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Capstone Outcome

PARTICIPATORY IRRIGATION

SOCIAL ORGANIZATION IN NATURAL RESOURCE MANAGEMENT

Overview

This guide has been written to provide an introduction to participatory irrigation management in Southeast Asia. These countries include, but are not limited to, Cambodia, Indonesia, Lao PDR, Myanmar, The Philippines, Thailand, and Vietnam. Participatory irrigation management is a form of community based natural resource management that is based on the notion that natural resources should be managed by the people who live with and depend on them. This guide is separated into seven chapters, each examining a unique aspect of participatory irrigation management. The goal will be to provide a solid understanding of the socio-economic factors that affect the management of agricultural water by communities in Southeast Asia.

Objectives

- Understand the core principles of participatory irrigation management
- Understand how community based organizations are developed
- Know the extent to which policies have an impact on participatory irrigation

Acronyms

CNBRM: Community Based Natural Resource Management

IMT: Irrigation Management Transfer

NIA: National Irrigation Administration (of the Philippines)

PIM: Participatory Irrigation Management

WUA: Water User Association

CONTENT OUTLINE

INTRODUCTION

There are more than one million irrigation systems on the planet, which supply water to grow over 40% of the food we eat. The drive to privatize agricultural water is occurring at a growing rate, where the control of irrigation water is slowly being taken away from communities by government interests. As the demand for water continues to grow, the demand for management, regulation, and planning are also increasing.

Community based natural resource management is a form of social organization that has members from the community act as equal common property resource managers. While all participatory irrigation systems can be understood as alternatives to privatization, equitable water management is more apparent where participants have higher degrees of autonomy. The numerous programs designed to encourage local farmer organizations to assume a greater financial and management role in operation and maintenance have had limited amounts of success. As the demand for water continues to fluctuate, the demands on the state for water management, regulation, and planning is increasing. Thus, there is a growing movement towards devolution that is occurring simultaneously with the movement towards centralization.

Section One

Community Based Natural Resource Management

Community-based natural resource management (CBNRM) describes different approaches and practices that are focused on integrating social, economic, and environmental community goals by devolving authority in resource management away from central governments, towards local communities. CBNRM approaches are particularly applicable where land is communally owned, instead of where they are owned by private entities. CBNRM approaches are created to improve the status of the resource used, as well as the livelihoods of those who manage and live with them.

Goals

- Improving socioeconomic conditions of rural communities

- Prioritizing benefits of resources to the communities that manage them

- Improving sustainable resource management

- Increasing autonomy and participation of communities in managing their resources

IS CBNRM EQUITABLE?

There is no definitive answer to the question of equity in CBNRM. Some scholars have questioned the ability for CBNRM to address inequity. Others have claimed that CBNRM policies can result in higher degrees of political and economic equity. The discrepancy should be understood as a contextual one, which depends on the degree to which facilitators of CBNRM intervene or engage with groups that been marginalized by policies. These groups have historically been women, ethnically marginalized groups, the disabled, and the relatively poor.

