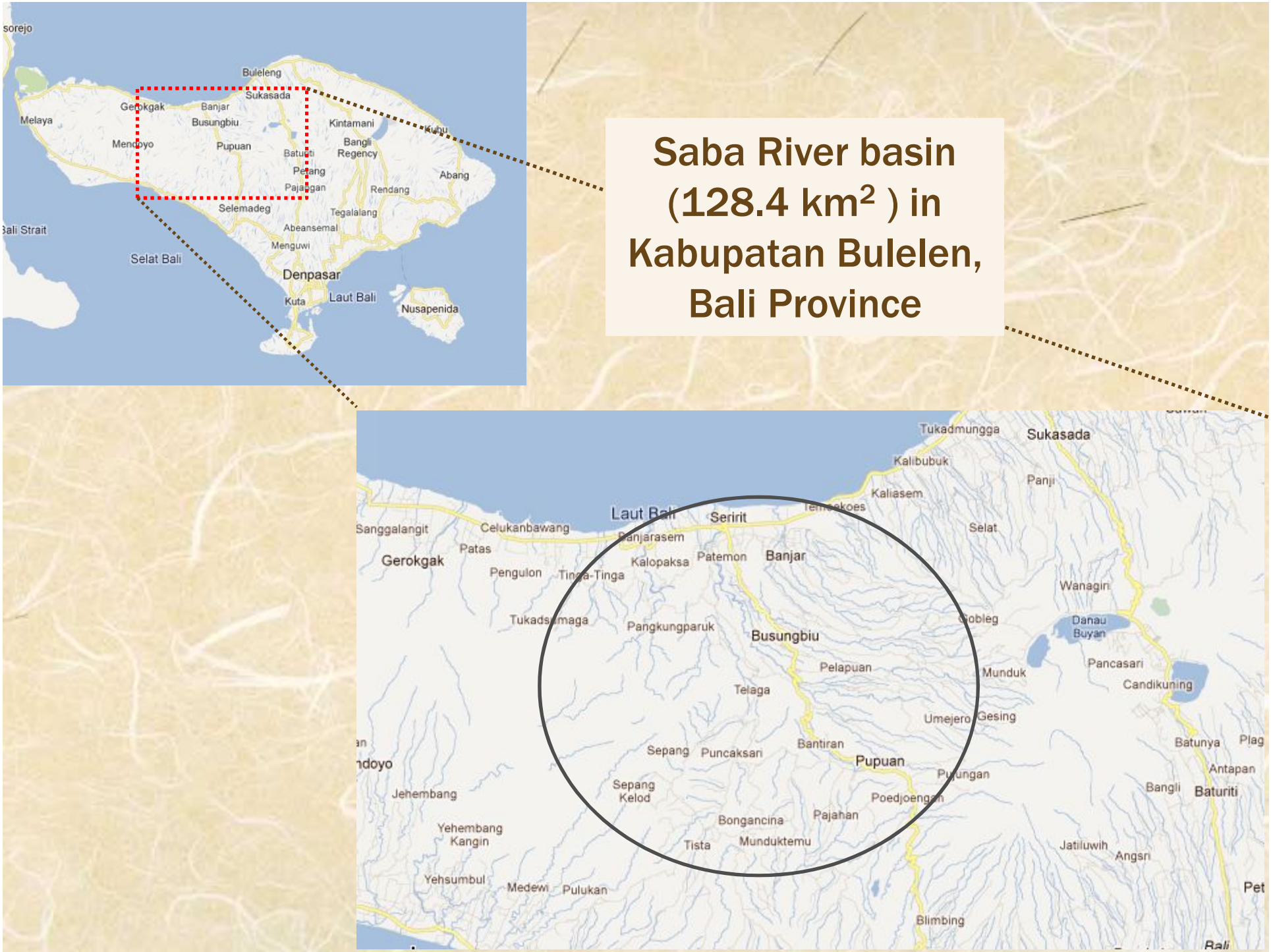
Abstract: At first two study areas in Indonesia, the Saba River basin in Bali Province and Bili-bili irrigation project in South Sulawesi Province, were briefly introduced, and road map of research was proposed. Then some issues related to the final target of the research project, "Designing the local framework of integrated water resources management", were listed up and discussed as follows; 1) monsoon Asia, 2) rice cultivation and irrigated agriculture in monsoon Asia, 3) why dry season irrigation is a challenging practice, and 4) organizational classification of irrigation system. In this discussion confronting problems in the dry season irrigation of two study areas were pointed out. Finally outline of Bali research plan were proposed including the following contents; 1) main objectives, 2) research topics, 3) research period, and 4) research member.

I. Study Areas in Indonesia

- Subak（WUA）
- Saba River basin（128.4 km^2）
- Bali Province

- P3A & GP3A（WUA）
- Bili-bili Irrigation Project
- South Sulawesi Province


Bili-bili project in South Sulawesi Province
Subak in Bali Province
Kualakapuas
Martapura
Limbong
Kalumpang
Rindingallo
Lamasi
Nuha
Bastem
Asera
Bonggakaradeng
Lembang
Mowewe
Duapitue
Wolo
Abuki
Lamuru
Makasar
Bontocani
Kabaena
Bungaya
Tanete
Situbondo
Wongsorejo
Flores Sea
Tempurejo
Mataram
Sambelia
Denpasar
Selong
Praya Barat
Dompu Regency
Ruteng
Ende Regency
Waingapu


Buleleng
Sukasada
Gerokgak
Banjar
Melaya
Busungbiu
Kintamani
Mendoyo
Pupuan
Bangli Regency
Baturiti
Petang
Abang
Pajahgan
Rendang
Selemadeg
Tegalalang
Abeansemal
Menguwi
Selat Bali
Denpasar
Kuta
Laut Bali
Nusapenida
Saba River basin (128.4 km²) in Kabupatan Bulelen, Bali Province
Tukadmungga
Sukasada
Kalibubuk
Panji
Kaliasem
Laut Bali
Seririt
Selat
Sanggalangit
Celukanbawang
Panjarasem
Patas
Gerokgak
Kalopaksa
Patemon
Banjar
Pengulon
Tinga-Tinga
Wanagiri
Pangkungparuk
Busungbiu
Danau Buyan
Pancasari
Pelapuan
Munduk
Candikuning
Telaga
Umejero
Gesing
Batunya
Plag
Bantiran
Sepang
Puncaksari
Pupuan
Antapan
Jehembang
Sepang Kelod
Bangli
Baturiti
Pajahan
Bongancina
Yehembang Kangin
Tista
Munduktemu
Jatiluwih
Angsri
Yehsumbul
Medewi
Pulukan
Blimbing

Rice terrace in Saba River basin

Rehabilitation of embankment: river infrastructure was damaged by flooding in 2010.

