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Irrigation in the Lower Mekong Basin Countries: The Beginning of a New Era?

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Introduction

The image of irrigation often conflicts with that of the Mekong River Basin – a monsoonal region with a wet climate and periodic floods. In the countries of the Lower Mekong Basin (LMB), however, the wet season that runs roughly from June to October is, in many places, followed by a dry season for the rest of the year. The rain-fed uplands in Laos and Cambodia receive the most rainfall (3000mm) and the Korat Plateau in northeast Thailand receives the least, between 1000mm and 1600mm (MRC, 2003a). In the LMB countries, irrigation is a key means of securing monsoon crops – shifting from a single crop (mainly rain-fed wet season rice) to multiple cropping systems – and increasing crop yields. It is estimated that water abstraction for agriculture accounts for around 90 per cent of all water diversions (Cambodia: 94 per cent; Laos: 82 per cent; Vietnam: 86 per cent; and Thailand: 91 per cent) in the region (MRC, 2003a). Thailand and Vietnam have extensively developed their irrigation infrastructure; while investments have declined in the last few years, hydropower development is going rapidly ahead (especially in Vietnam and Laos; see Chapter 2 in this volume). Laos, because of its sparse population, and Cambodia, due to the recent history of war and political turmoil, still have a low degree of infrastructure development; but more investments are expected in the coming years.

The Government of Laos (GOL) is intent on developing irrigation in the highland valleys as well as along the Mekong River corridor, although the schemes installed during 1996 to 2000 have shown relatively poor performance. In Cambodia, the agricultural sector contributed 31 per cent of the national gross domestic product (GDP) in 2007 (http://en.wikipedia.org/wiki/Economy_of_Cambodia) and provides employment to nearly 80 per cent of the total labour force in the country (MAFF, 2007). Cambodia has set ambitious targets for irrigation development and institutional reforms, although experience in the past decade has been mixed. Vietnam's agricultural policies must be seen in the context of the country's ongoing transition to a market-based economy. Of particular relevance to the natural resources of the Mekong Basin are Vietnam's plans to expand irrigation, improve existing schemes and expand the delta water management systems to deal with acid-sulphate soils and salt intrusion. Thailand is promoting basin-wide coordination of water resources management, the improvement of irrigation management efficiency, and the strengthening of farmer groups and water user associations (WUAs) (MRC, 2003b). It has also repeatedly proposed massive irrigation and water diversion projects, notably in the northeast region or *Isaan* (see Chapter 10).

Despite these past investments, the expansion of irrigated areas in these countries has slowed down during the last few years. The question is whether this trend heralds the end of large-scale public irrigation or, in fact, whether a new irrigation era is expected? This chapter revisits the development of irrigation in the LMB countries in the past and analyses the possible trends of irrigation in the future by considering several drivers – in particular, the recent increase in food prices around the world that affects food security in many countries in the Mekong region. It addresses both the question of how to improve and reform existing schemes and the rationale and scope for further development.

Revisiting irrigation in the Lower Mekong Basin countries

Agriculture and irrigation in the Lower Mekong Basin countries

Agriculture in the highlands is typically less productive than in the lowlands and the deltas, where the bulk of crop production takes place. Upland crops are usually rain fed, with relatively limited irrigation, and agriculture policies strongly support cash crops such as coffee, tea and rubber. The lowlands and deltas are relatively flat and nutrient rich and are under intensive rice cultivation, with some exceptions in the floodplains due to soils or flooding conditions. Farming systems in these regions include wet season rice, dry season irrigated rice, flood recession rice, floating rice, and multi-crop production systems that have gradually incorporated fish, shrimps, vegetables and fruit trees.

Rice production has increased rapidly during the past decade: by 81 per cent between 1993 and 2000 in Cambodia; by 38 per cent between 1990 and 1999 in Laos; by 33 per cent between 1994 and 2001 in northeast Thailand; and by 27 per cent between 1995 and 1999 in the delta and central highlands of Vietnam. Although high-quality jasmine rice and glutinous rice with low yield is still grown in many places, particularly in northeast Thailand and Laos, this increase was mainly due to the use of high-yielding varieties, increased irrigation and cropping intensity, and expansion of the area under cultivation (MRC, 2003a).

Despite these large investments in irrigation, in 2003 the ratio of irrigated land to total arable land was only 26.8 per cent (see Table 6.1), lower than the 45 per cent of Asia as a whole. And this rate has remained relatively stable during the past two decades.

Table 6.1 *Irrigated area in the Lower Mekong Basin countries until 2003*

Country	Irrigated land: 1000ha				Share in arable land and permanent crops (%)			
	1979–1981	1989–1991	1999–2001	2003	1979–1981	1989–1991	1999–2001	2003
Laos	107	135	174	175	13.3	15.7	18.2	17.0
Cambodia	120	240	270	270	5.8	6.3	7.1	7.1
Thailand	3007	4248	4973	4986	16.4	20.6	25.8	28.2
Vietnam	1685	2867	3000	3000	25.6	44.8	36.4	33.4
All LMB countries	4919	7490	8417	8431	17.7	23.6	26.1	26.8
Annual growth rate*		257	93	5				
(as percentage)		(5.2)	(1.2)	(0.1)		0.6	0.2	0.2

Note: * Compared with record in previous column.
Source: FAO AQUASTAT (2004)

Out of the five categories of the global irrigation system typology (Molden, 2007), four can be found in the LMB countries:

1 large-scale public paddy irrigation systems in humid areas;
2 small- to medium-scale community-managed (and built) systems;
3 commercial privately managed systems producing for local and export markets; and
4 farm-scale individually managed systems producing for local markets around towns or cities.

Large-scale public paddy irrigation systems in humid areas

These irrigation systems, such as the Lam Pao (50,000ha) in Thailand, the Stung Chinit (12,000ha) in Cambodia and the Quan Lo Phung Hiep (250,000ha) in

Vietnam, were developed to produce paddy. In some cases, they have gone through a process of incremental development by gradually increasing water control and cropping intensity; but they face some challenges in terms of economic and financial viability, and technical and managerial upgrading.

Small- to medium-scale community-managed (and built) systems

Many of these systems are found in the highland areas of the LMB countries. They are characterized by their small size, and private or community investment and management. Often these systems divert water from small streams through temporary (or concrete) weirs. These systems form the basis of the economies of their communities and typically show a large variety of cropping patterns. Public-sector involvement includes mostly the rehabilitation or improvement of weirs (often making them out of concrete).

Commercial privately managed systems producing for local and export markets

These systems do not yet represent a large share of irrigated areas in the LMB countries, but they are becoming more important to local economies, especially with non-rice crops such as rubber, palm trees, coffee and upland cash crops.

Farm-scale individually managed systems producing for local markets around towns or cities

These systems develop around towns or cities in the LMB countries to take advantage of local markets for high-value crops such as fruits and vegetables. They are highly dynamic and volatile, often characterized by large short-term returns on investment, and face environmental and health-related problems for both farmers and consumers when they use wastewater.

The size of an irrigation system in the Mekong countries is largely related to its funding sources that are either national or local budgets or international loans or grants. Table 6.2 gives details on the extent of irrigation across the LMB countries. The most basic systems provide only supplementary water during the wet season, while more intensive schemes provide water for two to three seasonal crops per year.