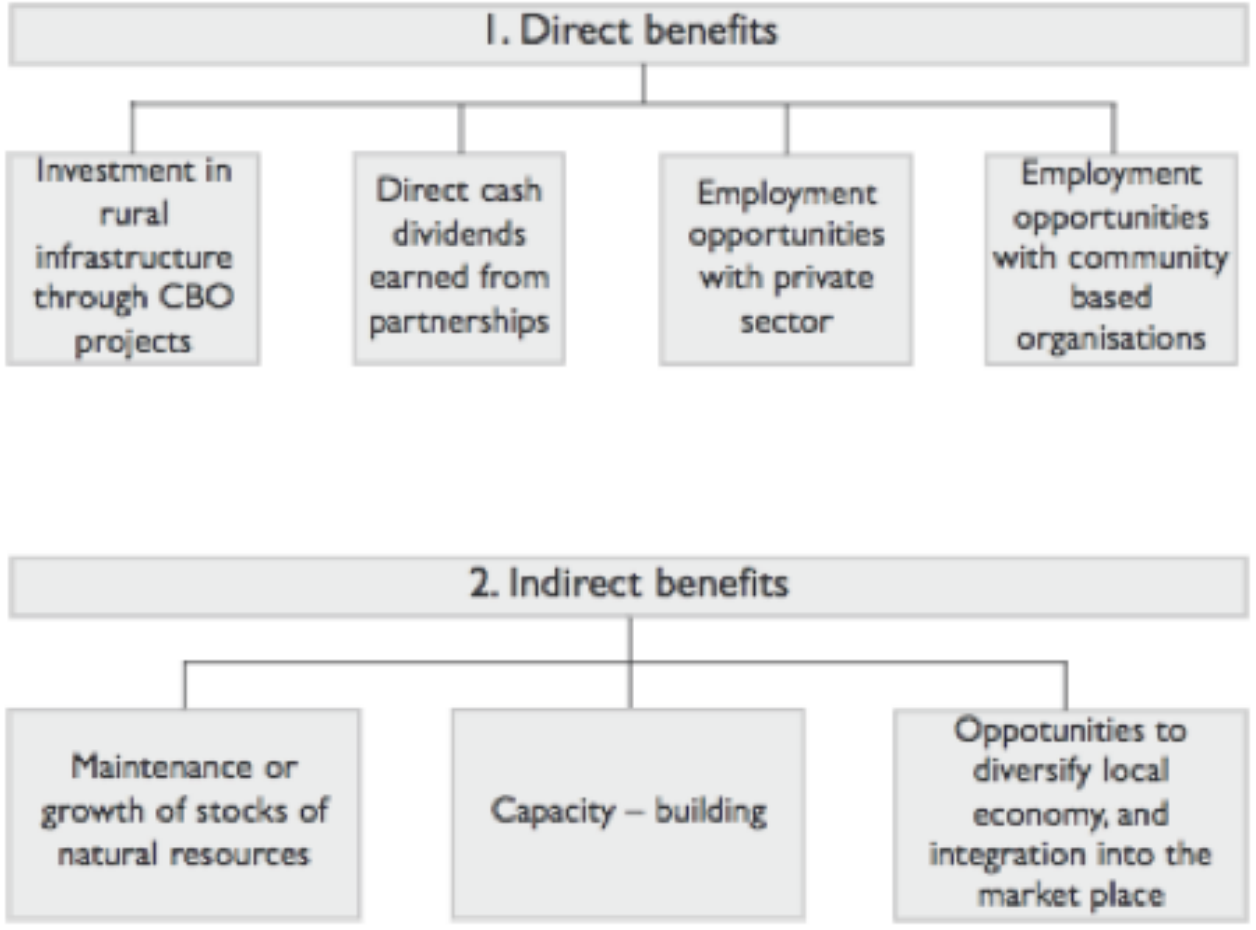


Figure 1: Benefits of CBNRM

Equity is not always compatible with sustainable natural resource management. In most cases, there is a tradeoff between the equitable the distribution of resources (and higher quality of living), and more efficient resource management. Resource managers and communities are always struggling to find an appropriate balance between more efficient resource use and better communal livelihoods.

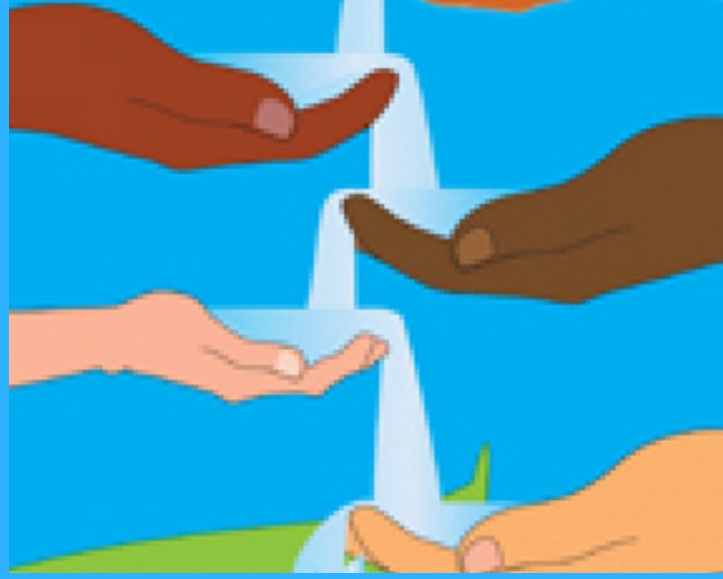
Participatory Irrigation Management

Participatory irrigation systems in the history of Asian civilizations are known for sustaining growing populations over long periods of time. They represent two distinct modes of irrigation development, one centered on community management, the other organized and implemented by powerful states. The centralization of the economy was sometimes paralleled by the achievement of large-scale infrastructures (China, India, and northern Vietnam), but this was not always the case (e.g., Kingdom of Majapahit in Java, in the 14th century).

Participatory irrigation systems have been pervasive throughout Asian countries, serving a significant portion of total irrigated area. They can be found in a wide ranges of sizes and have generally been created in mountainous or hilly areas in order to divert streams for agriculture, notably in regions such as the Himalayas, Northern Thailand, Lao PDR, Vietnam, China, Japan, the Philippines, and Indonesia.