Irrigation system in Saba River

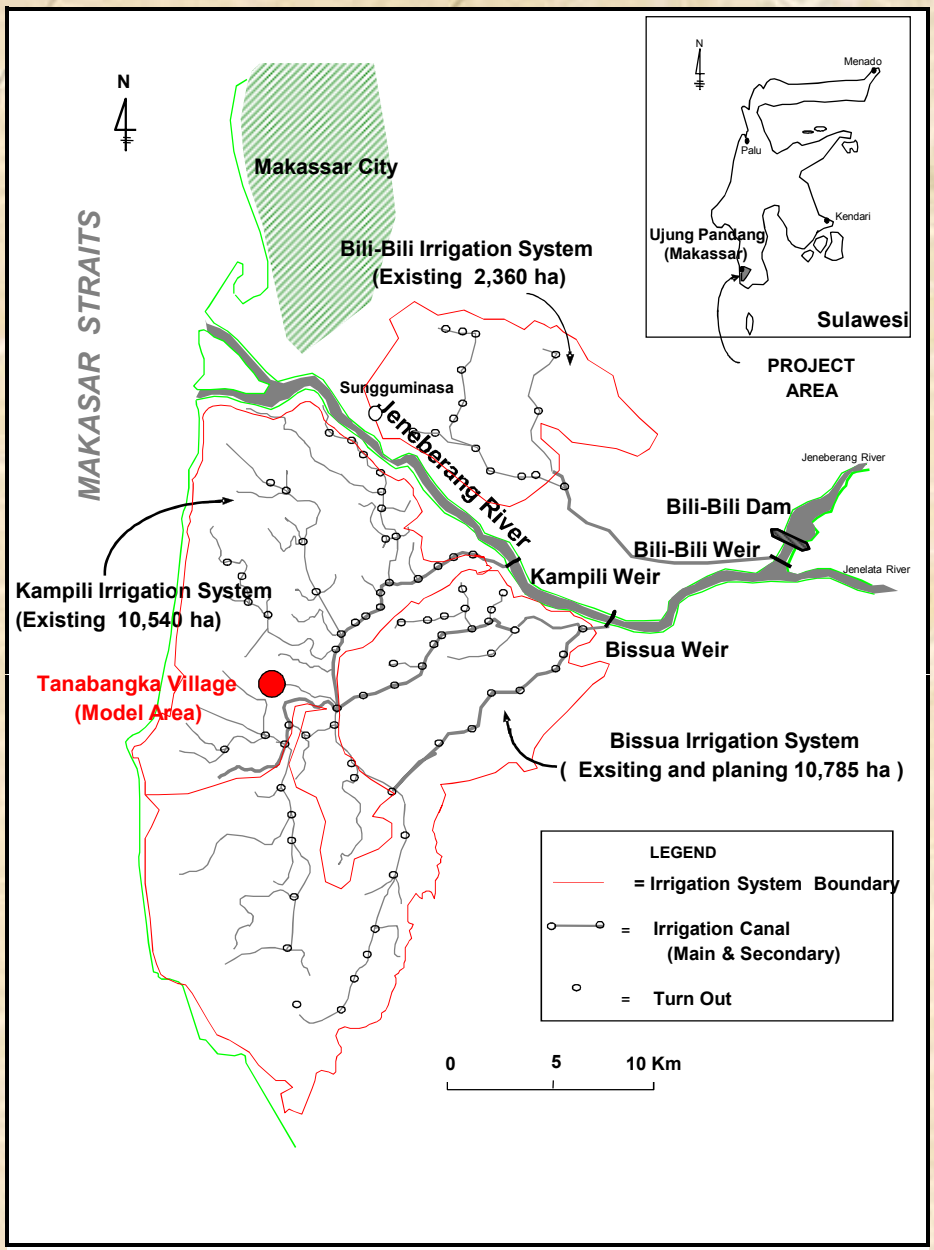
Dam

Main canal

Division structure and a tertiary off-take: tek-tek is the base unit of water division in subak.

Kampili Irrigation System (existing) : 10,540ha

Research area: Tanabangka Village



Map of Bili-bili Irrigation Project

Canal layout and tertiary/quaternary units in the research area of 289ha

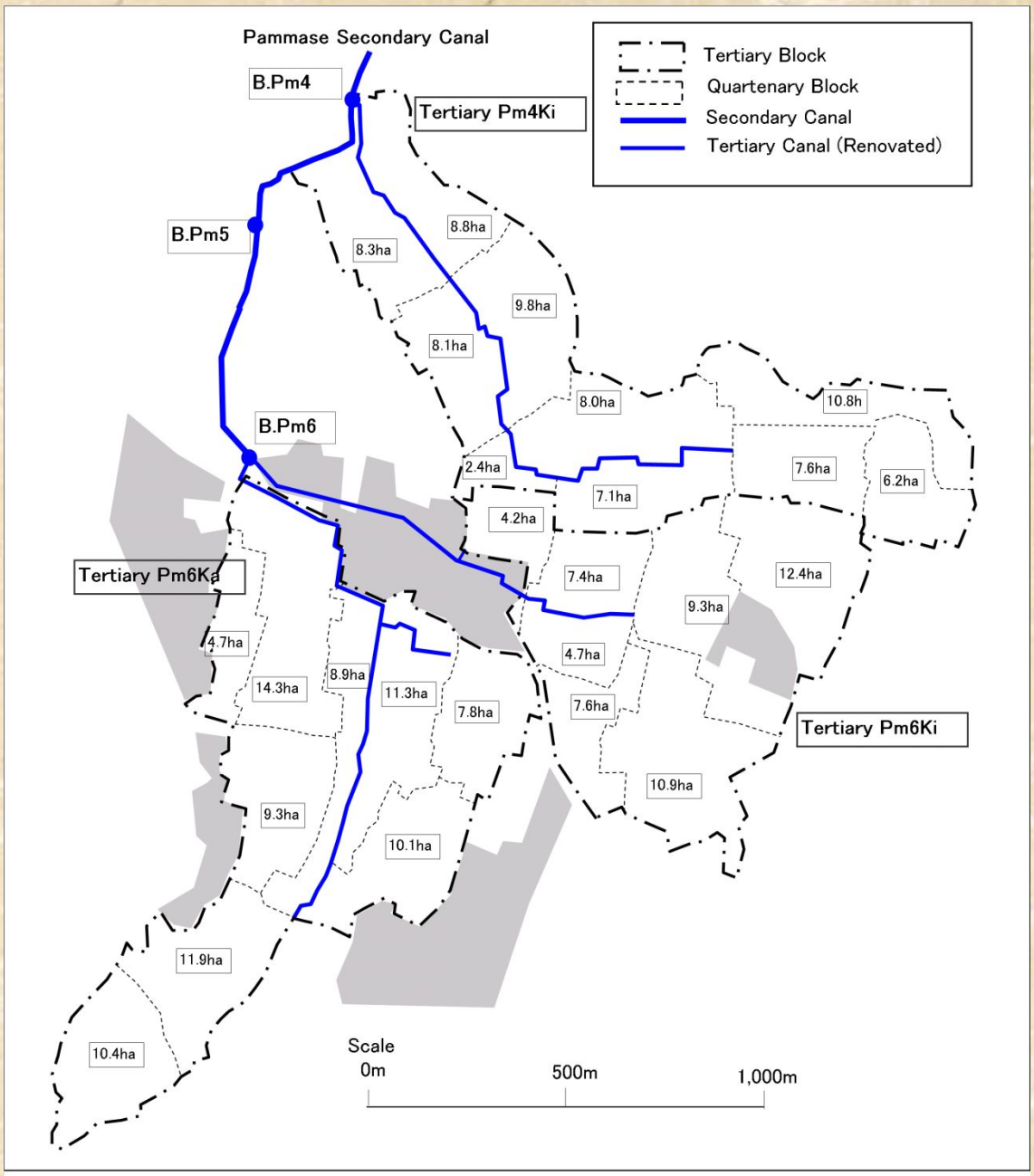


図　7　モデル地区の3次水路と4次水路ブロック

Inlet at tertiary canal:

Inlet will be installed at quaternary canal in the project.

Tertiary off-take at diversion point:

Quaternary canal will be excavated in near future.

