WATER MANAGEMENT SYSTEM FOR SUSTAINABLE AGRICULTURE IN BALI

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Introduction

Bali conditions:

- Total land area: 5,632.86 square km
- Population: ± 3.5 million persons
- Tropical climate: 1000 – 3000 mm/yr
- Southern portion: gently slope → fertile lands
- Northern & eastern portions: quite steep & dry
- Land use: 80,701 ha (14.3%) irrigated rice fields & 443 ha (0.08%) non irrigated rice fields; 481,611 ha (85.5%) dry lands, others (1.2%)
- Existance of dry land and wet land farming
  → Sukawana inscription (882 AD)

Introduction

Bali water conditions:

- **Main water sources: Batur, Beratan, Buyan, Tamblingan lakes, rivers, and groundwater**
- **Average potential annual available water: 5,357 MCM (rivers 4,965 MCM, lakes 180 MCM, ground water 502.4 MCM)**
- **Intricated networks of canals & tunnels to convey and distribute irrigation water to beautiful terraced rice field → built and maintained by farmers in subak since centuries ago**

Water Management System in Subak

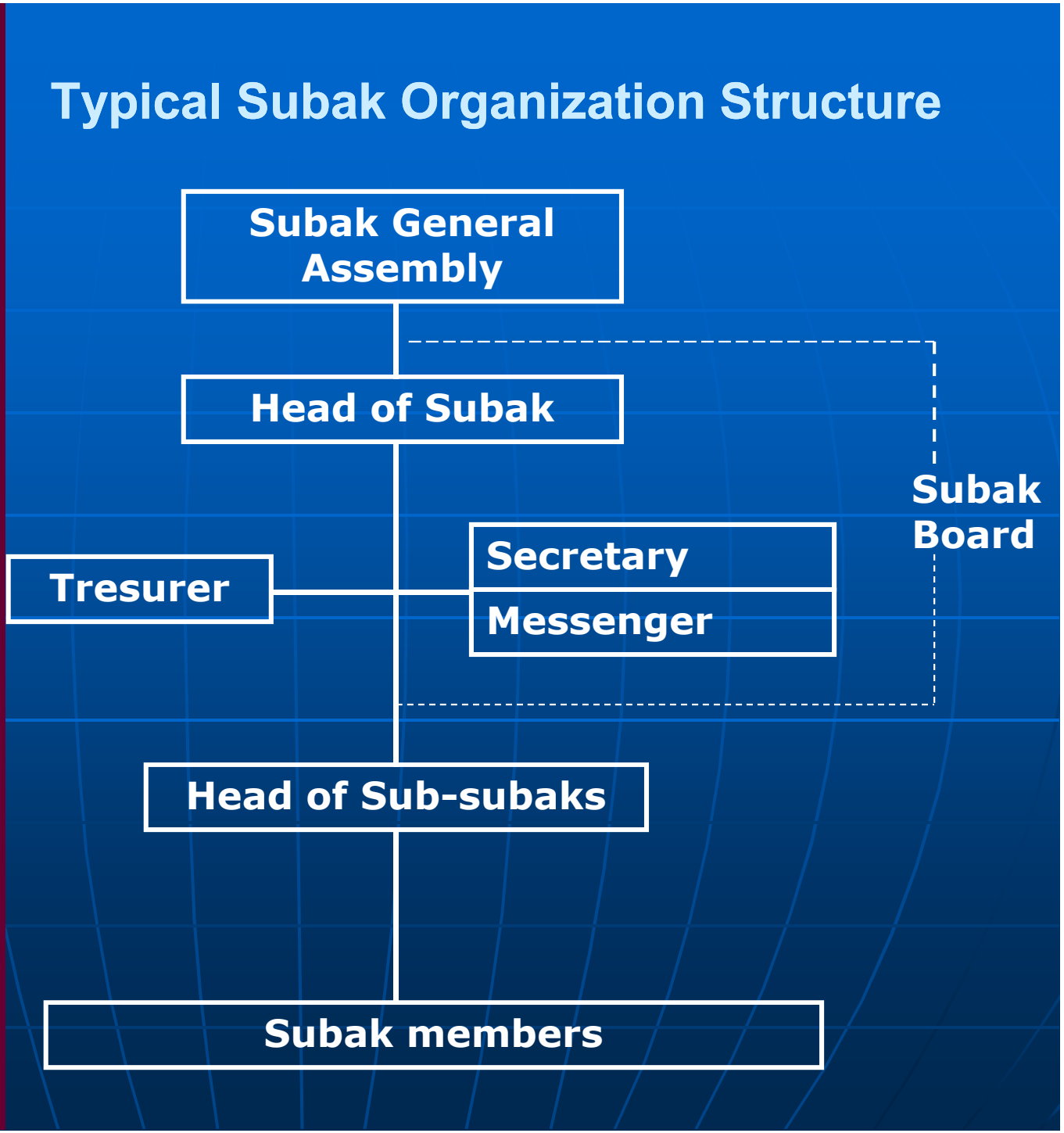
- **Customary WRMS in Bali is by Subak**
- **Definition of subak (Local Regulation of BP No 02/PD/DPRD/1972)** → customary law societies with socio-agrarian-religious nature which were established since long time ago and developed continuously as landholding organizations in the sphere of water distribution and other for rice field in one irrigation area
- **There are 1,559 subaks** (the smallest 3.545 ha the largest 799.17 ha)
- **Three elements of subak:** parhyangan, pawongan, palemahan
- **Based on the Tri Hita Karana (three happiness causes) philosophy** → three harmonious relationship among (a) the human being & God, (b) the human being & environment, (c) the human being themselves