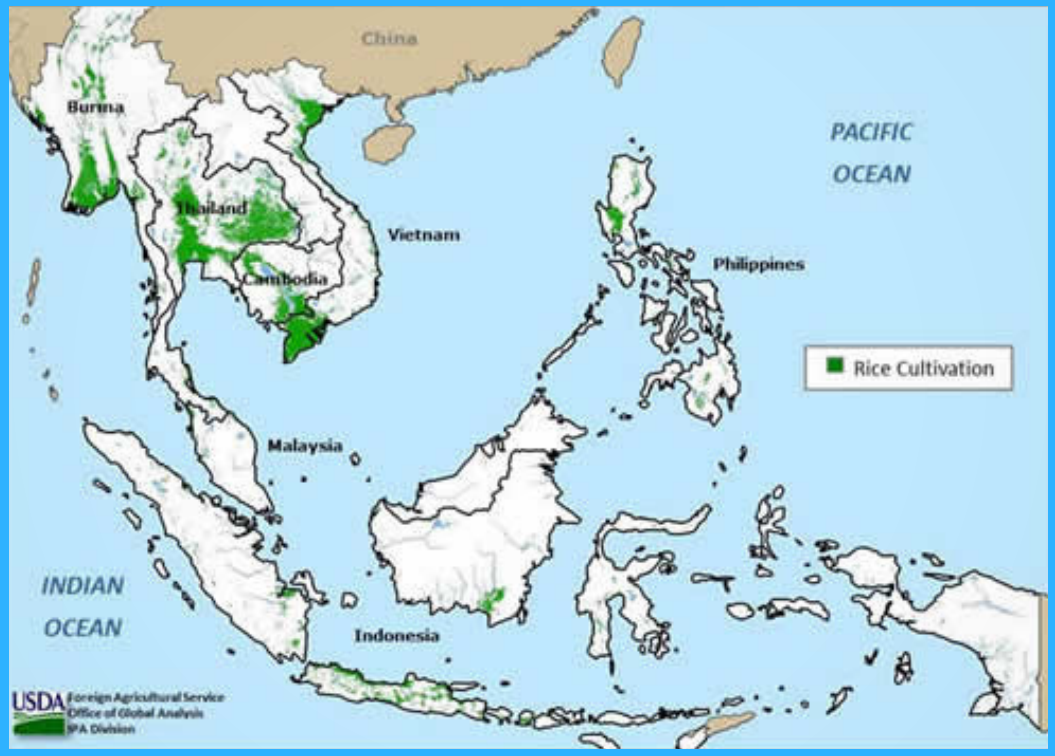
Community cooperation is most evident in areas of intense population pressure and limited water supplies, where the organization of community labor and management is essential for gaining access to and sharing water, as well as to minimize conflicts. Irrigated agriculture has changed dramatically in the last 50 years and has in turn fostered change and economic development in rural communities. Numerous programs have been designed to encourage local farmer organizations to assume greater roles in finance, management, operation, and maintenance of their systems. Agricultural water is problematic to privatize because it is not Geo-spatially situated. Under times of scarcity, these questions about management become more important for the livelihoods of agricultural communities.

The growing trend of shifting from subsistence agriculture towards commercialization exposes these systems to new threats as communities are becoming affected by world markets. Water users are diversifying their economic activities, the cost of maintaining systems is increasing, seasonal rain patterns are changing, and competition for fresh water is on the rise. Increased socioeconomic heterogeneity as well as the intervention of state governments in the construction and maintenance of irrigation systems has often weakened social cohesion and collective action. In addition, deforestation, afforestation, and changes in land use have often altered the hydrological regime and water quality, impacting on downstream users.



Traditional rights to water have been affected by outside parties diverting water from the same sources, or by the state, who have frequently imposed large water storage and distribution infrastructure upon communal systems. Disputes over the privatization of water reflect not only the conflict between local practices and more recent state intentions, but also the conflict between freedom of management and adaptation to sociocultural contexts. Privatizing common-pool resources is also symbolic of the desire for states to manage resources through top-down, capital-intensive, macro-focused strategies of development. The system of communal management and what comes under the more general term of common-pool resource management still offers an appealing option for water management, as opposed to more hegemonic practices of state or market-driven modes of regulation. However, due to rising wages, migration to urban locales, technological changes and the decline of traditional agriculture; the threats to the continuation of communal management raise questions about the adaptability of this form of management. The challenge right now revolves around creating institutions that can: allocate water equitably among users, integrate management of irrigation at farm and system level, as well as reduce the onset of social conflict.