In the LMB region, most of the irrigated areas are concentrated in northeast Thailand and the Mekong Delta in southern Vietnam. Figure 6.1 shows the distribution of irrigation schemes with different sizes in the Lower Mekong Basin.[1]

Table 6.2 *Irrigated areas in the Lower Mekong Basin countries*

Location	Number of schemes	Area of wet season irrigation [d] (ha)	Area of dry season irrigation [d] (ha)	Area of third season irrigation [d] (ha)	Irrigated area [a d] (1000ha)
Laos*	2532	224,232	151,940	0	224,232 [b]
Thailand* (total)	14,494	–	–	–	4,770,018
Royal Irrigation Department (RID) (medium/large)	788	–	–	0	3,781,128
RID (small)	11,567	–	–	–	90,963
Department of Energy Development Promotion (DEDP) (pumping)	2129	–	–	–	606,044
Royally initiated projects	2245	–	–	–	291,883
Cambodia*	1012	248,842	181,506	0	392,117
Vietnam Mekong Delta	120	1,964,223	1,358,669	281,497	1,964,223
Vietnam Mekong Highlands	76	36,008	7290	–	36,008
Total [c]	18,234	2,473,305	1,699,405	281,497	7,386,598

Notes: Dash (–) indicates information not available.

* Except for Vietnam, data given is for the whole country.

[a] Where there is no comprehensive wet or dry season cropping data available, the irrigated area has been taken as the common measure of the irrigation area.

[b] The total irrigated area in Laos has been recorded at 280,000ha, the difference being many small schemes which have not been formally inventoried or mapped.

[c] This is the total of all schemes and areas where data is available (i.e. many small unrecorded schemes are omitted).

[d] The data refer to the potential area under irrigation if the schemes were operating to full capacity, which is not always the case.

Sources: MRC (2003b, 2005); RID (2007) for Thailand

Irrigation development and issues in the Lower Mekong Basin countries

In the LMB countries, irrigation development, especially the traditional irrigation systems in highland areas, began centuries ago. For example, in Cambodia, the history of irrigation development goes back as far as the 3rd century AD, with further development during the Angkorian period between the 10th and 13th centuries (Higham, 2001). In Thailand, traditional farmer-managed irrigation systems, mostly found in the northern part of the country, were established as early as 700 years ago during the period of King Mengrai (Surarerks and Chulasai, 1982).

Large-scale irrigation development was initiated by the French in the Red River and Mekong deltas in Vietnam (see Chapter 8), and by the Thai monarchy in the Chao Phraya Delta at the end of the 19th century. During the Cold War (1946 to 1989), large-scale state-built irrigation was seen as a response to concerns of food security and poverty reduction while serving US geopolitical interests (Barker and

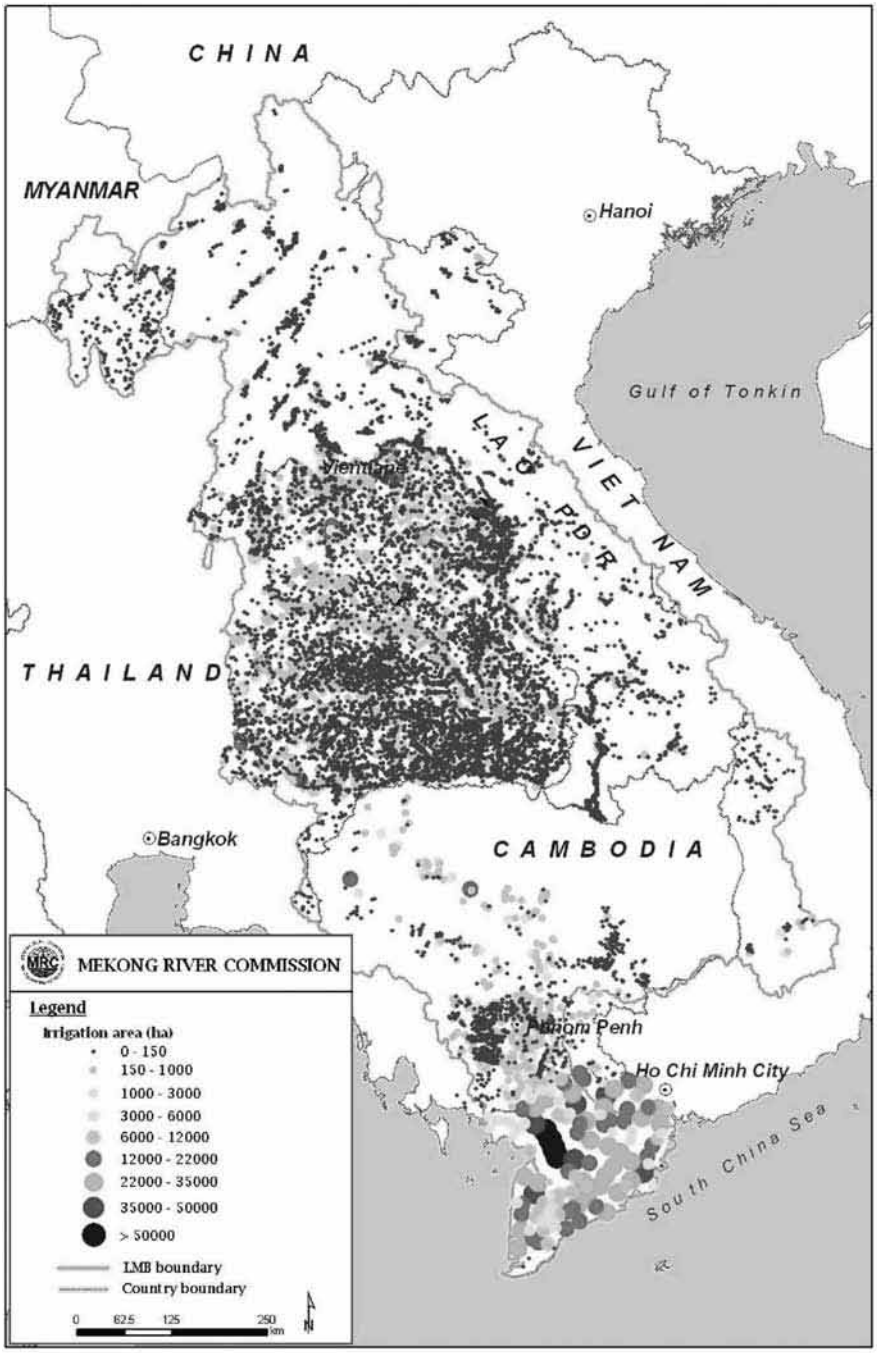

Figure 6.1 *Irrigation projects by area in the Lower Mekong Basin*

Source: MRC (2005)

Molle, 2004). Because of the Indochina wars, Thailand was the only country in the region that could continue to substantially develop its irrigation infrastructures at that time.

Irrigation is generally seen as a core part of rural development, with an important role in poverty reduction in the LMB countries, and food security in Cambodia and Laos. In Thailand and Vietnam, there is more focus on the intensification of irrigated cropping. There is also a move to diversify away from rice and to alternatives with higher financial returns such as aquaculture or cash crops. However, irrigation systems tend to be designed specifically to suit rice production, which makes it difficult for farmers to diversify into non-rice crops (MRC, 2003a).