Notes:

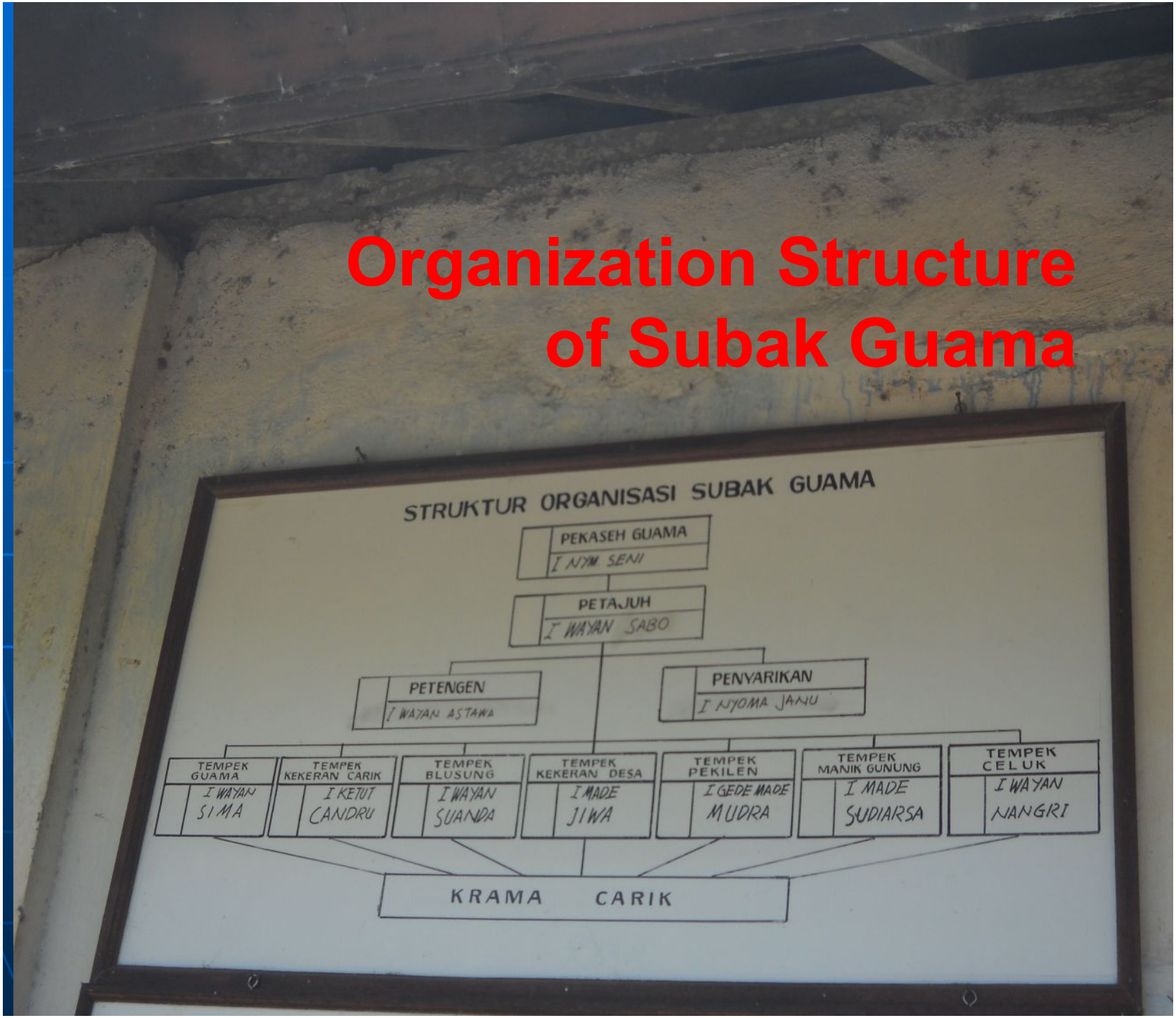
- Subak general assembly=*paruman subak*
- Head of subak =pekaseh
- Tresurer=*Juru raksa*
- Secretary =penyarikan
- Messenger=*Juru arah*
- Head of sub subak =*kelihan tempek*
- Subak member =*kerama subak*