Rice



Southeast Asia: Distribution of Paddy Fields
Source: USDA

- 31% of global rice production comes from Southeast Asia
- 45% of farming land is used for rice irrigation

The production of rice is essential for its ability to provide efficient amounts of calories and nutrition, it is also important economically for its export value. In Southeast Asian communities, rice is more than just food: it is the central subject of economic policy, a determinant of national culture, and an important anchor in the maintenance of political stability. The decline of rice production has been steadily building in the the last few decades, with prices reaching historical lows in 2001.

Rice prices reflect the willingness and capacity of exporting governments to subsidize rice exports, and of importing countries to restrict rice imports and protect domestic producers, as well as the degree of price and income volatility that governments in the major consuming nations are willing to pay. Years of surplus or of shortfall in production have a critical impact on the demand-supply of the world market.

Section Two

Property Rights

Property rights are rules that define rights to particular resources, they are used in determining the allocation of land and natural resources. It is traditionally believed that environmental problems are the result of poorly defined property rights over natural resources, which lead to over-exploitation and free-riding. Institutions engaged in resource management historically have favored private ownership to be the solution to poorly managed property rights. However, there is no single method of assigning property rights that can be universally applied. This guide supports the use of CBNRM as an alternative to privatization.

Figure 2: Types of Property Rights Management

Regime type	Owner	Owner's rights	Owner's duties
Private property	Individual	The law guarantees the owner control of access and the right to use the property for socially acceptable uses.	The private property regime also requires that the owner has a duty not to use the property for unacceptable uses.
Common property	Collective	Control of access and the right to use the property for socially acceptable uses. Exclusion of non-owners.	They have a duty to maintain the resource through constrained (limited) rates of use.
State property	Citizens	Generally, decision-making is allocated to a state agency for management purposes. Citizens will have the right to use the resource within a given set of rules.	The duty of the agency is generally to manage the resource or resources in order to promote national social objectives.
Open access (non-property)	None	In the case of there being no ownership of the resource, it is the first person to "capture" the resource who will then claim ownership.	The person who captures the resource has no specified duty or incentive to maintain the resource, limit the use of that resource, or even engage in socially acceptable uses of that resource.

Incentives of Institutional Change

- Institutional change refers to the process of shifting management of property rights from one system to another. In most types of CBNRM, including participatory irrigation management, institutional change is a gradual process. The incentives for these types of changes are:
- Direct benefits to stakeholders of resource management, producers are able to pay appropriate amounts of currency or resources to involved households and members.
- Indirect benefits to stakeholders of resource management, natural resources increase in quantity and quality for future use, if they are well managed.

Institutional change will only function sustainably if the net benefits of new management exceed the net benefits of the former one. These factors include:

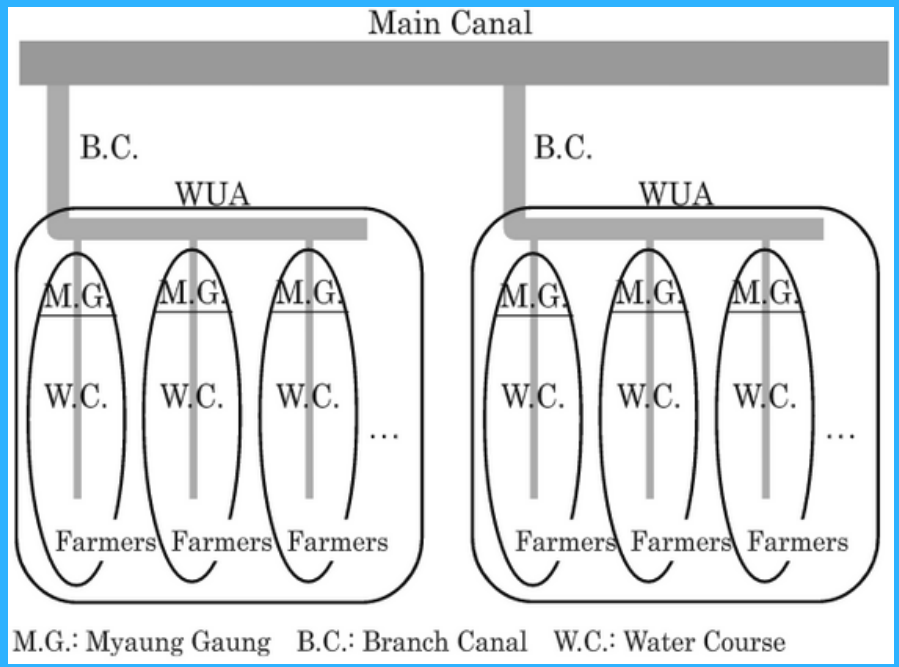
- Management costs need to be well organized at th lowest possible cost. Examples include allocating funds for monitoring, project implementations cost human resources expenditure, etc.
- Transaction costs in the process of institutional change should be efficiently organized. This represents the opportunity costs of community members involved in the transaction process.