Despite the great achievements in rice production in the LMB countries, there is a general consensus that irrigation systems have not lived up to expectations because of low performance in terms of control, water productivity, yields and quality of service delivery to farmers. The overall progress of the modernization agenda has remained relatively modest. The concepts of irrigation modernization are not fully understood and properly adopted (FAO, 2007). In some cases, modernization has been used to continue receiving funds for rehabilitation, operation and maintenance, or further capital-intensive interventions. In most countries, participatory irrigation management (PIM) and/or irrigation management transfer (IMT) has made very modest progress in improving system productivity and raising the cost recovery rate. Significant underinvestment in operation and maintenance and poor management continue to be the norm rather than the exception.

The reduction in financial benefits from agriculture between 1980 and 2000 has put governments under pressure to lessen irrigation management costs. Irrigation fees are being introduced with mixed success. Attempts to introduce an irrigation service fee in Thailand resulted in mass protests (MRC, 2003b). The alternative, and in some ways a reaction to excessive state control and bureaucratic government management, is to hand over schemes to farmers. But the effectiveness of this alternative needs to be investigated and questioned; huge investments in smaller schemes are at risk unless farmers have the incentives and capacity to ensure that they are adequately maintained. These institutional reforms do not capture the complexity of the hydrological cycle, the multiple functions of irrigation systems, and the relationships between different levels of management.

The situation among the individual LMB countries shows variations. Laos exhibits a low level of investment/infrastructure that contrasts with the fact that agriculture provides the largest share (40 per cent) of foreign currency income, 52 per cent of the GDP, and 85.5 per cent of employment (Molle, 2007). The Water Vision of the country stresses that 'The national economic development process is to be based on the wealth of natural resources, especially water and water resources', which particularly includes irrigation and hydropower (Nonthaxay et al, 2002). Significant improvements have been achieved in the agriculture sector,

with an increase in dry season rice area from 2700ha in 1976 to 110,000ha in 2000, and irrigation has shifted the average rice yield from 3 tonnes per hectare (t/ha) in rain-fed wet season to 4t/ha to 4.5t/ha in the dry season. This increase in area reflects the US$30 million to US$40 million investment in 7000 electric pumps installed along the Mekong and its major tributaries during the late 1990s (CES and AFD, 2007).

Irrigation coverage further increased from 19,170 irrigation schemes with a service area of about 295,000ha in the 1999/2000 wet season to 24,000 schemes serving 310,000ha in 2005 (Pheddara, 2007). This was mainly due to the large investment in the National Pump Installation Management Project (NPIMP), mostly along the Mekong River in the southern part of the country. However, most irrigation schemes are based on traditional weirs and are found in the northern and central regions. Medium-scale public schemes are largely confined to the Nam Ngum Valley near Vientiane. The government *Strategic Vision for the Agriculture Sector* (MAF, 1999) is to invest heavily in irrigation with a focus on small- and medium-scale schemes under farmers' management, both along the Mekong Corridor (pumping) and in the highlands (valley bottoms). In 2001, the government set ambitious targets of increasing irrigation schemes from an actual coverage of 36 per cent of agricultural land to 50 per cent in 2005, and 80 per cent in 2020, with 50 per cent of the area cropped in the dry season (Nonthaxay et al, 2002). But until 2004 the irrigated area reported was only 20 per cent of the national paddy area (Anonymous, 2004) and dropped to 17 per cent in the three following years.

Problems found in the pumping schemes along the Mekong illustrate the variety of difficulties faced by the irrigation sector. The area effectively cultivated in irrigation schemes, in general, totals only 70 per cent of the design command area. Dry season cropping intensity in pumping schemes was found to be around 50 per cent of the wet season cropping area. Problems are technical (no on-farm distribution systems; deteriorated networks; damaged or out-of-order pumps), economic (rice is often less attractive than other on-farm activities in the dry season; the price of fuel became unbearable; operation and maintenance costs are not covered by water fees; schemes deteriorated) and institutional (lack of technical capacity in managing pumping stations; hasty turnover of technical and financial responsibilities to farmer associations; weak water user groups or associations; top-down design and location of schemes), while full-cost repayment policies conflicted with a choice of community based on higher poverty index (CES and AFD, 2007).

New investments in irrigation as well as hydropower (often combined) are contingent upon loans by development banks and private-sector involvement, both explicitly welcomed by the government (Richardson, 2002).

In Cambodia, during the early 1990s the Asian Development Bank (ADB) approved a Special Rehabilitation Assistance Loan (SRAL) for emergency rehabilitation of infrastructure, including some irrigation systems. The need and the scope for further investments in irrigation were emphasized, as agriculture

dominates the economy and rural infrastructure was destroyed by the war (ADB, 2000). Irrigation in Cambodia is largely limited to the use of receding flood waters. Recession rice is gradually replacing lower-yielding traditional floating rice. Due to a limited ability in controlling water, the second irrigated rice crop in the dry season is grown only in approximately 10 per cent of the total wet season rice production area (MRC, 2003a). Renovation of irrigation schemes emerged as one of the most urgent rural development interventions for increasing agricultural productivity and for poverty alleviation (Öjendal, 2000).

The Ministry of Water Resources and Meteorology (MOWRAM) *Strategic Development Plan 2006–2010* targeted investments of over US$110 million for the irrigation reform programme. Objectives with the largest estimated costs generally involve significant infrastructural work, while those with lesser estimated costs generally relate to human resources capacity, management systems and the ministry's legal and regulatory basis (MOWRAM, 2007). In practice, the government has allocated only US$10 million per year to this ministry for urgent rehabilitation and construction work, mostly the construction of reservoirs for irrigated areas.

Large irrigation investment and irrigation modernization have been initiated with the support of external donors. The government aims to expand the irrigated area from 407,000ha (the actual area cultivated with rice is 2.5 million hectares) to 1.8 million hectares or more in the future through various interventions (Sinath, 2007), such as rehabilitation, reconstruction and development of gravity irrigation systems of various scales to provide supplementary irrigation in the wet season and full irrigation in the dry season. In addition, interventions include the provision of pumping stations (fixed and mobile), pumping generators and fuel; implementing and strengthening participatory irrigation management and development (PIMD) through farmers' water user communities (FWUCs) in order to ensure physical and financial sustainability, and modernization of the irrigation systems and flood protection facilities. Cambodia's policies on water reforms are strongly influenced by international financial institutions and aim to reduce the financial 'burden' to the state.

The recent master plan published by the Japan International Cooperation Agency (JICA, 2007) shows that the Tonle Sap and its catchments areas are the most important region for poverty alleviation, as well as overall economic development in the country. However, the study based on 320 existing irrigation systems on 4 out of the 12 tributaries flowing into the Tonle Sap reported some major problems, including:

- low ratio of farms under irrigation;
- lack of comprehensive rehabilitation work;
- deterioration of plot bunds;
- low ratio of establishment of FWUCs;
- insufficient canal capacity; and
- lack of irrigation structures.

The management reforms have been shaped by power struggles between agencies and built without due consideration of field experiences or local expertise (Molle, 2005, 2007; Roux, 2005). Water resource management and development come under diverse institutions of MOWRAM and the Ministry of Agriculture, Forestry and Fisheries (MAFF). Poor coordination among water-related institutions, together with unclear definition of their functions and responsibilities have often resulted in overlapping activities and financial costs. Other problems faced in irrigation management include rampant corruption, weak state administration capacity, ailing political legitimacy, under-educated civil servants, political factionalism, local-level conflicts, and a limited national budget (Öjendal, 2000). The problems in organizing local participation and the lack of project coordination at scheme level are still main constraints. This is one of the reasons why certain schemes in Cambodia resulted in cost overrun and why their benefits have been reduced (see Box 6.1).