- **The larger subak**: *pangliman/petajuh* (deputy)→ assistant of the head of subak

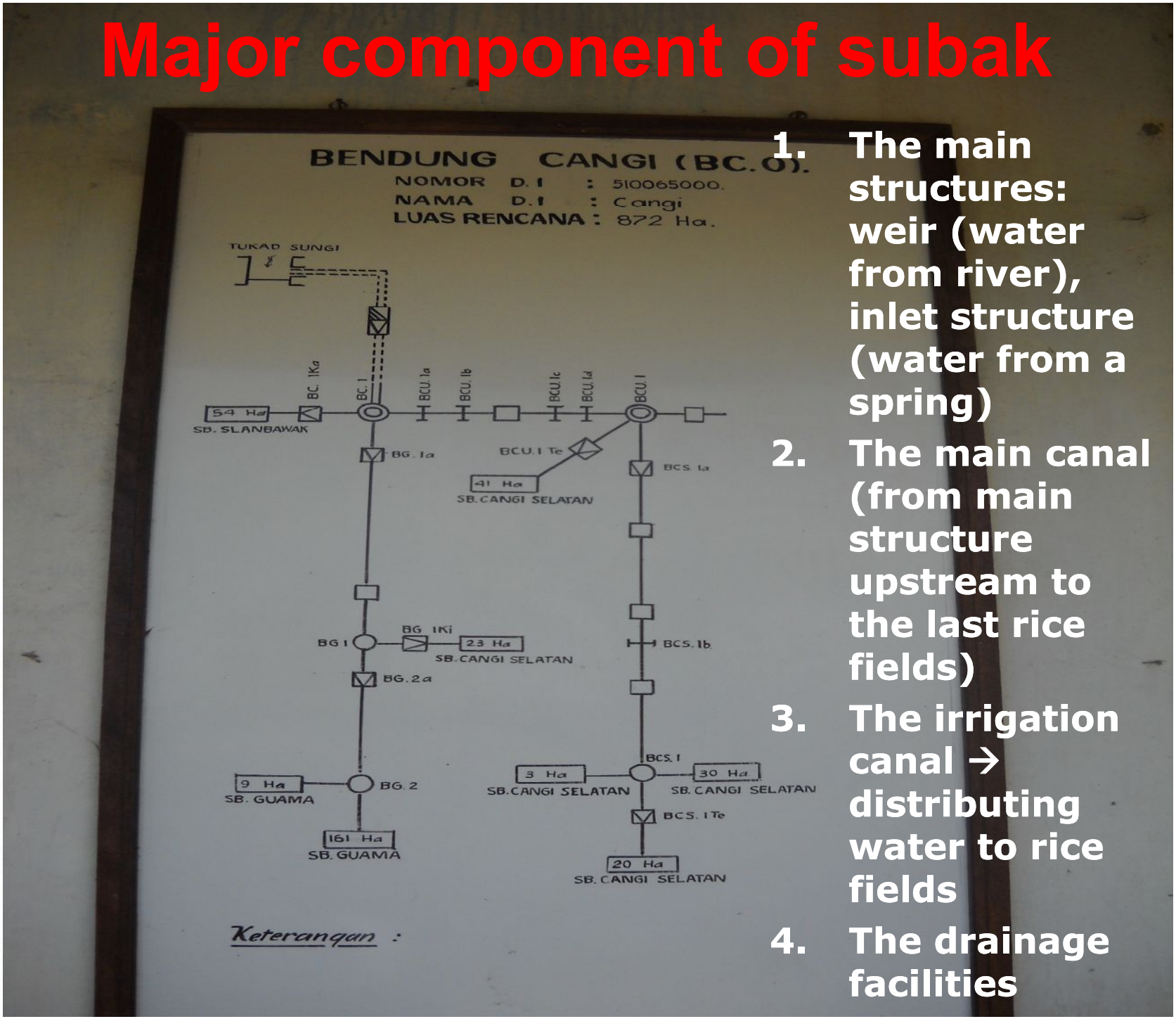
- **The biggest**: subak→ sub-subaks (tempek), and pekaseh is assisted by *kelihan tempek* (head of sub-subaks)