Water User Associations

- Water user associations (WUA) are seen by many social scientists as an essential element for improved irrigation system performance. They are a form of water rights that dictate how water should be managed. Terms used to describe these types of associations include participatory irrigation management (PIM) and irrigation management transfer (IMT).

- PIM: A level of farmer participation that would increase responsibility in the management process
- IMT: When irrigation management shifts away from private institutions or the state, towards local entities

Many irrigation systems in Asia were developed through PIM methods and techniques. Irrigation has developed dualistically, with more recent state-led systems being emphasized over community managed systems. As the construction of large public systems has gained national emphasis, donors and agencies have often ignored the presence of functioning communal irrigation systems and their means of local management.



Note: Myaung Gaung is water head

Figure 3: Organizational structure of Ngameoyeik irrigation system, Myanmar

National Irrigation Administration of the Philippines

The first formation of PIM in Asia were found the Philippines in the late 1970s. The National Irrigation Administration (NIA) sought to change the bureaucratic management of irrigation systems in place at the time. Being influenced by the successful functionality of community managed systems, the NIA decided that PIM would lead to higher quality operation and maintenance, as well as improved agricultural production. The program was supported by the Ford Foundation, the United States Agency for International Development, and the World Bank. Their objective was to transfer full responsibility for operation and maintenance, control of canals, and payment collection to water user groups over time. This transfer of agency did not completely come to fruition due to interior political issues, but similar programs began to grow again in the 1990s, partly due to the desire of many governments to reduce spending on irrigation.

In the past few decades, the World Bank has endorsed IMT as a main water management policy. In areas where IMT implementation has been successful, government spending and exterior agency involvement have decreased, maintenance has improved in many cases. However, there has not been any conclusive evidence of IMT leading to more productive uses of irrigation water.

Section Three

Community Development

Community Development is the process of having stakeholders control the development and resources of their communities. This means giving responsibilities of natural resources over to those closest to the resources, who also have the greatest incentive to manage them. The specific objectives of institutional change towards community development include:

- Facilitating cooperation between users
- Facilitating the integration of marginalized groups with their larger communities through equitable governance
- Provide a voice for local knowledge in the designing and functioning of management schemes
- Allow all stakeholders to participate in each step of resource management

8 Design Principles for Participatory Irrigation System

In order to understand institutions that practice participatory irrigation management, outside stakeholders must understands how rules, combined with physical, economic, and cultural environments, create incentives and results. These design principles were created as an attempt to explain certain key characteristics that contribute to the functioning of long-enduring participatory irrigation systems around the world. These design principles are:

1. Clearly Defined Boundaries: Individuals or households with rights to access water and the boundaries they operate in are clearly defined. Without defined boundaries, local users risk losing their resources to outsiders who can attain the benefits of their resources without contributing to managing them.

2. Equivalence Between Benefits and Costs: Rules that specify the amount of water users are allocated are proportional to local conditions, labor input, and/or monetary input. Those who receive higher proportions of water are also required to pay higher costs.

3. Collective Choice Arrangements: Individuals and households that are affected by operational rules are also able to modify these rules. These rules can be modified over time by water users. It is ideal for water users themselves to invest in the monitoring and sanctioning of these rules.

4. Monitoring: Monitors actively audit the physical conditions of irrigation schemes and the behavior of water users. They should be accountable to the users and/or consist of users themselves.

5. Graduated Sanctions: Water users who violate operational rules must incur punishment from other water users or officials that are accountable for them. These punishments must be proportional to the seriousness of the offense, and should be undertaken by participants themselves.

6. Conflict Resolution: Water users and officials have access to low-cost resources in resolving conflicts among users or between users and officials.

7. Minimal Recognition of Rights to Organize: The rights of water users to devise and organize their own institutions are not challenged by external authorities. Many participatory irrigation systems are not recognized by authorities, and may face the threat of external authorities using their power to support those against organization.

8. Nested Enterprise: Appropriation, provisioning, monitoring, enforcement, conflict resolution, and governance are all organized in multiple layers of enterprise. By having water users organized into tiers of specialized labor, they can take advantage of different scales of organization.