P3A (WUA) meeting:
NGO staff shows farmers the layout of quaternary canal

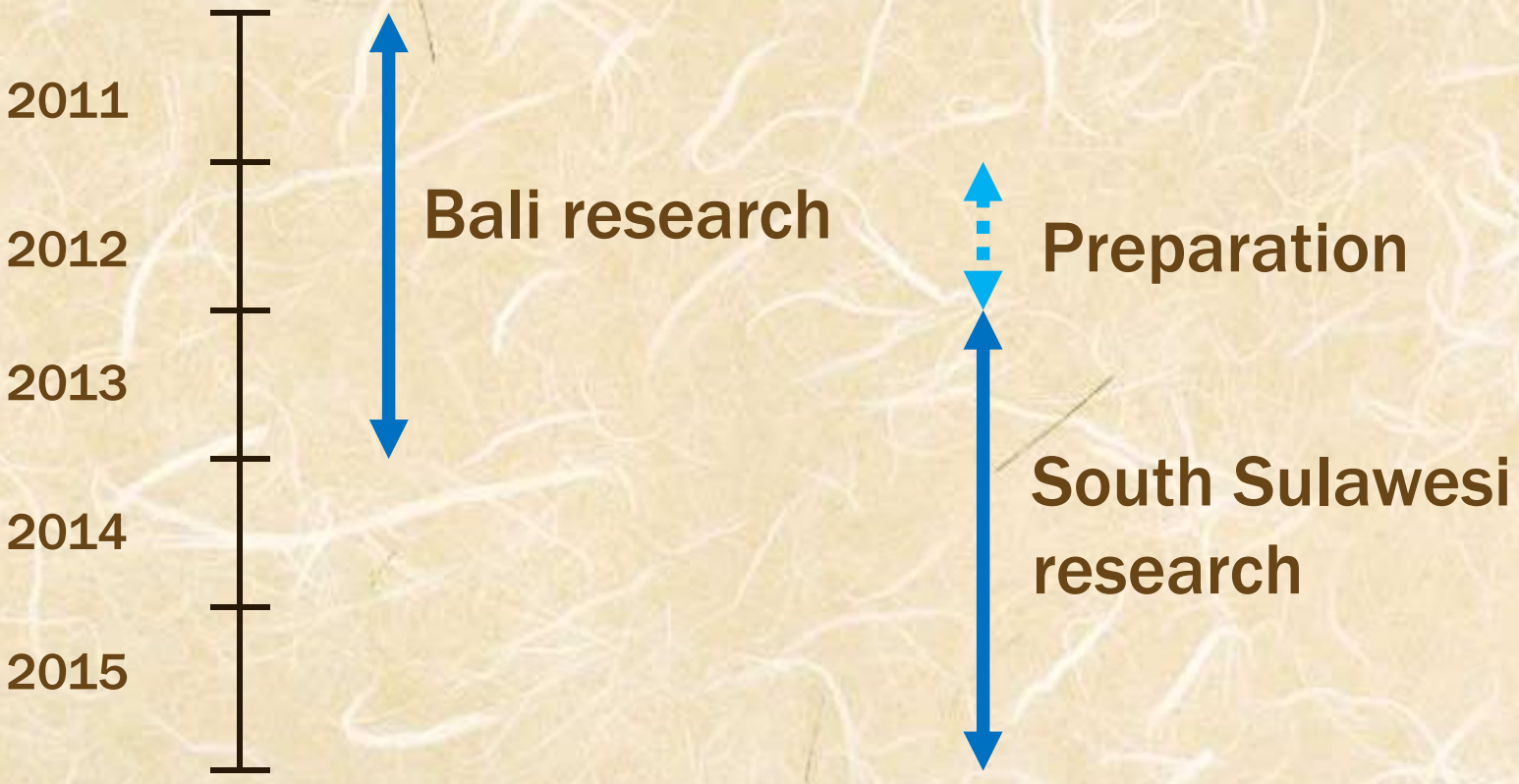
P3A (WUA) meeting:
An engineer of local company advises farmers on quaternary canal construction

Mandro je'ne with canal cleaning tools:
They are parent and child appointed by P3A.

Rice sack to store collected rice

Bucket used for irrigation fee (paddy) collection

II. Road map of RIHN research in Indonesia



III. Some issues related to "Designing the local framework of integrated water resources management"

1. Monsoon Asia
2. Rice cultivation & irrigated agriculture in monsoon Asia
3. Why dry season irrigation is a challenging practice?
4. Organizational classification of irrigation system

1. Monsoon Asia

Definition of "Monsoon Asia"

by Musiake, K. (2001)

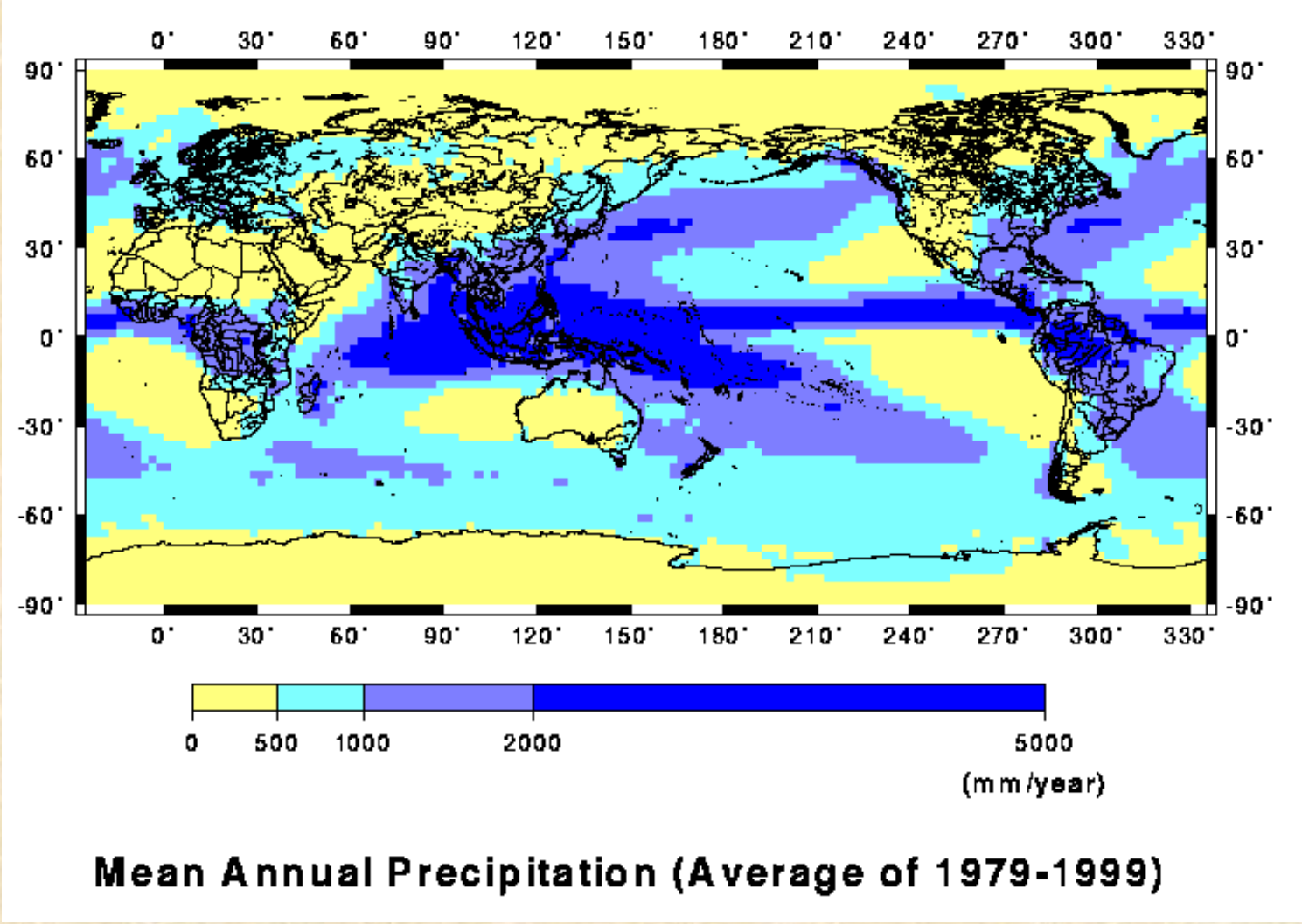
Climatic Factor; Warm Humid Climates => Monsoon Climates

Geomorphological Factor; Tectonic Zone

Human Intervention to the Natural Environment;

Paddy Rice Cultivation, Irrigation and Drainage, Flood Control Measures

Humid Climate defined here
(areas with annual precipitation of more than 1000mm)
covers large part of Asia