Organization Structure of Subak Guama



Major component of subak



1. The main structures: weir (water from river), inlet structure (water from a spring)
2. The main canal (from main structure upstream to the last rice fields)
3. The irrigation canal → distributing water to rice fields
4. The drainage facilities

Subak irrigation facilities

- Originally quite simple, contructed with local materials
- Built through communal work of subak
- Presently, built with permanent structure

Partition of irrigation water

- Based on ayahan principles (available water divided by number of subak members
- A portion of irrigation water → called tektek/ kecoran/tanding

No	Sub-subak	Number of members	Number of Land Portions	Number of Water Portions	Irrigated area (Ha)
1	Labak	15	29	29	9.70
2	Dugul	10	5	5	3.00
3	Abangan	30	30	30	11.79
4	Dlod Desa	20	30	30	12.20
5	Dlod Dangin	15	30	30	12.20
	Total	90	124	124	48.89

Source: Subak Tedung (Public Work of Bali Province, 1997)

Saba river basin condition

- There are 27 irrigation area from up to down-stream
- Covers 57 subak, two subak gede (Subak-gede Sri Amerta Saba dan Subak-gede Buana Saba), and one Subak Agung Amerta Saba
- Water in upstream and in the middle is proportionally distributed, but reduced in dry season
- While, in the downstream, the water is rotationally allocated and need coordinating body to do it
- Some flood have to destroy the river body, and know rehabilitation project is going on

O&M activities

Subak components	Activities
Parhyangan	▪ Daily ceremonial
Pawongan	▪ Subak general assembly
	▪ Adm, reg, and financial report ▪ Transportation ▪ Organizing business units
Palemahan	▪ Subak temple maintenance ▪ O&M of agric machines ▪ O&M of irrigation network ▪ Farm management & other business

Financial sources

- Contribution of subak members after harvested→sarin tahun
- Daily contribution of subak member → peturunan
- Payment from inactive members (pengampel/ pengohot)
- Payment by punishment existence
- Patyment of principles and interest of credit
- Rice fields rental for duck → *lelang bebek*
- Agric machines rental
- Direct fund from government

Subak Development for SA

- Subak & Agriculture → interrelated
- INPRES 3/1999 → Policy of Irrigation Management Transfer
- In Indonesian law No 7/2004 → Participatory Irrigation Management
- Limited human & capital sources provided by government

DOUBLE ROLES OF SUBAK

- An example: In 2003, Subak Guama in Selan Bawak Village, Marga District, Tabanan Regency have received fund from Government about of Rp843 million for developing (1) agricultural inputs supply unit (2) crop livestock system unit, (3) farm household industry units.
- Present business unit with good performance is certified rice seed production. Right know, the capital asset is to be more than Rp5 billion
- The partition of profit from business units is to cost daily ceremonial, operation and maintenance of irrigation, business development, management fee, etc.

Thank you