

2.2 Basin-wide Perspectives

Areas currently used for irrigated rice in the Lower Mekong Basin vary considerably between the countries, with the largest areas found in Cambodia where double rice cropping is common - with two harvests in the dry season and one in the wet season. About half of Cambodia's dry season irrigated rice area is recession rice, whilst about ten percent of the wet season area is floating rice. Probably less than half of the area of irrigated dry season rice in Cambodia is fully irrigated. The rest of the area is planted to recession rice, which derives half of its moisture requirements from the water remaining in the soil horizons after flooding and thus requires only half the amount of applied irrigation water when compared to dry season rice grown on non-flooded lands. The amount of water vapour transpired to the atmosphere is comparable in both cases, however.

Table 4: Irrigated Dry Season Rice in the LMB and Predicted Increase (km²)

Type of Crop/Land	Thailand	Lao PDR	Vietnam Central Highland	Mekong Delta	Cambodia	Total
Irrigated dry season rice (2000)	1,070	920	370	34,030 ¹	2,510	38,900
Predicted situation (2025)	1,200	2,000	400	35,700	5,000	44,300
Increase	10%	100%	0	5%	100%	14%

Source: Lower Mekong Basin, Future Trends in Agricultural Production (MRC, 2003)

¹ Includes double cropping in dry season

Note: It is suspected that the MRC data concerning potential irrigation expansion may involve transgressing some currently forested wetlands, which would have adverse impact on the fisheries. This should be investigated more closely by detailed analysis of remote sensing information.

The potential for expanding dry season irrigated rice is also unevenly distributed between the countries. In the lowlands of northern and northeastern Thailand, it is assumed that the future dominant production will be low input, low risk, wet season rainfed and irrigated rice production. The area of irrigated dry season rice did not increase from 1990 to 2000 and expansion in the future is expected to be limited, unless the economic returns from irrigated rice are improved - either through technological advances such as higher yielding varieties, cultural practices, or higher farm gate prices. Expansion of irrigated sugarcane area for the production of ethanol for motor fuel and bagasse for steam-powered electricity generation could be expected; so could expansion of the current trend to irrigate small areas of high value crops, such as vegetable seed and fruits. Rehabilitation and upgrading the efficiency of already installed irrigation systems would be more recommendable than expansion of irrigated area onto more marginal soils.

Seen against this background a fair guess of the future expansion is that it would be limited to 10% of today's area over a 20-year period; this would mean an additional area of around 100 km². A large percentage of the potential arable land has already been converted to agricultural purposes in the Vietnamese part

of the Mekong Delta. Of the total area of flat land and gentle slopes, 88% is utilised for agriculture and settlements. Both the lack of suitable land and the limited profitability of growing rice presently discourage further expansion of dry season rice cropping in the Mekong Delta. Instead, the current trend is to devote land to more profitable products such as fruit trees and fish and prawn ponds augmented by fish cage culture. Accordingly, only small increases in dry season rice cropping can be expected in the future, possibly limited to around 5% in the next 20 years.

The Central Highlands of Vietnam are also in a similar situation as regards land utilisation and potential for increased irrigated rice area. Conversion of land for agricultural purposes is likely to continue with a focus on orchards and other crops that give higher returns than rice cultivation. The future expansion of irrigated dry season rice in the Central Highlands is therefore likely to be limited. Sprinkler irrigation of coffee, vegetables and fruit orchards by pumped groundwater is facing problems of aquifer depletion and is thus likely to retract rather than expand.

The countries that possess the most significant potential areas for expanded rice cultivation are Lao PDR and Cambodia. Lao PDR has between 20,000 and 30,000 km² of flat and rolling land that could be utilized for agricultural purposes. Possibly as high as 50% of the soils of this land type are infertile and poorly suited for agriculture but there are possibly nearly 10,000 km² of more-fertile land. Most of these high potential areas are located on floodplains of the Mekong tributaries in the central and southern part of the country. The expansion of dry season irrigated agriculture (including forage crops for more intensive livestock raising) will in the future mostly be on already existing paddy field areas, plus expansion of irrigation civil works to currently rainfed arable farmland on gentle slopes. The pace of expansion of irrigated area will depend mainly on the pace of rural electrification for pumping because by now, most of the conveniently exploitable stream diversion gravity irrigation opportunities have already been availed of. Given the donor-driven characteristics of the Lao PDR economy, the availability of investment capital for civil works will probably not be problematic, but funds for maintenance and repair works will be, if planning does not take full account of the economics of irrigated agriculture, hand in hand with demographic projections. Given the ample availability of suitable land, a doubling of today's area within 20 years may be possible. This would mean an area of around 2,000 km² of dry season irrigated crops by 2025.

In eastern and southern Cambodia more than 4,600 km² of relatively good agricultural land are located on the Mekong floodplain. Much of the land in southern Cambodia is flood prone, however. In the Great Lake region, around 7,500 km² of reasonably fertile land can be found but much of the potential land is either isolated or consists of flatlands where water storage is problematic. Exploitation of groundwater by tube well pumping would therefore present the only mechanism capable of expanding dry season irrigation. Apart from the high investment and operational costs involved, tube well irrigation involves risks of potential salinity or underground water pollutants such as arsenic, together with high operational costs. Before deciding to expand irrigation, other options, such as deep-rooted tree crops which can tap the shallow aquifer during the dry season should be considered, and their relative economic feasibility compared. There are some 2,000 km² of such land awaiting agricultural intensification (including orchards, farm forestry, etc.) in Cambodia.