Challenges to Implementation

- Managing community governed resources can be difficult due to the differences in contextual arrangements. Many systems that follow design principles may fail due to problems faced over time. Faults of CBNRM become apparent from observations in the field, theoretical ideas, and empirical findings. Examples of these faults include:

- Blueprint thinking: when policymakers, donors, scholars, or authorities propose uniformed solutions to an array of problems that are understood through a single framework.
- Over-reliance on simple voting rules: substituting a majority vote for long discussions towards consensus decision making is problematic for self-governing communities because the long-enduring problems are not often addressed. Voluntary compliance is lost at the cost of the enforcement of gaining compliance.
- Rapid changes: these include changes in technology, labor, and ecosystems. These changes are threats to the continuation of participatory irrigation systems.
- Transmission failures: these failures occur across generations in accordance with the passing of operational principles. If certain key principles are not transferred, community governance will also change as a result.
- Relying on external sources: The availability of funds from external authorities or donors may hamper the ability that local institutions have in sustaining themselves. These assistance programs incentivize water users to remove themselves from operation and maintenance.
- International aid and exclusion of indigenous knowledge: as irrigation systems grow, more projects by external engineers are undertaken. These projects are often done to generate profit for landholders, and do not take into account indigenous knowledge.
- Corruption and opportunistic behavior: corrupt exchanges between officials and private contractors as well as between farmers and officials are wide-spread.

Section Four

Irrigation in Southeast Asia

The Mainland Southeast Asia subregion is composed of Cambodia, Lao PDR, Myanmar, Thailand, and Vietnam. Mountains and hills make up about two thirds of total area. The climate alternates between wet (May to October) and dry (November to February) seasons. Total irrigation potential in this region is around 14.4 million ha, 44% of which is in Thailand. In 2009, about 13.8 million ha has been equipped for irrigation, making up 8% of the region. Rice production accounts for 80% of irrigation agriculture.

The Maritime Southeast Asia subregion consists of Brunei Darussalam, Indonesia, Malaysia, Papua New Guinea, the Philippines, and Timor-Leste. The region is mostly made up of lowland plains and swamps. The climate is tropical and monsoonal. Total irrigation potential in this region is around 12.2 million ha. In 2009, about 9 million ha has been equipped for irrigation, making up 6% of the region. Rice production accounts for 82% of irrigation agriculture.

Figure 5: Irrigation in Southeast Asia

Country	Irrigated Area (ha)	Irrigation Potential (ha)	Irrigated Area as % of Cultivated Areas	Small Scale Context-based (ha)	Large Scale Context-based (ha)	Year of Study
Brunei Darussalam	1,000		17	1,000	0	1995
Cambodia	353,566		9	17,090	259,320	2006
Indonesia	6,722,299	10,886,000	18			2005
Lao PDR	310,000	600,000	27			2005
Malaysia	362,687	413,700	4.8	100,658	240,059	1994
Myanmar	2,110,000	10,500,000	20			2004
The Philippines	1,879,084	3,126,000	19	625,360	1,253,724	2006
Thailand	6,414,800	12,245,000	34	2,848,240	3,566,560	2007
Timor-Leste	34,694		16			2002
Vietnam	4,585,500	9,400,000	49	1,638,297	2,947,203	2005

CASE STUDIES

KARYA MANDIRI IRRIGATION SYSTEM

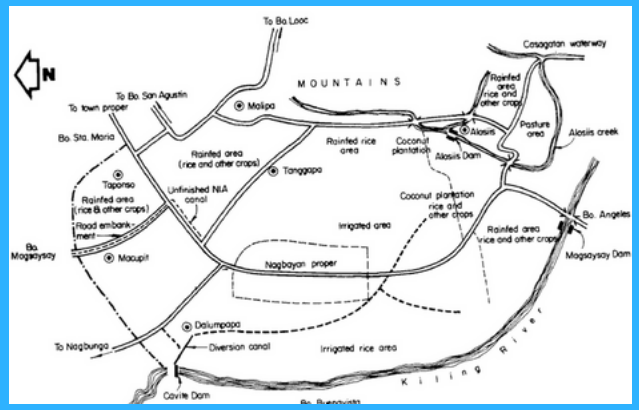
- Located in the Agam District of West Sumatra of Indonesia, with a 127 Ha service area for 1,500+ people.
- Main product is high quality rice
- Farmers pay 20% of harvest for sufficient irrigation
- Elected clan leaders meet with members to create management agreements
- Clan leaders monitor infrastructure and users, as well as resolve conflicts
- Irrigation services are sold to neighboring villages for profit
- Revenue from irrigation entrepreneurship is used to finance infrastructure development and agricultural technology

Concrete Dam of KMIS

Piping irrigation to neighboring village of Salo

CAVITE COMMUNAL IRRIGATION SYSTEM

- Located in Castillejos municipality, Zambales province of the Philippines, with a 90 Ha service area for 100 people
- Large amount of voluntary labor from neighboring villages
- Not all farmers hold equal sized properties, but water received from irrigation is proportional to land size
- A village council runs the irrigation system, they elect a village captain every three harvests to oversee monitoring
- Free-rider problem: many landlords rely on voluntary labor and do not face sanctions for their lack of labor