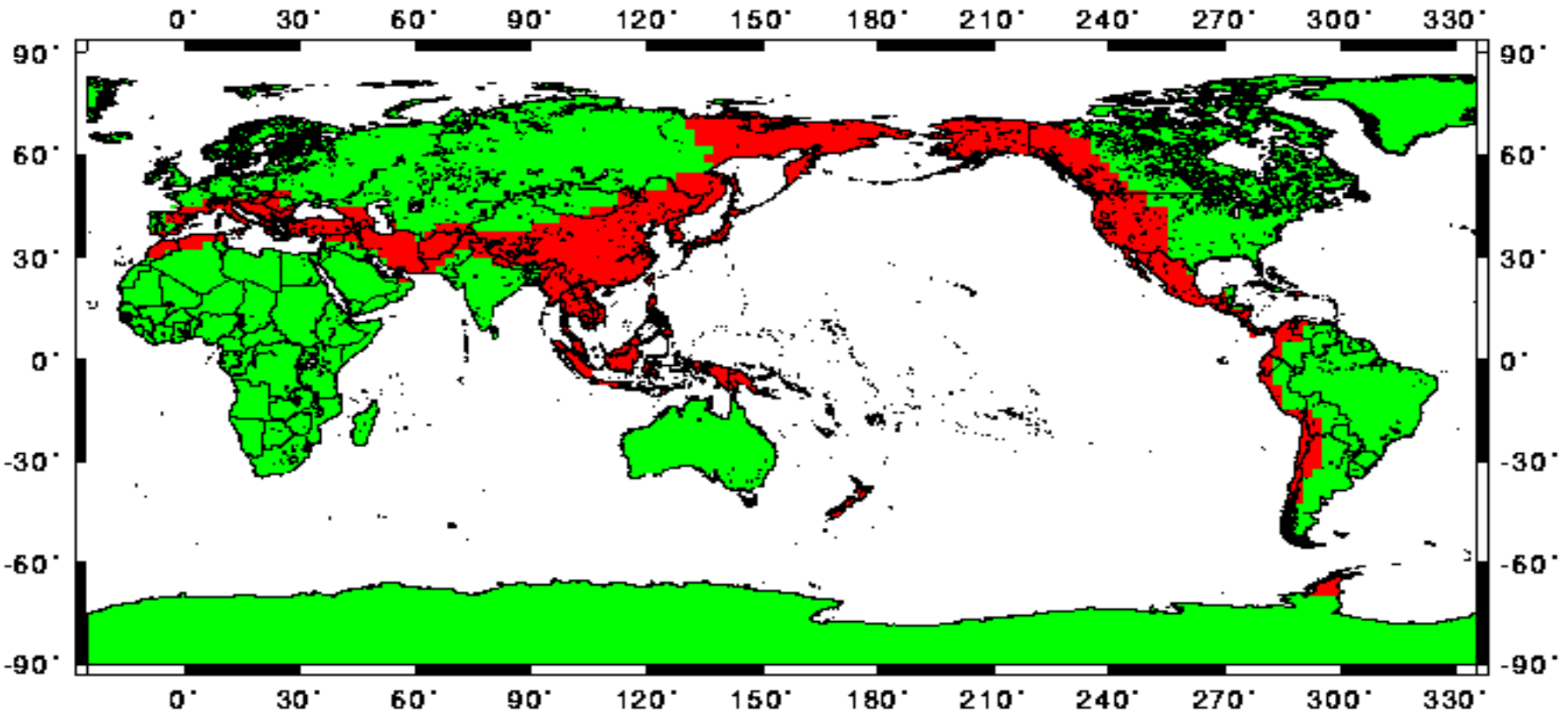


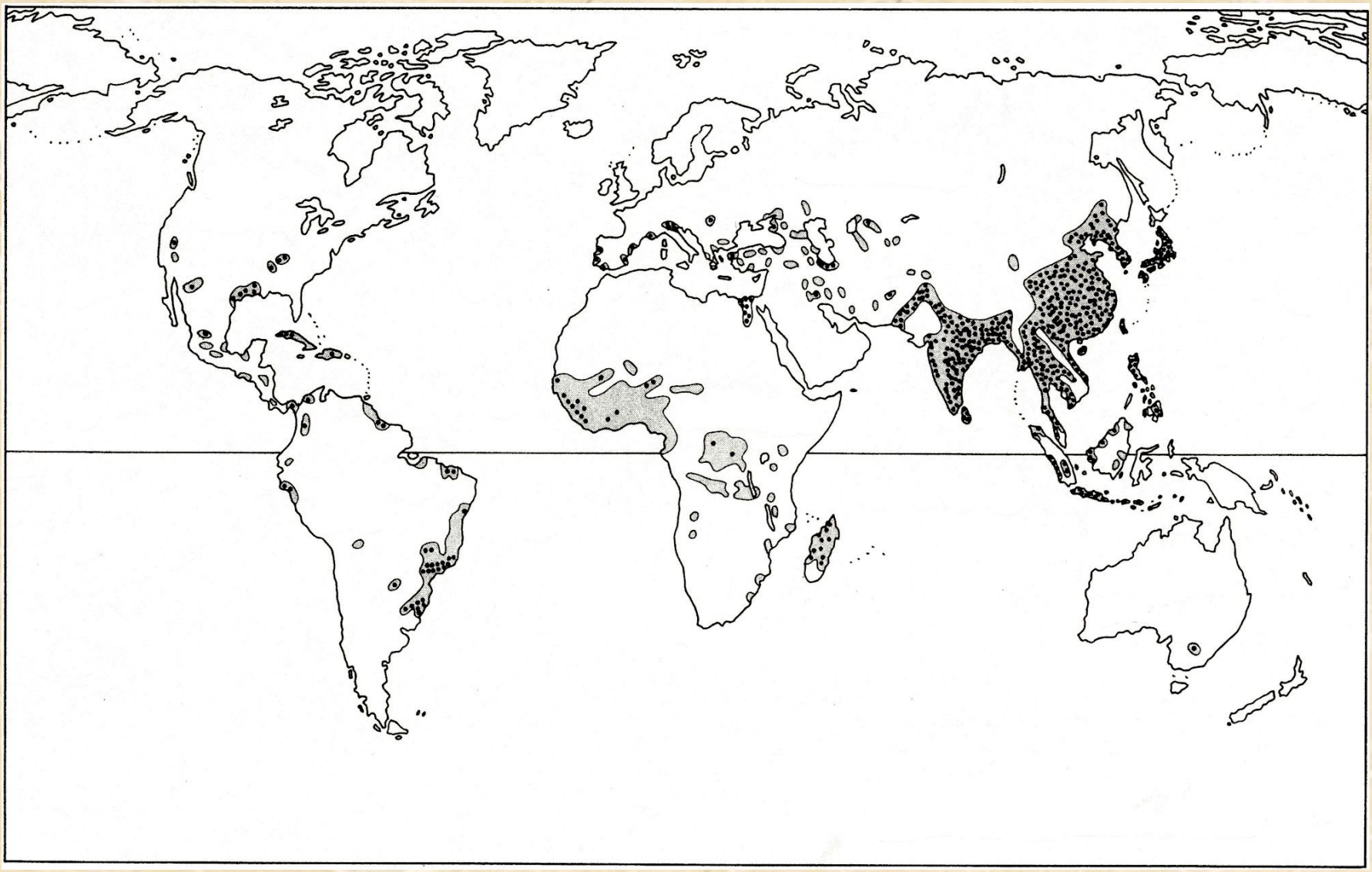
Mean Annual Precipitation (Average of 1979-1999)

Two Tectonic Zones Formed by the Present Plate Tectonic Motion

-Alpine-Himalayan Zone： Alps -- Mediterranean Coast -- Middle and Near East -- Himalaya -- Sumatra – Java

-Circum-Pacific Zone： New Zealand – New Guinea – Philippines – South-western fringe of Asian continent -Japan Archipelago– Aleutian Islands – West Coasts of both North and South America





Rice Cultivation in the World

(Oxford Economic Atlas of the World, 3rd ed.)

2. Rice cultivation & irrigated agriculture in monsoon Asia(1)

- More than 3.4 billion people are alive in monsoon Asia.（UN 2006）
- Rice production in the world is 622.6 million ton (unhulled rice) in 2008, out of that 591.9 million ton is produced in monsoon Asia.（FAOSTAT 2009）
- Rice is a staple crop to sustain the population.
- Population of monsoon Asia is estimated to 4.5 billion in 2050.（UN 2006）Thus irrigated agriculture is strongly expected to increase crop yield.

2. Rice cultivation & irrigated agriculture in monsoon Asia(2)

- The world arable land is 1,523 million ha, out of that 18% or 274 million ha is under irrigation.（FAOSTAT 2000）
- In Asia the irrigated fields extends to 180 million ha with 57% of irrigation ratio. Most of them belongs to rice paddy.（IRRI 2002）
- Crop diversification, planting secondary crops and rice in dry season, is a powerful measures to obtain better nutrients and higher income for farmers.

Irrigated agriculture both in wet and dry season can not be ignored to obtain better quality of life.