For example, on similar country in northern Central Thailand, banded rainfed paddy fields have been provided with drains and planted with fast-growing *Eucalyptus* and *Acacia* trees for pulpwood. There is a growing demand for wood

fibre in Southeast and East Asia. Fast-growing trees can be inter-planted with upland rice in Year 1, with peanut in Year 2 and can be inter-sown with forage grasses for grazing cattle in Years 3 and 4. The pulpwood is harvested in Years 6 or 7 and either ratooned or replanted. Bamboo plantation is another possibility. In Lao PDR, the ADB Industrial Tree Crops Loan Project involving the private sector (including smallholders) is entering its second phase.

In Thailand, a consortium of universities and local consultants is designing a nation-wide campaign of irrigation system upgrading and sustainable expansion of rainfed irrigation onto sloping lands adjacent to irrigation schemes.

The intensification of land-use and development of the irrigation potential in the Basin are not expected to contribute significantly to cumulative effects on the hydrological regime caused by other development sectors.

2.2.2 *Trans-basin Diversions*

Trans-basin hydropower schemes are potentially more impacting than are single basin reservoir schemes; Run-of-River schemes are potentially least impacting. Trans-basin schemes drastically reduce the depth and flow in the donor river (except during floods) for considerable distances downstream of the diversion dam.

Main impacts are on local navigation and fishery with some knock-on effects on terrestrial wildlife. Local water tables may be lowered and the energy input required for pumping water out of the river increased (see Table I - 4). Potential positive impacts are increased scope for stream bank and sandbar gardening in the dry season and increased opportunities for panning gold and other heavy metals. Potential adverse impacts in the recipient river include marginally increased wet season flood levels, flooding of dry season stream bank gardens, extermination of sandbar-inhabiting wildlife (e.g. turtles), fishery species composition will be modified, fishing technologies may have to be altered but the overall impact on fisheries would probably be positive. Energy cost for pumping irrigation water to the top of the bank would be slightly reduced; severity of flooding in both donor and recipient rivers depends on the reservoir and power station operational regime.

Mainly, due to widespread deforestation of the catchments, rural population growth and rapid urban industrial development, the Chao Phraya Basin in central Thailand experiences dry season water shortages. Many of the urban groundwater supplies extract fossil water, which is non-renewable. There is a proposal under consideration to divert water from the Kok and Ing Rivers in the Mekong Basin via a tunnel to the Nam River in the Chao Phraya Basin.

A large portion of northeastern Thailand has topography reasonably suitable for agricultural cultivation but suffers a six-month long dry season with virtually no rainfall. Fossil groundwater urban supplies are also near exhaustion in some centres. Various proposals have been considered for diversion of part of the flow of the Mekong mainstream or major tributaries into the Chi River Basin. These include the Pa Mong Dam across the mainstream, upstream from Vientiane, and diversion of the Nam Ngum and Xe Bang Hieng in Lao PDR via tunnel passing under the Mekong into the Chi Basin in northeast Thailand. Part of Savannakhet Province in central Lao PDR is similarly in rain shadow and one of the proposals considered has been to pass the NT2-HPP turbinated discharges via aqueduct across the Xe Bangfai and into the Savannakhet Plains. It is understood that the Pa Mong Project idea has been abandoned due to the large number of villages that would need resettlement. Generally poor soil quality and the risk of salinity in both northeast Thailand and Savannakhet make the long-term viability of these trans-basin diversions questionable.

2.2.3 *Predicted Impacts of Agriculture*

Agriculture in the Lower Mekong Basin is expected to intensify rapidly due to the pressure of increasing populations. The risk is that history will repeat itself and lands that are better suited to forestry or conservation will be utilised for rainfed agriculture without adequate erosion protection precautions. This would result in soil and ecosystem degradation - some of it irreversible.

Neither China, Thailand, nor Vietnam has lands suitable for agricultural expansion; land use in China and Vietnam is already very intensive and further sustainable intensification is questionable. Development plans for the Delta include increased production and diversification of cash crops.

The most important water management issues in the Delta are dry season water shortage combined with saltwater intrusion. During the dry months March through May, peak irrigation demand coincides with the lowest flow volume in the Mekong distributaries.

During the dry season, brackish tidal waters move into the deltaic distributaries and canals; the highest salinity is usually observed in April. Currently about 1.7 million ha of the total Vietnamese delta area of about 4 million ha is affected by saltwater intrusion. This affects irrigation and domestic water supply and sets a limit to further expansion of irrigation systems. Operation of the NT2-HPP would alter the flow regime so that on average, the number of days per year with negative flow at Tan Chau would be reduced and thus have a beneficial but very slight effect on salt water intrusion and consequently the suitability of water for irrigation.

In the **5-year** perspective, the period with negative discharges (water flowing upstream due to high tide and low flow) at Tan Chau would be reduced to 8.4% of the time from 9.5% in the baseline. The positive effect on more water available for irrigation will increase accordingly.

2.2.4 *Ongoing & Planned Irrigation Upgrading and Expansion*

In that construction contractors are always seeking continuity of business and engineers hold sway in most of the riparian countries irrigation departments, there is a general tendency to "build first and justify afterwards". Projects are planned for wherever there is a topographical, hydrological and technical feasibility to install dams, weirs, canals and/or pumps. Efficiency of design, soil suitability and social and economic feasibility have often been accorded lower priority. Monetary allocations for upgrading, maintenance and repair are much smaller and more piecemeal than budgets for initial construction and are therefore given less emphasis. Estimates for irrigation expansion potential given in the accompanying table therefore should be regarded as estimates of technical feasibility rather than overall socio-economic feasibility.