Map of Nagbayan irrigation area

NGAMEOYEIK IRRIGATION SYSTEM

- Located in the Lower Delta of Myanmar, with an Irrigation service area of 28,000 Ha
- A water head, called the Myaung Gaung, is in charge of every WUA
- Myaung Gaung's are responsible for monitoring, repairing and cleaning the channels
- Due to government ownership of the Ngameoeyeik Dam, authorities control and allocate how much water the system receives
- Between 2004-2005, infrastructural (water delivery, distribution, drainage) and institutional (encouraging farmer involvement in design and implementation) improvements were made to increase rice production

Ngameoyeik Dam

CASE STUDIES

SUBAKS OF LUWU

- Located in the Kalaena irrigation area of Luwu, Indonesia, with a size of 6,615 Ha, providing services to 1,378 farmers
- Subak's were brought to the area through transmigration of Balinese immigrants
- Farmers are given 1 Ha of land for rice production
- WUA's are in charge of monitoring irrigation system
- All farmers must attend meetings, or else they are fined
- Japanese International Cooperation Agency reported that WUA's need improvement in operation and maintenance

Working on stream channels in Kalaena

NAM TAN IRRIGATION SYSTEM

- Located in Muong Phieng Valley of Laos, with an irrigation service area of 2046 Ha, providing services for 900 farmers
- All farmers receive 3 Ha of farm area for equal labor
- Farmers pay fees in rice to water chiefs for irrigation services
- Water chiefs are under the jurisdiction of the central administrative staff
- Central administrative staff is employed by the local government, they monitor the system and work in irrigation, grain processing, and research

HOP TIEN COMMUNE

- Located in Hop Tien Commune in Dong Hy, Vietnam, with an irrigation service area of 230 Ha providing service to 5,875 people
- WUA's consists of a team leader and 15-20 team members and is tasked with overseeing headworks operation and irrigation water distribution to fields for five villages in the commune
- Hop Tien WUA has significantly contributed to successful operation of irrigation structures and greater food security.
- Hop Tien WUA depends on the authority of the Commune People's Committee (CPC)

Cap De Kam canal system in Hop Tien Commune

Section Five

Evaluating Participatory Irrigation

These principles are useful tools for diagnosing and explaining why some projects are not sustainable, and they can also be used for prescribing alterations in operation and maintenance, so long as such reforms remain steady ongoing processes that involve consensus from all water users. In assessing design principles of participatory irrigation, it should be noted that it is difficult to match rules to local circumstances. Not all participatory irrigation systems exist within similar contexts, long-term sustainability is not always equivalent to optimal production or food security.

These principles should be understood as incomplete, and needing additional criteria for management that takes into account all contextual social variables. They are characteristics of communities and institutions, and even though these factors are important for system functionality, the most effective aspects of system functionality are social mechanisms such as trust, legitimacy, and transparency. Critiques of these principles include:

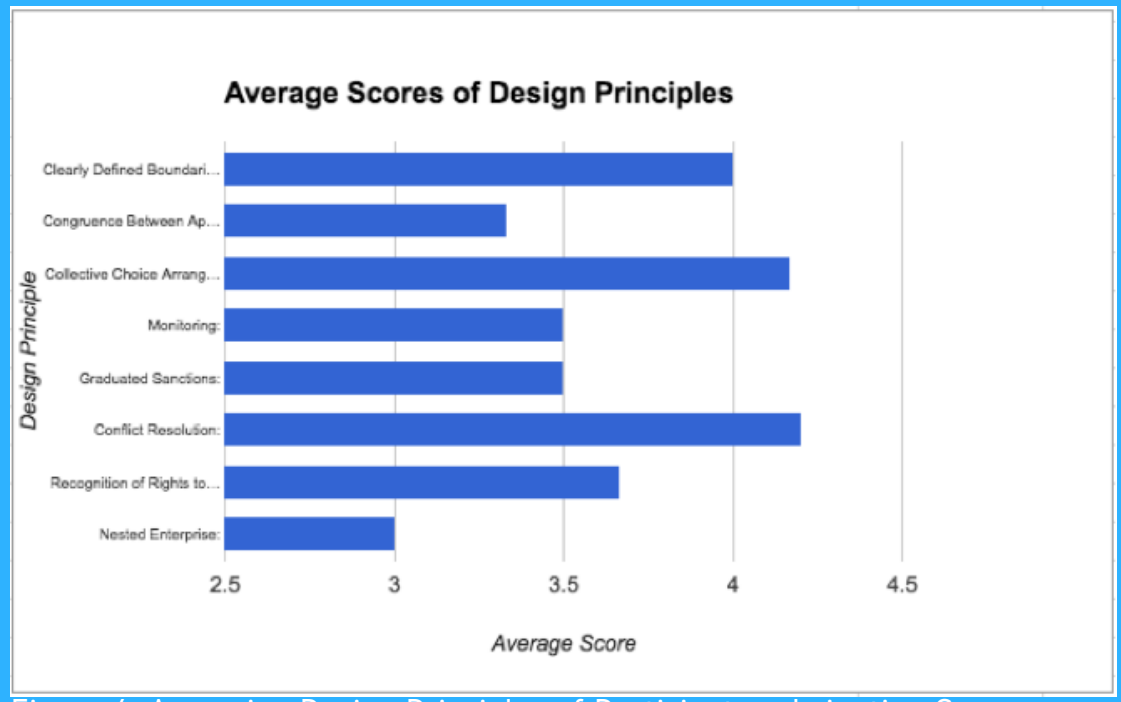


Figure 4: Assessing Design Principles of Participatory Irrigation Case Studies in Southeast Asia

- It remains questionable as to whether or not these principles can applied to cases beyond small scale management, an example of this would be the globalized international market for rice production, can these theories be scaled up to relate to larger communities and social-political networks.
- Blueprint thinking of principles leads to confirmation bias of rules and abstracts from the natural and social environments that users are a part of.
- Design principle approach views resource users as rational decision makers and not communities of real people who have internal conflicts.

External Socio-economic Factors:

- Market integration of agricultural systems can lead to increased inequality
- Market integration can lead to declining resource conditions eg. overfishing
- Development (external or internal) and market forces can destabilize CBNRM systems that function better when isolated
- External integration can alter local incentives: when users are not as dependent on their resources, welfare is less linked to cooperative management

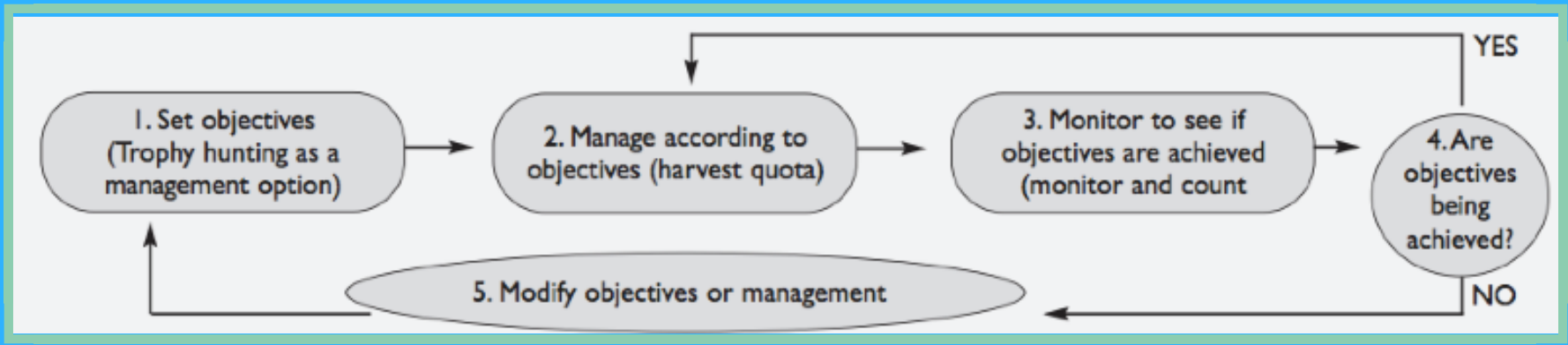
Rice Market in Thailand

Adaptive Management

Successful CBNRM requires evolving rules. The concept of adaptive management suggests that current systems should be adapted and reinterpreted to meet changing contextual conditions. Countries in Southeast Asia are always changing politically, agriculturally, and environmentally. The strength of adaptive management lies in its ability to establish experimental approaches to resource management, as long as they are decided on consensus. Adaptive management functions continuously and cyclically.

- Testing assumptions: new decisions should be systematically attempted for desired outcomes by developing an objective and implementing actions. This testing requires a monitoring system that collects evaluative information
- Adaption: actions for improvement should always be taken. This could be in response to: prior false assumptions, poorly implemented actions, changing conditions, poor monitoring.
- Learning: assumptions, actions and results of monitoring should be documented to ensure how different management techniques functioned in the past.

Figure 6: The Process of Adaptive Management



Principles of Adaptive Management:

- Adaptations should not be imposed on communities by outsiders
- An environment in which people are willing to experiment is needed. New ideas should be encouraged and constantly discussed
- Mistakes or troubles should not be considered failures

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