3. Why dry season irrigation is challenging practice?

Advantages:

- High income generation by cash crops
- To realize agricultural innovation such as mix farming

Difficulties:

- Very little experience in dry season irrigation, such as canal layout, water delivery, adjustment of water resources , etc.
- Framers involvement in O&M

Necessity of irrigation

	Wet Season	Dry Season
Rainfall:	Plenty, dry spell & yearly fluctuation	Little or none
Rainfall vs. Water requirement:	Rainfall > Crop water requirement	Rainfall < Crop water requirement
Role of irrigation :	To overcome dry spell	To assure crop cultivation
	To schedule planting time	To stabilize crop production

Differences in Irrigation profile

	Wet Season	Dry Season
Category:	Supplemental irrigation	Complete irrigation
Type:	Demand-oriented & on-request delivery (Ogata 1979)	Supply-oriented & dictated delivery (Ogata 1979)
Method:	Continuous and simultaneous	Rotational and intermittent
On-farm irrigation :	Plot to plot is acceptable	Individual use is desirable

Irrigation system for wet season is not always effective in dry season

4. Organizational classification of irrigation system

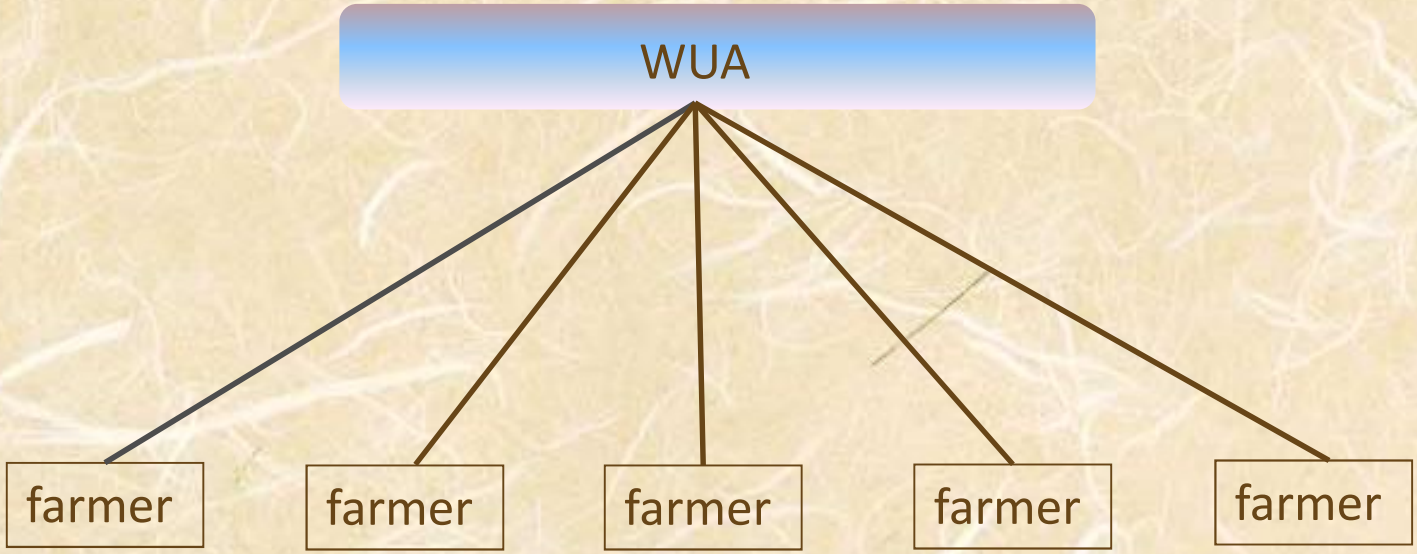
View point:

- Vertical linkage
  - Who holds the authority and responsibility?
  - Bottom-up or top-down?
  - Centralized or Decentralized?
- Horizontal relation
  - Relationship between water users (farmers)

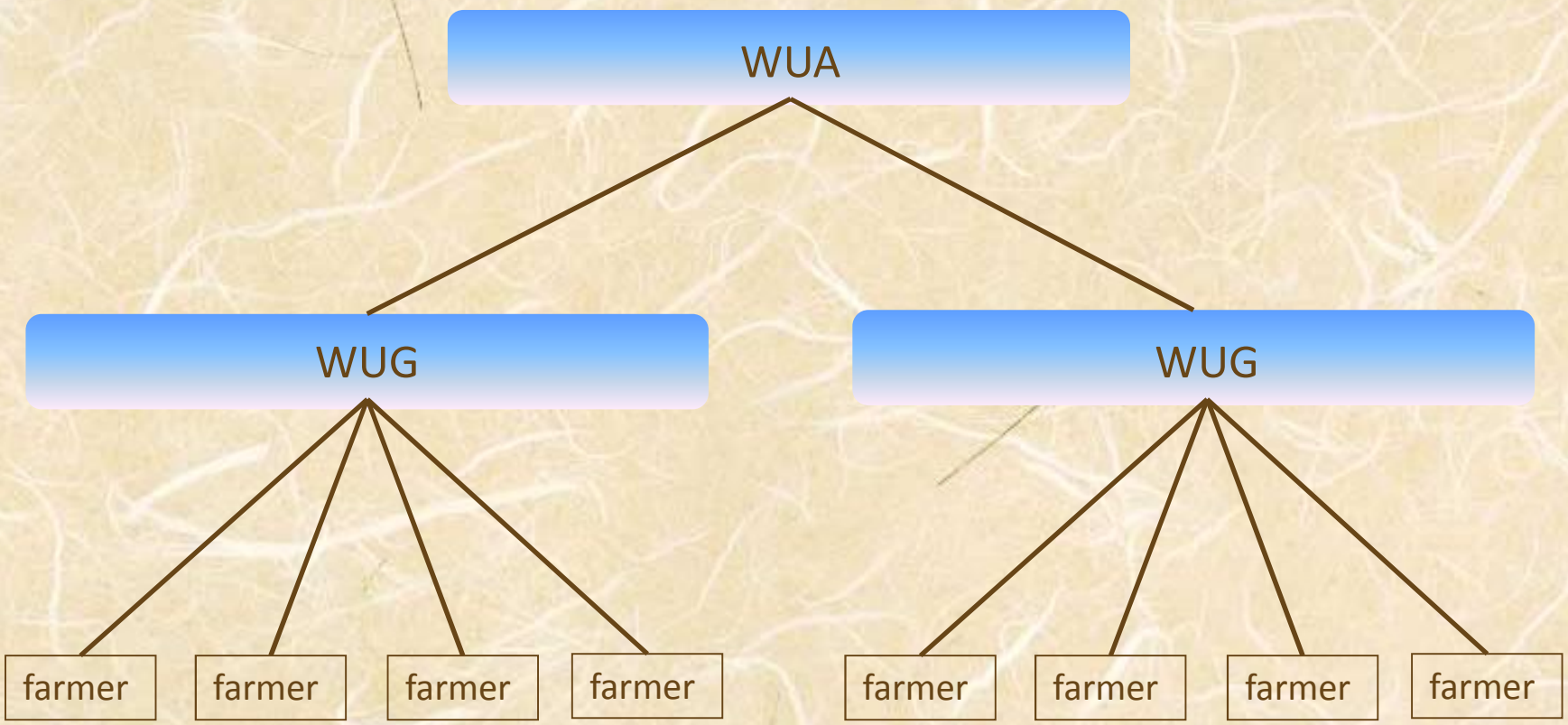
Organizational classification is an useful tool to understand the property of irrigation system.

How to classify irrigation organization?