Box 6.1 Issues in participation and integration: Lessons from the Stung Chinit Irrigation Scheme (SCIP) in Cambodia

The Stung Chinit Irrigation Project (SCIP) provides a striking example of the mismatch between project planning and reality (Try, 2008). The scheme was built during the Pol Pot period in 1977 by using forced labour from Kampong Thom and Kampong Cham provinces. The planned total command area of SCIP was 12,000ha. The project was designed to increase agricultural productivity and farmers' incomes and stimulate the rural economy of Kampong Thom Province by providing irrigation and drainage, agriculture extension, rural roads and markets. But due to some structural shortcomings, the scheme could not be operated up to its design capacity. In 1997, the Asian Development Bank (ADB) financed technical assistance to assess the feasibility of rehabilitating the SCIP. The consultants focused on the full development of the system, including an upstream dam and storage to provide wet and dry season irrigation over 12,000ha. In 2000, the full proposal for the Stung Chinit Irrigation and Rural Infrastructure Project was submitted to the ADB for approval. The revised plan decreased the proposed irrigated area to 7000 ha in the wet season and 2000 ha in dry season. The overall project implementation period was supposed to start in 2001; in practice, construction only started in 2006, and then was extended up to July 2008. However, by that time the scheme could only irrigate 2000ha in the wet season and about 300ha in the dry season.

The delay in construction resulted in higher construction costs and ultimately affected the expected benefits to farmers in the SCIP. The revised design was not fully fitted to local conditions, such as drainage requirements, fish migration, etc. Moreover, the rehabilitation plan could not secure the active involvement of all actors associated with the project; therefore the participation of the water users could not be achieved as expected; for example, some farmers were not willing to join the project because it would result in a loss of grazing and agricultural land. In the dry season, farmers in the project area show limited interest in rice cultivation as it is often affected by insects and they also find alternative sources of livelihood by going upstream for logging or engaging in farming activities that provide more benefit than rice cultivation.

Since 1961, the strategies defined by comprehensive National Economic and Social Development Plans (NESDP) have guided irrigation development in Thailand. In the beginning, emphasis was put on the construction of large- and medium-scale irrigation projects to expand irrigable areas as much as possible in order to prevent drought (Budhaka et al, 2002). During the 1960s and up to the mid 1970s, external development ideas, loans and grants influenced irrigation development. Many of the irrigation systems are underutilized, with low benefits, and continued financial support of government was necessary to maintain the systems. During the late 1970s and the 1980s, the focus of the water policy of successive Thai governments was directed towards the completion and upgrading of distribution systems and on the rapid development of small-scale irrigation infrastructure. Irrigation, however, fell short of its promise regarding cropping intensity and diversification towards cash crops. While contract farming has occasionally been successful (Dolinski, 1995), experience from the Lam Pao schemes (Burt and Styles, 1999) or Nam Oon (World Bank and NESDB, 2005) in northeast Thailand have provided the same lessons about dry season cropping areas remaining at low levels because of lack of tertiary canal service, unreliable water supply, limited market organization and opportunities, labour constraints, and unwillingness of farmers to face the health hazards brought about by pesticide use. During the 1990s a river basin approach was adopted, while irrigation systems had to operate under growing pressure of commercial agriculture (especially dry season farming), as well as competition for water from other non-agricultural sectors (Bastakoti and Shivakoti, 2008).

The direction of irrigation development is reflected in Thailand's National Water Policy and Vision (Budhaka et al, 2002). After the adoption of participatory irrigation management policy, more emphasis has been given to participation of users in system management, especially water allocation, operation and maintenance at tertiary levels (FAO, 2007). A national strategy has been formulated to improve irrigation efficiency and water management in existing systems, while expanding new small and medium systems. The government emphasized the Common Irrigators' Organization framework to integrate local people (beneficiaries) within the irrigation systems (Shivakoti, 2000, 2003). Although there are examples of involvement of local communities in the management of irrigation systems (Molle et al, 2001; Shivakoti and Bastakoti, 2006; Bastakoti et al, 2008), participation has remained limited. In many cases, water user groups were organized at the tertiary level and had no influence on the allocation of water at higher levels or on the quality of the supply of water to their canal; they were thus quickly undermined (Molle et al, 2002).

The government is currently implementing an initiative from the King of Thailand to encourage farmers to diversify out of rice to produce an intensive mix of crops, fish and livestock. No large-scale projects have been developed recently due to lack of economically viable suitable storage sites, as well as environmental concerns. Improving the efficiency of existing water management projects and promoting basin-wide coordination of water resources are key priorities of Thai agricultural policy (RID, 2007).

Although approximately 4 million hectares are irrigated during the wet season, in 2003 the government launched the idea of a national 'water grid' that would triple the area of irrigated land, and in July 2003 announced that it would target 200 billion baht (equivalent to US$5 billion in July 2003) to solve the problem of water scarcity in Thailand, mainly in the poor north east region (see Chapter 10). With the fall of the Thaksin administration, the project was put on the back burner; but, recently, an underground pipeline that would divert water from the Mekong River to *Isaan* (*Bangkok Post*, 2008) was included by the government in the 'top-priority' megaprojects, with a total value of at least 500 billion baht (about US$15 billion). The new project aims to divert water from the Mekong through underground tunnels to Loei and Udon Thani provinces, where reservoirs will act as distribution centres to send the water through small pipelines to farms in other provinces during the dry season. In April 2008, Thailand's cabinet approved a budget of 10 billion baht (about US$334 million) to build irrigation infrastructures within seven years, from 2008 to 2015 (Agroinfo, 2008).

Vietnam, in line with the proverb *Nhat nuoc, nhi phan, tam can, tu giong* ('Water is the first determining factor, then fertilizer, hard work and crop variety'), is still involved in massive investments for rural and water infrastructures. Vietnam started to invest massively in modern irrigation development in 1975, and between 1988 and 1994 the annual expansion rate of irrigation reached 4.6 per cent. Particularly in the Mekong Delta, improved water control permitted a shift from a single crop to two or three crops annually (see Chapter 8). This concerned, in particular, the flood-prone area of the upper delta and the coastal zone where salinity intrusion has been controlled by constructing dikes and by gating streams. Pump irrigation plays an important role in Vietnam and accounts for 26 per cent of its total irrigation area (FAO, 2007). Rapid adoption of small private pumps, particularly in the Mekong Delta, has greatly facilitated crop diversification. But extraction of more fresh river water for irrigation will facilitate further intrusion of salinity in the main branches of the river. Salinity control in coastal areas also leads to other problems such as pollution being retained inland and poor drainage, and conflicts between rice farmers who require fresh water and shrimp farmers who prefer brackish water for their shrimps.

The government, with World Bank support, is focusing on five sub-projects in the Mekong Delta covering 535,000ha, which includes irrigation, salinity control, flood protection and institutional development. Irrigation in the Vietnam Highlands is less developed, with rice and coffee as the main crops. Since 1995, coffee irrigated with groundwater has yielded some of the best financial returns in Vietnam's agriculture.