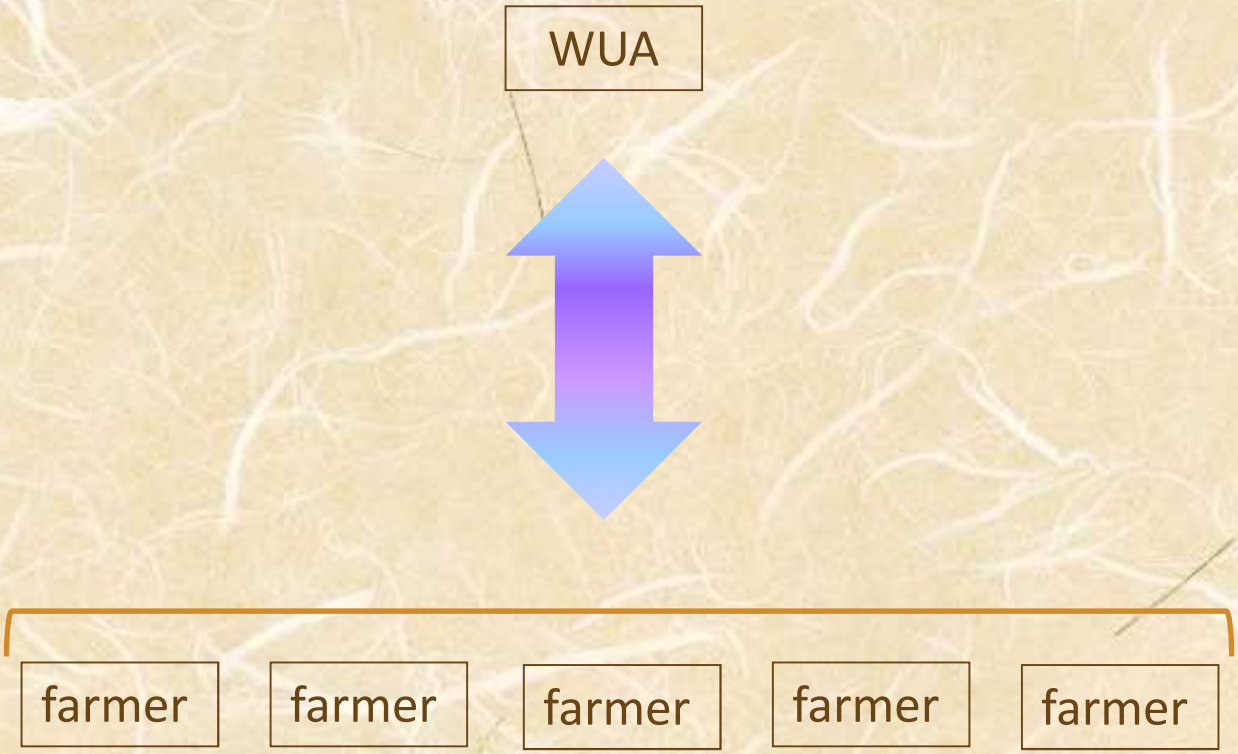
Single layer



Double layer in stratified structure



Types of vertical linkage

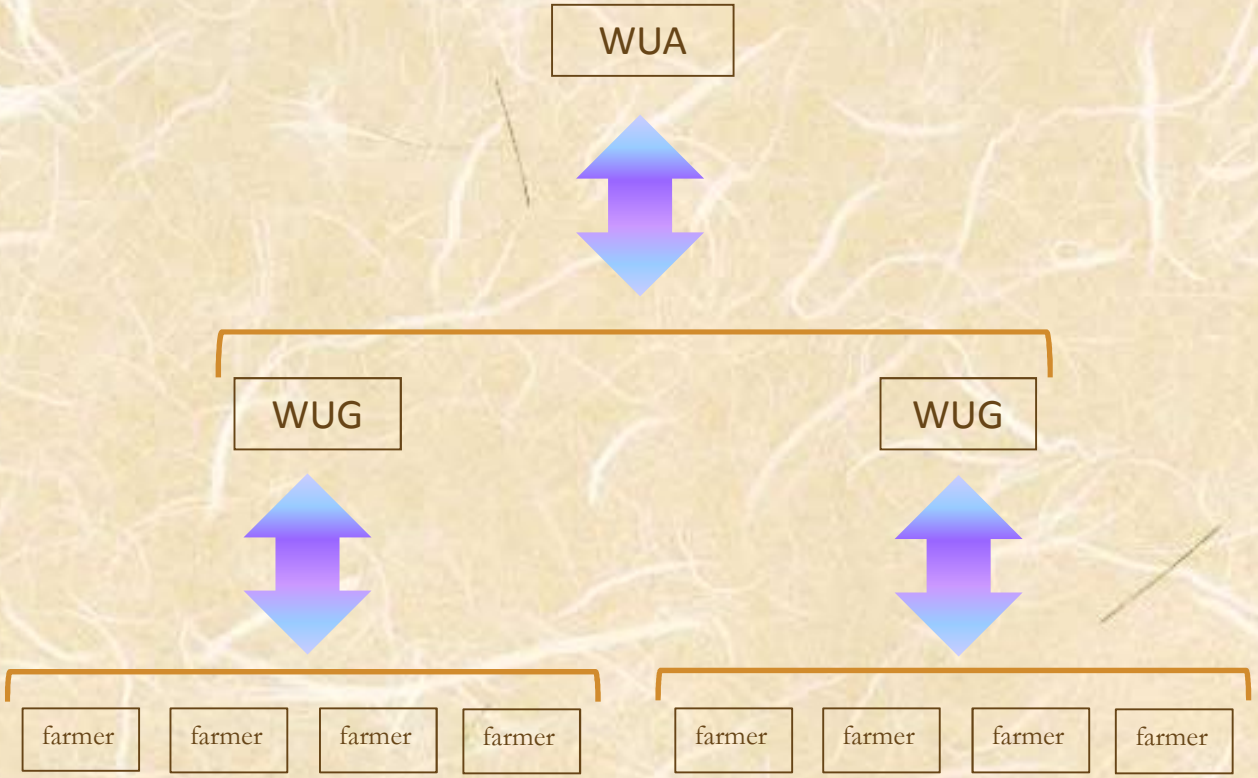


- Bureaucracy
- Autonomy
- Contract
- Trust

Definition of vertical linkage

Bureaucracy	Authority and responsibility of irrigation management is retained by the central / local Govt., and water users do not have any participation in decision making.
Autonomy	Water users have the authority and responsibility of irrigation management and control irrigation by themselves.
Contract	Water users make contract with water supplier to acquire irrigation water under volumetric charge.
Trust	Water users have the authority and responsibility of irrigation management and irrigation control is conducted by a group of engineers on the trust basis.