The national authorities have recognized the challenges faced by the water sector under the '*doi moi*' economic reforms and initiated a series of reforms in the country's water sector. These included the enactment of the Vietnamese Water Law in 1999, the Decision on the Establishment of a National Water Resources Council in June 2000, the establishment of basin-level committees to oversee the

management and allocation of water in the Red River Basin, Mekong Delta and Dong Nai Basin (Molle and Hoanh, 2008), and the creation, in November 2002, of the Ministry of Natural Resources and the Environment (MoNRE). In 2006, the total budget of the Ministry of Agriculture and Rural Development (MARD) was about US$200 million, ranked second behind the Ministry of Transport. Planning and management of small- and medium-scale irrigation have been decentralized, with the provincial authorities now autonomous and self-financing many of the irrigation activities.

Based on many surveys of the whole country, Tiep (2002) reported that, on average, existing irrigation systems supply water to only 50 to 60 per cent of the design command area.[2] Less than 5 per cent of expenditure for irrigation and drainage has been devoted to operation and maintenance (O&M). Inadequate cost recovery and deteriorating infrastructure are major concerns, and ways are being sought to involve greater water-user participation in operation and maintenance (Barker et al, 2004). Although water-fee charges are higher than in most other Asian countries, fee collection covers only half of O&M costs. However, in October 2007, the government issued a new policy that exempted farmers of irrigation fees at the national level.

THE BEGINNING OF A NEW IRRIGATION ERA?

The wider economic context of rice production and irrigation

The last 50 years have seen massive investments in large-scale public surface irrigation infrastructure as part of a global effort to increase the production of staple food, ensure food self-sufficiency and avoid famine. Investment in irrigation accelerated rapidly during the 1960s and 1970s, with irrigated areas in developing countries expanding at 2.2 per cent a year and reaching 155 million hectares in 1982 (see Figure 6.2). The private and community-based investments in developing countries grew rapidly since the 1980s, propelled by cheap drilling technology, rural electrification and low-cost small pumps (Molden, 2007). Global irrigated areas increased from 168 million hectares in 1970 to about 300 million hectares at the end of the 1990s. The food price index fell from around 310 in 1974 to around 90 in 2000 to 2002.

As areas best suited to irrigation had already been developed first, the costs of further development increased, while prices of staple cereals declined, in part because of the very success of irrigation (Barker and Molle, 2004). These two factors made irrigated agriculture economically less attractive than in the past. The underperformance of large-scale irrigation also reduced donors' interest. Declining cereal prices at the end of the last century slowed growth in input use, investment in crop research and irrigation infrastructure (Sanmuganathan, 2000). More competition for water from other sectors also reduced the scope for further

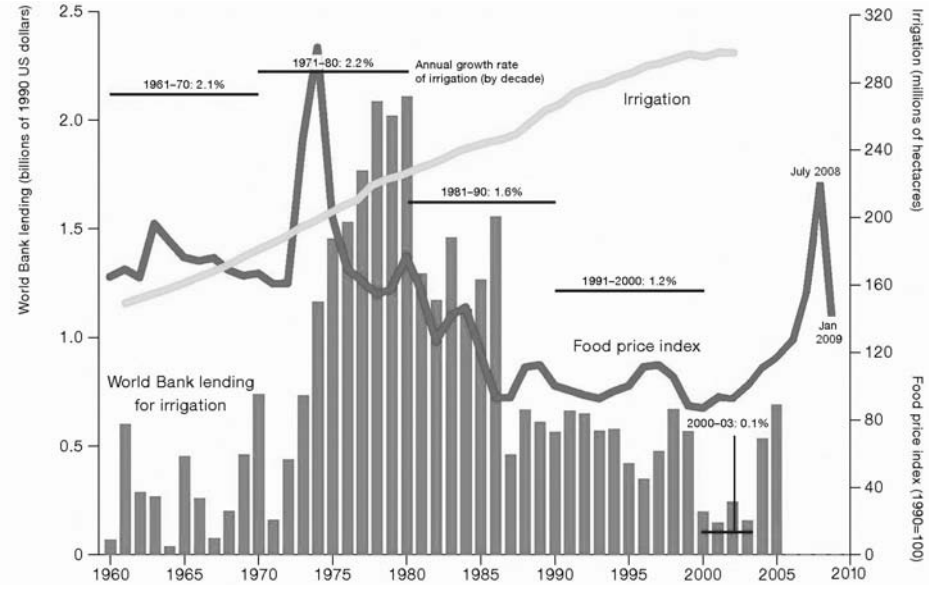

Figure 6.2 *Food price index and irrigation expansion during 1960 to 2009*

Source: Molden (2007) with updated FAO data for 2009

development of irrigation. At the global level, irrigation is predicted to expand at lower rates compared with that from 1960 to 1990; but its contribution to total agricultural production is expected to exceed 45 per cent by 2030 as yields continue to increase and cropping patterns shift to higher-value crops (FAO, 2003). This means more water withdrawals for irrigation.

The situation in the world food market has recently witnessed a radical turn. Rice prices have gradually increased from US$200 per tonne (Thai white rice, 100 per cent B second grade) in 2003 to US$376 per tonne at the end of 2007, and peaked in May 2008 to at US$963 per tonne (FAO, 2008). The food price index soared up to over 210 in 2008, then dropped to 146 in January 2009 (see Figure 6.2). The low annual growth rate of irrigation area during the last ten years (only 0.1 per cent during 2000 to 2003) is not considered to be the main reason of this upsurge, but reflects the lack of attention to, and investment in, the agriculture sector at a global level.

Although both the Organisation for Economic Co-operation and Development (OECD) and the United Nations Food and Agriculture Organization (FAO) (OECD–FAO, 2008) project that high food prices will not last long and will gradually come down because of the transitory nature of some of the factors that are behind the recent hikes, they also conclude that, after falling from their current

peaks, prices will remain at higher average levels over the medium term than during the past decade.

With the recent soaring prices of food (particularly rice), more farmers in the LMB countries have reverted to rice because of their advantages – of which irrigation is a major factor – in rice production compared with other countries. The governments of Thailand and Vietnam have encouraged farmers to increase paddy crop production to take advantage of the rising rice prices in the world market in 2008; triple cropping has increased (e.g. in some parts of central Thailand and in Hau Giang and An Giang provinces in the Mekong Delta) and others have switched back to rice farming (like shrimp farmers in the Ca Mau Province, reversing a trend that began over five years ago (*VietnamNet*, 2008). In Cambodia, MAFF and the FAO are launching an emergency project under the FAO-led Initiative on Soaring Food Prices (ISFP) to help farmers boost agricultural production, in particular through the provision of seeds and fertilizers (which are petroleum-based and thus out of reach of poor farmers as oil prices increased) (*China View*, 2008). In Laos, almost 75 per cent of households that have adopted modern rice varieties now have a surplus or are self-sufficient in rice (ADB and OED, 2008). However, even though the government reported that the country produced more than 2.7 million tonnes of rice in 2007, the lack of infrastructure and high fuel price make transportation difficult, and shortages persist in remote mountainous areas (especially those occupied by the Lao-Soung and Lao-Theung tribes) (Vorachak, 2008).

Under the ISFP, many countries have indicated that they would accelerate or strengthen their irrigation rehabilitation, construction and water management programmes, while major donors have emphasized the importance of public investment in irrigation infrastructure and policy reform. The investment flow into the irrigation sector is thus expected to increase significantly in coming years.