Vertical linkage in double layer



Bureaucracy

Autonomy

Contract

Trust

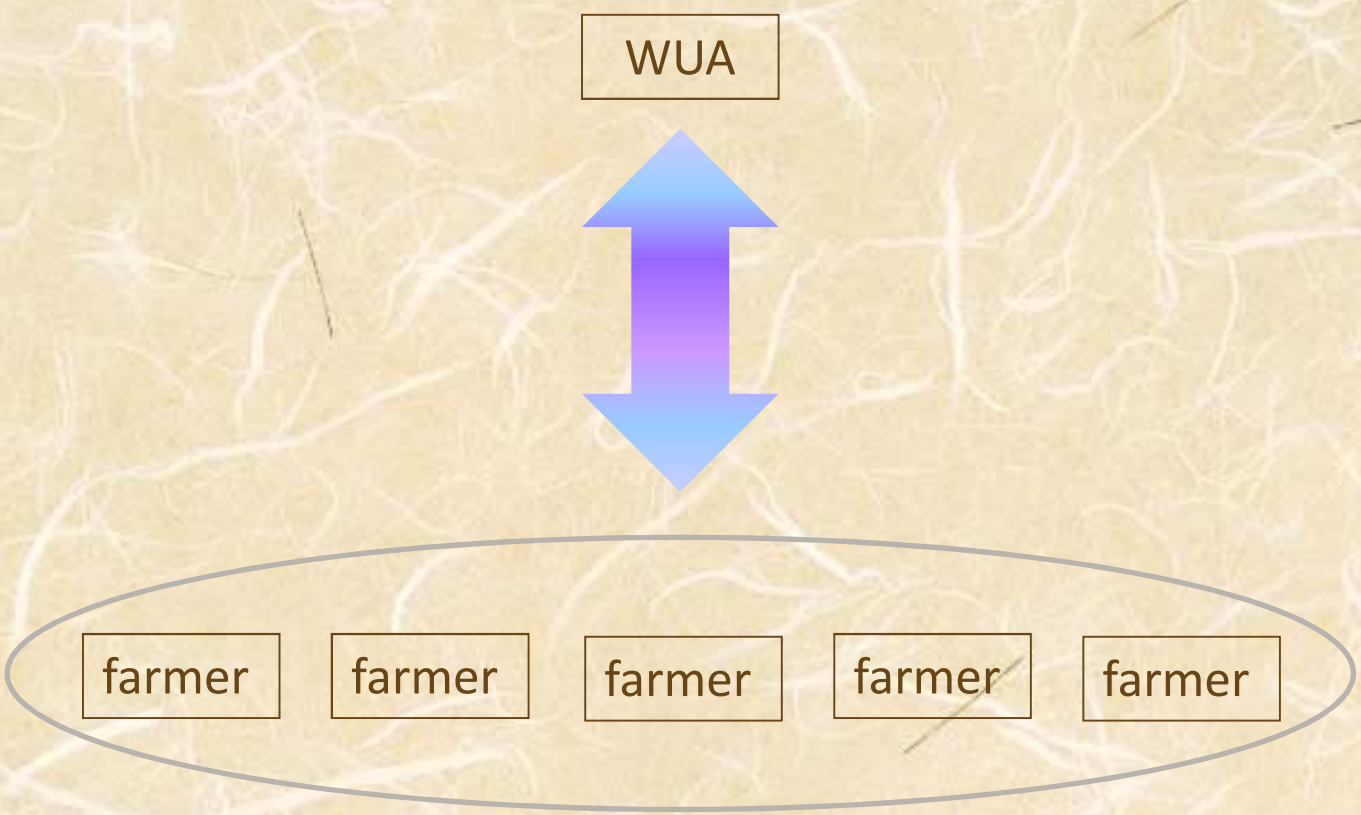
Bureaucracy

Autonomy

Contract

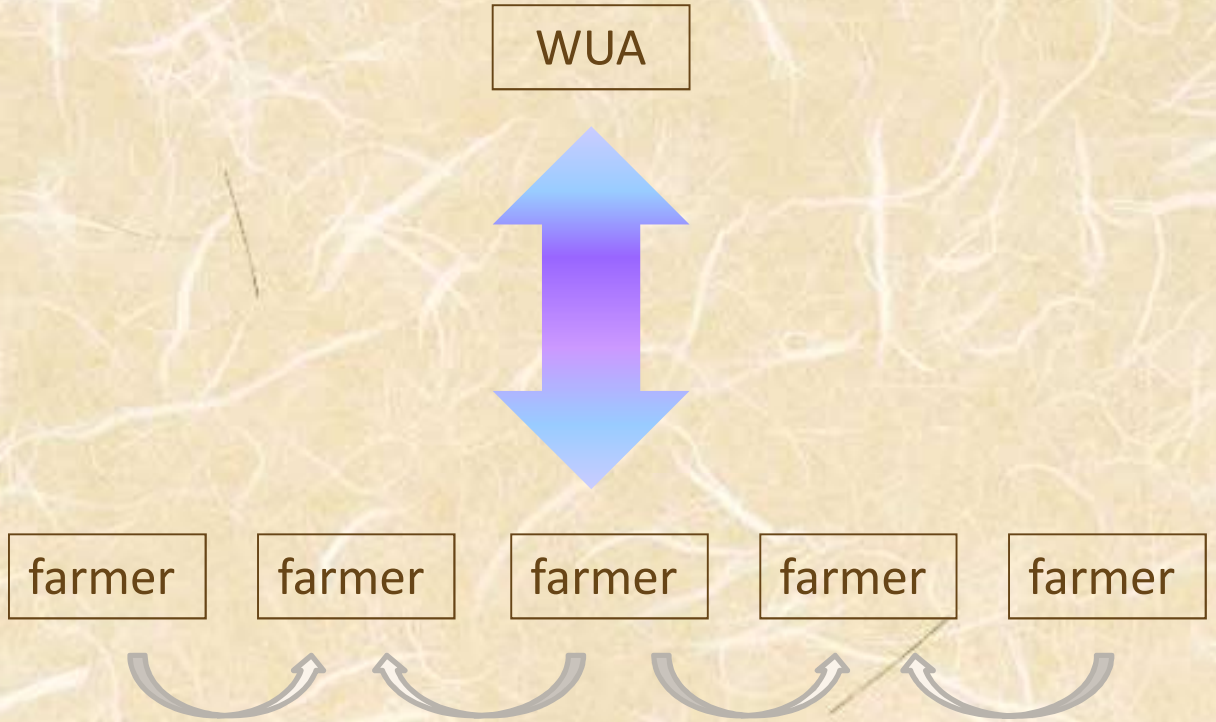
Trust

Horizontal relation among water users



Mutual help and obligation works for sustaining irrigation system is forcibly imposed on the community member. The member has to obey the customary rule.

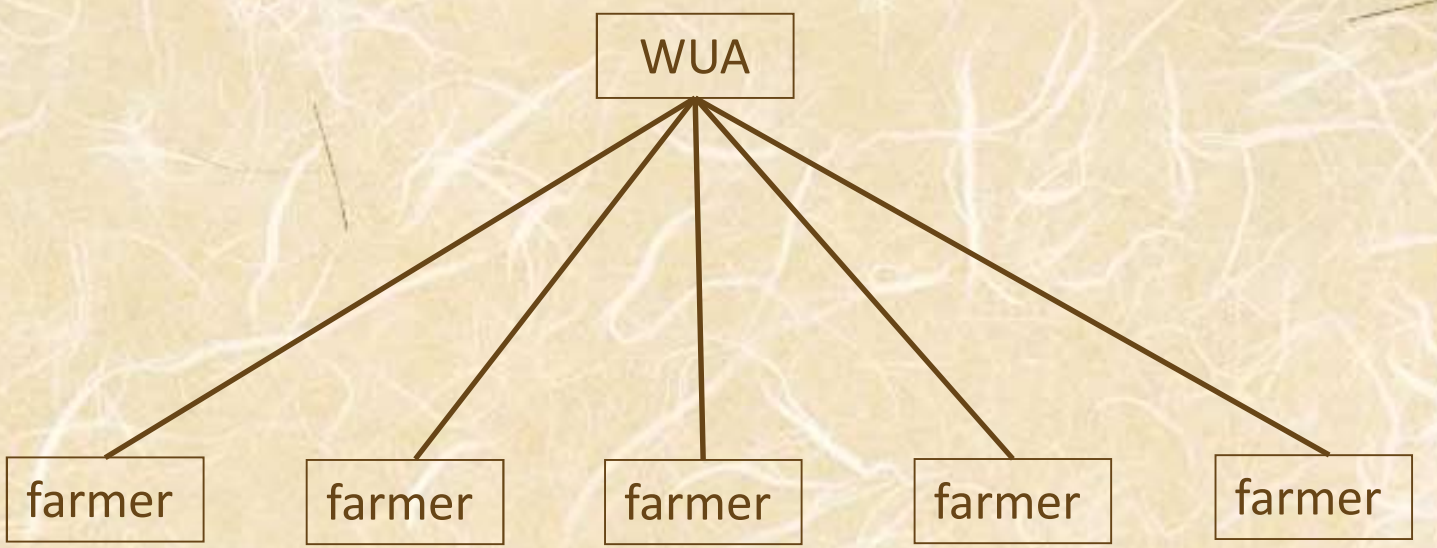
Horizontal relation among water users



Cooperative

Farmers in the irrigated area receive membership with the corresponding rights and duties. Each member, once decided, has to follow the regulation of O&M activities.

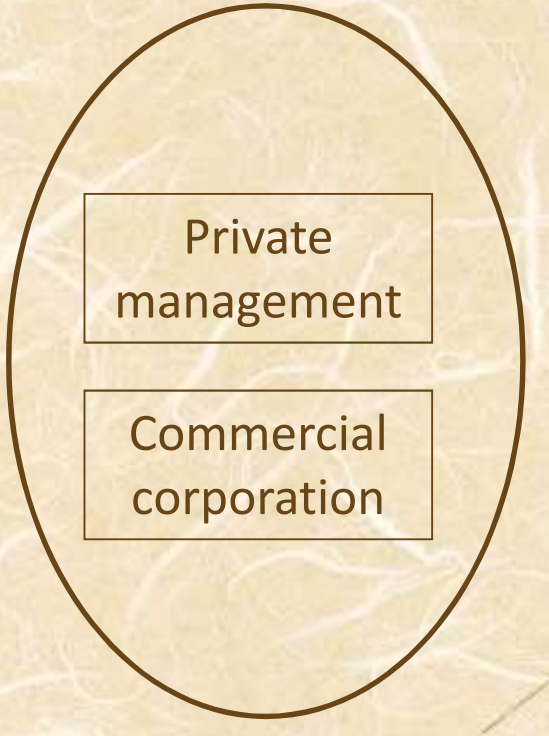
Horizontal relation among water users



Independent

Water users do not have any relation each other. A water user independently makes a link to the water supplier for water acquisition.

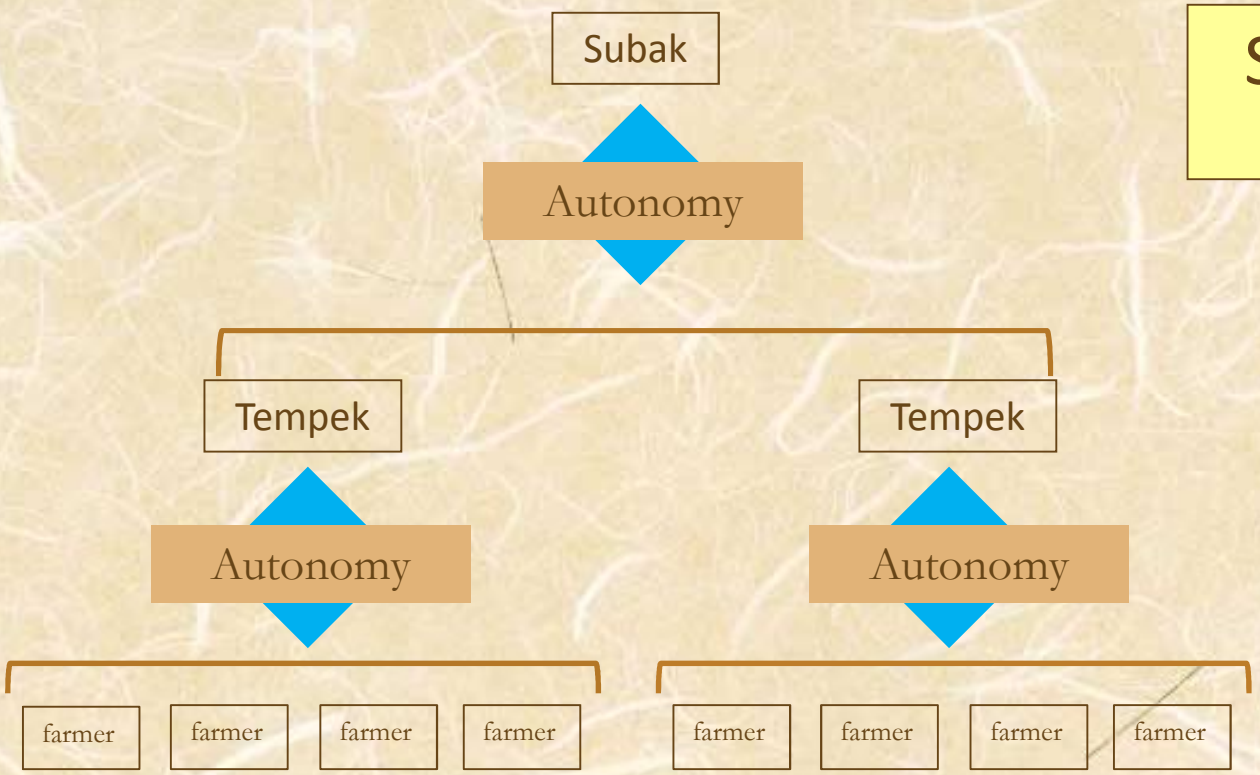
Horizontal relation among water users



Monopolistic

Water supplier and water user is the same body in the estate farming .

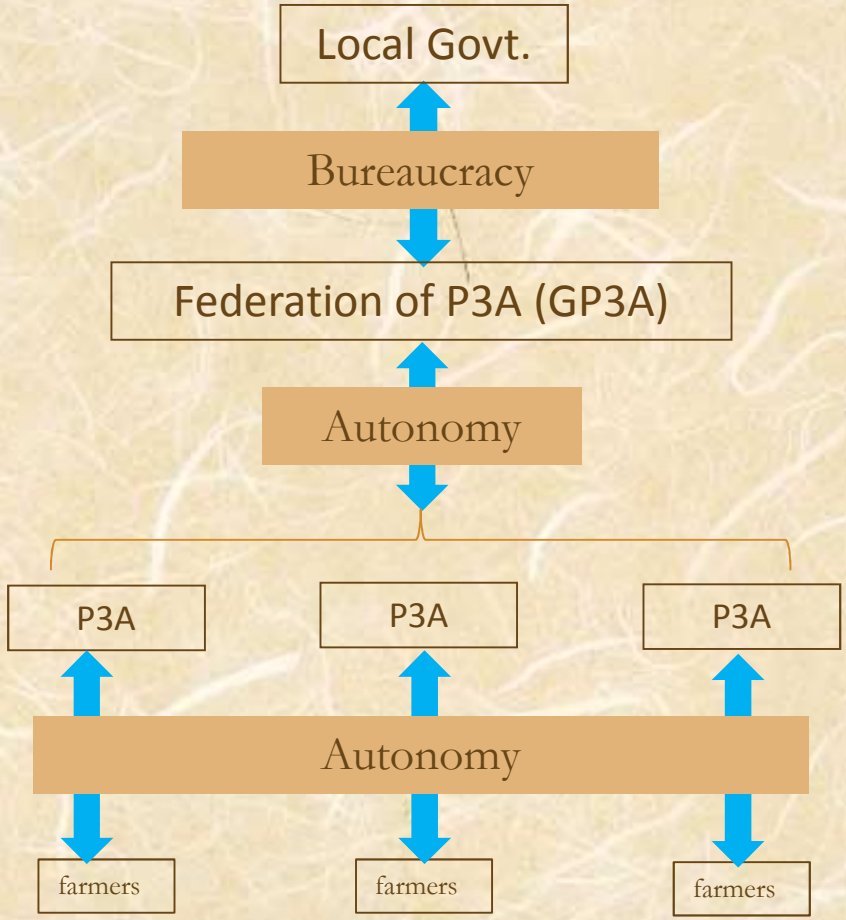
Vertical linkage and horizontal relation in Subak



Subak in Bali
Double layer

Subak is an irrigation system characterized as an autonomous and communal organization managed by farmers.

Vertical linkage and horizontal relation in P3A



Cooperative

Bili-Bili Irri. Project
Triple layer

P3A is an irrigation system characterized as an autonomous and cooperative organization controlled by local Govt.

Subak vs. P3A in dry season irrigation

	Subak (Bali Province)	P3A (South Sumatra Province)
Crops:		
wet season:	rice	rice
dry season:	rice , tomato, cucumber, chili, maize, onion, etc.	rice (limited area)
Operation & maintenance		
	subak member	*mandro je'ne* (appointed farmer)
On-farm irrigation		
	individual use	ploy to plot and mobile pump

Confronting issues in dry season irrigation

	Subak (Bali Province)	P3A (South Sumatra Province)
Water resources:	?	limited
Irrigated area:	known	unknown
Crop diversification:	realized	not yet realized
Irrigation fee:	collected	partially collected
Canal maintenance:	member	appointed farmer
Principle of water use:	tek-tek	none
Penalty on water theft, etc:	customary law	?
Decision maker:	WUA	Local Govt.

IV. Bali research plan

1. Main objectives

- To grapes the present water utilization system in the Saba River basin.
- To build the Local Framework Model of Integrated Water Management in the Saba River.
- To make a proposal of Integrated Water Management Framework taking sustainable and better quality life into account.

IV. Bali research plan (cont.)

2. Research Topics

2-1. Basic data collection of water regime in the Saba River basin for hydrological analysis.

2-2. Data collection and analysis of agriculture and land & water management in the Saba River basin to clarify; 1) recent changes in land use and its influence on river runoff, 2) problems regarding agricultural and domestic use of water, and 3) recent activities of upland subak.

IV. Bali research plan (cont.)

2. Research Topics (cont.)

2-3. Data collection and analysis of; 1) adaptive management taken by local people and subak against water shortage and flooding, and 2) recent activities for inter-subak water allocation initiated by hindu priest or other organization.

2-4. Data collection and evaluation of; 1) “equity” in subak water management, and 2) “multi-functionarity” of irrigation system.

IV. Bali research plan (cont.)

2. Research Topics (cont.)

2-5. Discussions on the Local Framework Model of Integrated Water Management in the Saba River, and its compilation for a proposal to Bali Province.

3. Research period

from FY2011 to FY2013

IV. Bali research plan (cont.)

4. Research member (tentative)

Masakazu MIZUTANI
Haruya KAGAMI
Ken-ichi NAKAGAMI
Takao NAKAGIRI
Hisa-aki KATO
Urara TAMURA

Budi SETIAWAN
Satyanto Krido SAPTOMO
I Gde PITANA
I Wayan BUDIASA
Agnes RAMPISELA
Made SUDARTHA
I Dewa Putu Punia ASA
I Ketut SUHARTA

According to research topics, sub-research group should be organized.