Reinventing irrigation in the Lower Mekong Basin countries

The question of whether, where and how to invest in irrigation is much more intricate than it may seem. A broader definition of investment includes public investment in irrigation and drainage development, modernization, institutional reform, improved governance, capacity-building, management improvement, creation of farmer organizations and regulatory oversight, as well as farmers' investment in joint facilities, wells, and on-farm water storage and irrigation equipment (Molden, 2007).

National, local and environmental contexts

The context of irrigation varies from one country to another depending upon factors such as the degree of food security, actual infrastructures and potential,

percentage of the population working in the agricultural sector, or the existence of employment opportunities in other sectors. Strategies underpinning the evolution and future development of irrigation in the socio-economic context of the LMB countries are presented in Table 6.3 (FAO, 2007), which distinguishes between different types of irrigation and three main socio-economic contexts. These contexts can be found simultaneously in different areas of the LMB countries, while the general trend is that areas move from A to B and, in some cases, C.[3]

Challenges for the irrigation sector

The irrigation sector faces two main challenges: strengthening both the hardware (hydraulic infrastructures) and software (institutions) of existing schemes, and finding ways of improving decision-making with regard to new investments. These challenges are examined in this section.

Scheme rehabilitation and modernization

As discussed earlier, the debate between rehabilitation of irrigation systems and modernization seems to have been resolved ten years ago in favour of modernization, understood as the transition from supply-driven to demand-driven management, or the adoption of service-oriented management, with supportive re-engineering of management set-up and infrastructure. In practice, very little modernization has happened on the ground, with, on the one hand, a persistence of traditional design standards and processes (both for rehabilitation and new projects), and, on the other hand, rather weak institutional reforms that have not significantly altered the relationship between the irrigation service providers and the farmers, as well as the management and operation practices of irrigation agencies. Irrigation investment costs in Southeast Asia were estimated to be almost the lowest in the world (Inocencio et al, cited in Molden, 2007), reflecting a combination of expected standards and economic performance.

Meanwhile, the concept of modernization has been revisited to take into account a new understanding of the complexity of the rice irrigation systems prevalent in the LMB characterized by multiple roles related to floods and groundwater recharge, a recognition of the importance of fish and aquatic resources for local livelihoods, an acceleration of the transformation of rural economies, and increased attention to supplying water for energy, growing cities and industries. With the soaring food prices, the integration of LMB farmers within the global market will continue. It has been reaffirmed that:

> *… in the present context and under future perspectives, modernization of the irrigation systems and their management to increase their flexibility and insert them in river basin management, taking into account the multiple functions of agricultural water management, is*

Table 6.3 *Irrigation types in the Lower Mekong Basin countries based on water source and their evolution scenarios*

Irrigation water source classes	Main characteristics	National and sub-national stage (see notes)		
		A Developing (focus on domestic agriculture)	B Intermediate (focus on export agriculture)	C Post-agriculture (focus outside agriculture)
1 Reservoir – gravity	Water is stored in large reservoirs, distributed via canal networks to the fields mainly by gravity	Large reservoirs are too expensive for rice but planned as multi-purpose structures	Anticipate on multiple uses, not economically justified by agriculture alone	Optimizing multiple use economically justified, but sites available for new systems are limited
2 Off-river – gravity	Water level in the river is raised by a small weir so that water can be distributed by a canal network	Low costs, hence comparative advantage compared with other options	Improved and (endless) modernization; inherent limitations of supply	Reduced, merged or neglected due to low reliability, or converted to type 3 or 4
3 Off river – pumping	Water is pumped into a canal network for distribution to the fields	Affordable investment, but requires subsidized O&M	Probably reduced due to energy costs, particularly for paddy	Crop diversification because economically unjustified for rice; sites available for new systems are limited
4 Conjunctive groundwater-surface water system	Both gravity-fed surface irrigation and groundwater pumping	Highly flexible, decided by farmers based on market demands	Highly flexible, decided by farmers based on market demands	Highly flexible, decided by farmers based on market demands
5 Integrated management in delta systems	Multi-purpose canal networks in the delta, including dike, dams and sluice gates, for navigation, irrigation, drainage and settlements	Expanded quickly in newly reclaimed lands	Optimized for multiple use, but expensive drainage when facing environmental issues, particularly in peri-urban agriculture	Optimized for multiple use with more crop diversification and urban services
6 Small-scale water storage	Rainwater harvesting structures	Provided water to individual or groups of farms for supplementary irrigation by pumping	Modernized with improved water-use technologies	Optimized multiple water use, with focus on high-value cash crops.

Notes: Economic and agriculture situation in each stage:
Stage A: rely on rice production due to pressing needs for food security. Very little attention paid to ecosystems and water-dependent livelihoods; Stage B: on the way to diversification with a quick demographic transition under improvement of food security and rice export for foreign currency earning; Stage C: highly diversified agriculture under resources competition with high environmental concerns and diet changes; water is linked with multifunctionality of agriculture and classical environmental issues.
Strategy and policy in each stage:
Stage A: water resources development and rice irrigation expansion with strong government financial support and external assistance; Stage B: stabilization and modest development of rice irrigation areas, development of small systems and increase in financial self-sufficiency; Stage C: reduction/decommissioning of rice irrigation areas, specialization for improved water productivity, protection of environment and water quality, and government investment in scheme modernization.
Source: adapted from FAO (2007)

> *more required than ever. A fast pace of change is the one certainty, the other certainty being that unless management adapts, the discrepancy between stated and actual policies will widen.* (FAO, 2007)

In addition to the rising prices of agricultural commodities, which may change the economic and financial equation of investment in modernization, rising energy prices may provide additional incentives to attempt to improve water delivery service by irrigation canal systems and decrease the farmers' needs to pump water from available water bodies or from groundwater.

The question then is: will modernization plans continue to remain mostly on the shelves or will the LMB countries see an effective change of investment and management strategies, away from rehabilitation with classic PIM (with maybe the token addition of IMT), to deliberate modernization? This obviously requires proper policy and suitable institutional arrangements that cannot be determined within the irrigation or agriculture sectors only, but should be considered within the socio-economic conditions of each irrigation system.

The answer then is: cautious optimism. The region should start seeing a broader implementation of modernization concepts and practices, more internalized by irrigation agencies and management than dictated by international agencies and donors. A pragmatic approach to professionalization of management and improvement of service should pave the way in the longer term to more substantial service orientation:

- There is a greater awareness of the present deficiencies of the irrigation systems as knowledge does exist, efforts to develop tools have been substantial and effective, and efforts to develop capacities have been effective where implemented.
- Substantial capacity-building programmes are under way (Vietnam) or are being planned (Thailand) in the context of innovative investment programmes (Vietnam) or agencies' own resources (Thailand), focusing on details of design and operation.
- More importantly, perhaps, assessment and performance evaluation indicators and methodologies are being introduced or revised to be consistent with service orientation and modern management concepts, and their results are being used to review current strategies and to shape investment. They include rapid appraisal of performance, Mapping System and Service for Canal Operation Techniques (MASSCOTE) (Renault et al, 2007), benchmarking, service-oriented irrigation management, balance sheets, and improved data collection and processing. This has led to the recognition of the need to change design standards.

Institutional reforms

To improve irrigation system performance governments and multilateral lending agencies continue to implement reforms in the LMB countries, including water

pricing and cost recovery policies, setting up of water user associations, and institutional/legal reforms and policies.

Cost recovery and associated water charges have been the subject of intense debate and controversy (Molle and Berkoff, 2007). A reduction of government funding was expected for irrigation programmes in LMB through the application of cost recovery principles. However, implementation is slow because farmers are not willing to accept cost recovery measures when service delivery is poor and results in an overall reduction in benefits. Vietnam, however, notably in the pump-irrigation schemes of the Red River Delta, where pumping costs are difficult to compress, shows reasonable rates of recovery. Allocating the costs resulting from the maintenance of the Mekong 'delta machine' is also a huge and growing challenge (as shown in Chapter 8). Yet, the decree recently issued by the government that cancelled irrigation fees across the country shows the political nature of taxation/subsidies schemes and also suggests a measure of the social volatility of the countryside and, possibly, a perception of increased independence of the governments in the region on the policy prescriptions associated with funding from international financial institutions.

Under such conditions, a sensible option for reducing public funding in irrigation would be a progressive rise in water charges, corresponding to increased accountability and transparency on the part of service providers and progressive transfer of authority to users, matched by increased profitability of irrigated agriculture (Molden, 2007). However, this option can probably only be implemented widely in the LMB countries for the systems at stage C of the evolution pattern, as presented in Table 6.3. The issue is, therefore, for irrigation agencies that have adopted or declared an intention to move towards service-oriented management (RID of Thailand, MARD of Vietnam) to do so without the incentives and accountability generated when farmers pay irrigation service fees. The demand for improved service will need to come, in this case, initially from the agencies themselves, while in the mid term, improved service delivery to farmers and deliberate efforts to reduce farmers' pumping costs, and the setting up of new institutional arrangements associating farmers to main decisions on management objectives or service agreements, might set the stage for a renewed dialogue on service fees. Meanwhile, costs do need to be recovered from the irrigation agencies themselves, by shifting their budgetary allocations from new system development to better provisioning of O&M for existing projects; from local governments to which responsibility has been shifted through decentralization; from other water users; and from farmers themselves for the levels of system devolved to them.

PIM has also featured prominently in the region, notably in Thailand and Cambodia. A recent survey in Cambodia and an assessment of nine of the FWUCs piloted by MOWRAM as part of the PIMD programme has clearly shown that these organizations are at different stages of development, maturity and overall functionality. These differences are brought about by internal factors, including the degree of organizational management, leadership and decision-

making, understanding of financial aspects, resources for system operation and maintenance, and external drivers of functionality, such as physical infrastructure, capacity of agencies to assist in the implementation of PIMD, availability of markets for products, and inputs. While the overall picture is somewhat bleak, there has been positive improvements in the overall operation of the systems, in increased cultivated areas and cropping intensity, and in the number of farmers receiving water (Perera, 2007).

Based on a study by the FAO, Table 6.4 provides a list of conditions for successful institutional reforms, as well as reasons for failure; the latter are currently more prominent in the region than the former.

Table 6.4 *Main conditions for success and reasons for failure of institutional reforms*

Conditions for success	Reasons for failure
Strong political backing A clear role for the different stakeholders	Lack of political support Resistance of public agencies and water users
Support for the empowerment of institutions at all levels (including water user associations and local governments)	Insufficient resources
The autonomy of the water user associations	Poor quality and predictability of water supply undermining local organizations
The legal framework needed to accommodate the proposed changes in authority	Lack of legal support for the proper involvement of water users
Capacity-building of the people governing the transferred system	Lack of coordination among stakeholders involved with project implementation
Functioning infrastructure	Transfer of dilapidated or badly designed infrastructure that is dysfunctional and does not fit within local culture and context
Success in recovering operation and maintenance costs	Cost overrun and reduced benefits

Source: adapted from Molden (2007) based on an FAO study

While some issues can be addressed satisfactorily through successful modernization of the systems, allocation of sufficient resources for support and capacity-building, and legal support, a key question for the future of PIM in the region is whether this would be sufficient and whether the PIM models adopted by the countries should not be revisited altogether. The PIM models of small resource-poor WUAs, progressively federated into resource-poor organizations conceived as instruments for conducting operation and maintenance activities without having a real say in water management introduced to the region, have largely been copied from other

countries where, after more than 30 years, they have not proven any more successful than in the LMB countries. It is time for the region to explore new and more diverse options, which may be based on larger organizations with a critical mass, and on the characteristics of traditional water management organizations, or build on the strength of existing institutions (such as irrigation teams in Vietnam) or on processes that allow flexibility in designing farmer institutions to suit particular management objectives and circumstances, rather than follow an overly prescriptive model. They should be able to meet the changing characteristics of farming – more part time, more commercial, more woman oriented and gender sensitive – and to integrate other water users (including fishing and aquatic resources), and roles and functions of the irrigation systems.

The separation of regulatory and management functions to avoid conflicts of interest in the water sector has been a key reform promoted by the ADB in the region. The Ministry of Natural Resources and Environment (MoNRE) has been established in both Vietnam and Thailand, for example (Molle and Hoanh, 2008). The MoNRE is supposed to be the manager of water resources, while the MARD (in Vietnam) and the RID (in Thailand) are supposed to concentrate on building and operating the irrigation systems. Management of water resources is supposed to be done at the level of river basins; but river basin organizations have not been empowered at a level where they could be influential in decision-making, in general, and the definition of basin plans and water allocation, in particular.

They have faced the power of traditional line agencies (MARD, RID) and have lacked legal and political backing (especially in Thailand) to challenge the established positions of these agencies. Environmental regulation remains incipient and the decision-making power with regard to new dams or inter-basin transfer projects remains entrenched in political and line agencies circles. Yet, experiences in some pilot river basins in Thailand suggests that long-term processes have a potential to incrementally shift governance in the direction of a greater participation of concerned stakeholders.

Other 'soft' reforms concern the agronomic and economic environment of irrigation and refer to the necessity of providing adequate agricultural extension services and enhanced access to markets (TWGAW, 2006).

Development of new irrigation areas

At a very general level there are, of course, good reasons to invest in irrigation over the next decades. A growing and more urbanized population means that more food must be produced at a time when competition for water grows and environmental impacts must be reduced. Irrigation can be a path out of poverty for the rural poor and more investments will probably be needed to respond to global warming as more climate variability and sudden and extreme climate events are expected in the future. In the LMB, the projected range of temperature change is 1°C to 2°C. The hot period of the year will extend longer, rainfall intensity will increase (Snidvongs,

2006), and so will the extreme rainfall and winds associated with tropical cyclones in Southeast Asia (Christensen et al, 2007), including the LMB.

However, the rationale underpinning the 're-engagement' in the financing of water projects frequently draws heavily on general arguments of food security, poverty alleviation and economic development. As illustrated by the case of the Thai Water Grid (see Chapter 10), benefits are presented in terms of area served, putative drought-proofing of agriculture, and increased cropping intensity and incomes. The huge costs incurred (with US$10,000 per hectare as a good basis), the necessity to shoulder operation and maintenance costs (including costly pumping operations), and, above all, the question of potentially better alternative investments, both in the water sector and outside of it, are glossed over. Estimates by the Thai Water Resource Department that 19,000 villages are facing a 'chronic shortage of water' or estimates of 'coming water shortages' in Thailand and the alarm sounded by the National Economic and Social Development Board (*Bangkok Post*, 2004) sound like *ad hoc* justifications. The justifications for large-scale investments are usually raised by repeatedly stressing the impact of droughts and floods and by looking at the benefits of the projects alone, disregarding costs. Debates are also frequently 'securitized' by government leaders who conjure up ominous threats to national or food security.

The principal challenge in the region is thus the risk of present circumstances related to food and energy security being exploited to promote projects, irrespective of their intrinsic quality or lack thereof, that are pushed by politicians willing to please their constituencies, and government agencies and private companies in search of business opportunities. This occurs in lieu of giving renewed attention to the sector at the highest levels, as well as mobilizing resources, in order to engage in substantial and meaningful reform and to promote ambitious but rational and balanced approaches, exploring the best options and addressing the poor performance of existing systems and their causes.

In Cambodia, the expansion of irrigation within provinces surrounding the Tonle Sap Lake has been the top priority of existing and new donors. For instance, the joint European Union–Royal Government of Cambodia ECOSORN project (Economic and Social Re-Launch of Northwest Provinces in Cambodia), established in 2006, injected 26 million Euros in integrated rural development, with irrigation renovation as a priority activity. The Northwest Irrigation Sector Project is jointly funded by the ADB and Agence Française de Développement (AFD): more than 50 irrigation schemes in four provinces (Pursat, Battambang, Batteay Meanchey and Siem Reap) are being reviewed for rehabilitation and development (ADB, 2003). The ADB and AFD are still working on selection criteria for irrigation scheme rehabilitation in order to avoid a repetition of the problems faced in Stung Chinit (see Box 6.1).

However, the definition of such criteria is seen as a constraint by the government, which tends to seek new donors or fund new schemes on its own budget. MOWRAM, under joint projects with Qatar and Kuwait, is planning to spend

US$400 million to build two large dams in the Vaico and Stung Sen rivers to irrigate 400,000ha (*The Mekong Times*, 2008). The ministry aims to build four dams in Pursat Province that would supply irrigation to more than 35,000ha of land and generate 300MW of power. Other proposed dam sites include locations in Battambang, Kampong Chnang and Banteay Meanchey provinces, and the ministry is consulting with engineers from China and South Korea. To achieve these giant plans, the ministry will need more than US$4 billion (*The Phnom Penh Post*, 2008).

In sum, the situation in the irrigation sector is evolving towards a scenario that is similar to the hydropower sector:

- Social and environmental standards associated with 'traditional' lending are seen by governments as a burden and a constraint to large-scale development projects.
- This encourages them to deal with funding institutions and construction companies that have not adopted similar safeguards.
- Projects are capital intensive and are promoted by 'iron triangles' and other forms of financial or political interest groups linked to the completion of these projects.
- Governance, as a result, is weak and secretive regarding planning; purported benefits are highlighted, while impacts and costs are downplayed or ignored.

While irrigation projects (e.g. Stung Chinit in Cambodia, the Mekong pumping schemes in Laos, or many schemes in northeast Thailand), even those heavily funded and studied by external financing partners, are showing deficiencies that are difficult to address, new projects to irrigate hundreds of thousands, or even millions (in Thailand) of hectares are being proposed. The involvement of intended 'beneficiaries', as well as consideration of environmental impacts, required labour force and market availability will need to be addressed when these projects face public consultation. Environmental and social impact assessments have now become mandatory – as embodied, for instance, in Thailand's previous constitution. Unsuccessful rehabilitation or construction projects generate huge costs, as well as recurring expenditures that may come to be a disproportionate burden to the benefits generated.

The regional community has recently developed recommendations for the development of new large-scale irrigation projects (FAO, 2007). Before committing to new large-scale irrigation developments, a comprehensive assessment of options for land and water use should be made. If a new large-scale irrigation development is proposed, it should be examined by a wide-ranging feasibility analysis to determine whether it is ecologically, physically, economically, politically, socially and culturally sound. This should take place before progressing into the formal legal, often rigid and relatively narrow, 'impact assessment' process. The Commonwealth Scientific and Industrial Research Organization's (CSIRO's) 5-Way methodology

and the World Commission on Dams' (WCD's) guidelines, where relevant, are international references. Irrigation scheme design should also be flexible enough to take account of the inevitability of future demand changes, include credible input from different stakeholder groups, make sure funds to meet full operation and maintenance costs will be available, and include future monitoring of impacts upon ecosystems and livelihoods.

Conclusions

Agriculture provides the livelihood of 75 per cent of the population of the LMB countries and is a key driver of national development in each of the riparian countries. Irrigation has expanded and intensified across the four countries; but irrigation systems have not lived up to their expectations and have faced a number of problems. The differences between stated policies and actual practices are generally large, while policy changes have little impact; institutional reforms do not capture the complexity of basin-wide water management, the multiple functions of irrigation systems, and relationships between different levels of management. PIM/IMT initiatives, furthermore, have made very modest progress, while there is significant underinvestment in operation and maintenance, and poor management remains pervasive.

However, the recent soaring prices of food in the global market has alarmed regional governments and fuelled calls for further reinvestments in irrigation. In a broader sense, these include public investment in new schemes, scheme modernization, institutional reforms, improved governance and the creation of farmer organizations. Changes in governance, however, only emerge slowly and will remain dependent upon the democratization of society and the evolution of the relationships between the state and the various forms of civil society.

Recent announcements of large investments in new irrigation schemes in Cambodia or Thailand seem to have surfaced with no reference to the difficulties and the limitations faced by existing schemes. In Cambodia, the financial capacity to shoulder operation and maintenance costs, the access to markets, the managerial capacity of farmers, and the problematic relationship between the state and villagers preclude the enthusiasm conveyed by big numbers labelled in dollars or area to be equipped. In Thailand, notably its northeast region, the high investment costs per hectare and environmental constraints such as soil salinity, not to mention the actual low interest in dry season cropping, suggest that massive investments will face severe setbacks. In both settings, the existence of more attractive off-farm activities or market constraints remain important limitations, even if increased output prices have made agriculture temporarily financially more attractive. In the Mekong Delta, large increases in the abstraction of fresh water in the dry season combined with rising sea level are likely to worsen salinity intrusion in the main river channels.

The question posed in the title of this chapter thus has to remain for the moment. The coming years will tell us whether the current opportunities to address the real challenges of poverty and food security of the LMR have been used wisely. The risk remains that the large sectoral and private interests that benefit from massive capital investments will prevail over more carefully targeted investments in irrigation or agriculture, more decisive reform and a necessary focus on improving the performance of existing assets.

The large-scale transformation of waterscapes through irrigation comes with risks and costs that are often downplayed, but which must be constantly reassessed and remembered by those with responsibility for decision-making, as well as those directly benefited or affected by these transformations. New systems may still be developed in predominantly agrarian economies, in ecosystems with comparative advantages; but their planning and appraisal process should be reformed in order to include improved water governance.

Notes

1 The density of spots in northeast Thailand is partly misleading because most of the irrigation shown is local and effected through mere diversion of small streams to bunded plots.
2 But in many cases part of the remaining area is irrigated through local village-based pumping stations.
3 These evolution scenarios were developed at the end of 2005; so some conclusions made at that time may need to be revisited due to, on the one hand, rising food prices and, on the other, rising energy prices.

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