| FISHERY COUNTRY PROFILE | Food and Agriculture Organization of the United Nations | FID/CP/LAO |
|---|---|---|
| PROFIL DE LA PÊCHE PAR PAYS | Organisation des Nations Unies pour l'alimentation et l'agriculture | November 2006 |
| RESUMEN INFORMATIVO SOBRE LA PESCA POR PAISES | Organización de las Naciones Unidas para la Agricultura y la Alimentación | |

# The Lao People's Democratic Republic

## GENERAL ECONOMIC DATA – November 2006

| | |
|---|---|
| Area: | 236,800km² |
| Water area: | 6,000 km² |
| Population (2005): | 5 900 000 |
| GDP at purchaser's value (2005): | 2,9 billion $US |
| GDP per head (2005): | 440 $US |
| Agricultural GDP (2005): | 46% of GDP |
| Fisheries GDP (2005): | 6.8% of GDP |

## Fisheries data

| 2003 | Production | Imports | Exports | Total Supply | Per Caput Supply |
|---|---|---|---|---|---|
| | tonnes live weight | | | | kg/year |
| Fish for direct human consumption | 94 700 | 4 792 | 19 | 99 473 | 17,6 |

| | | | | |
|---|---|---|---|---|
| Fish for animal feed and other purposes | - | - | - | - |

| | |
|---|---|
| Estimated Employment (2002): | |
| (i) Primary sector (including aquaculture): | ~5.0 million (or around 80%) |
| (ii) Secondary sector: | 2.9 million[2] |
| Gross value of fisheries output (2002)[4] : | 119 million $US |
| Trade (2004): | |
| Value of fisheries imports: | 3 331 000 US$ |
| Value of fisheries exports: | 25 000 US$ |

# Fishery sector structure

## Overall fishery sector

Lao PDR is a landlocked country bordering Cambodia, China, Myanmar, Thailand and Viet Nam. The borders between Lao PDR and China, Myanmar and Viet Nam are in highland and mountainous regions with little infrastructure; in contrast, the Mekong river forms the major part of the 1 800 km border between Lao PDR and Thailand. The greatest population density is found along the Mekong River, in the central Lao PDR plain and in lower Lao PDR. The Mekong River has traditionally been, and remains, the primary access route to the rest of the world, although there is now significant cross-border trade between Lao PDR and China and Viet Nam with the expanding road network. Fisheries is concentrated on the Mekong River and its tributaries.

The total fisheries production in 2004 was estimated by FAO at 94 700 tons of which 64 900 tons were from aquaculture and 29 800 tons from fisheries.

## Inland capture fisheries

Fishing as a full time occupation is rare, and limited to locations near major rivers or reservoirs. Even in those locations, full-time fishers rarely account for more than a few percent of the population. The commercial fishery in Nam Ngum reservoir, probably the country's largest, has developed as a result of the availability of a large and relatively non-seasonal resource, combined with relative closeness to the market in the capital Vientiane. In other regions, the commercialization of fisheries has traditionally been limited by the tendency for most households to meet their own subsistence requirements and the strongly seasonal nature of river and floodplain fisheries.


Map No. 3959 Rev. 2 UNITED NATIONS
January 2004

Department of Peacekeeping Operations
Cartographic Section

### Catch profile

Some 340 fish species have been recorded in Lao PDR. Some of the main species are pangasius catfish (*Pangasius*spp.), Isok barb (*Probarbus jullieni*), Common carp (*Cyprinus carpio*), Small-scale mud carp (*Cirrhinus microlepis*), Black sharkminnow (*Labeo chrysophekadion*) and Sheatfish (*Kryptopterus*spp.). Approximately 30% of the catch is composed of molluscs, crustaceans, insects, amphibians and reptiles.

In Nam Ngum reservoir, Pa Keo (*Clupeichthys aesarnensis*) makes up 28% of the total catch, but only about 10% of the total value. Most of the Pla Keo catch, approaching 80%, is dried immediately and sold to fish traders. Some Pla Keo (13.9%) is also consumed locally, and is a cheap source of protein. Only 2.5% (48 t) of the Pla Keo catch is used for aquaculture as feed in cages (Mattson*et al*., 2000, 2001).

### Landing sites

Important fishing areas are the Nam Ngum Reservoir and the waters around Khong Island. The main landing zones are near the urbanized areas of Vientiane, Thakhek, Savannahket and Pakse; landings take place along the bank of the Mekong river and its tributaries. A proportion of the catch is probably landed in Thailand due to the higher market prices (almost double).

## Fishing production means

According to 1999 studies as part of the Mekong River Commission's Assessment of the Mekong Fisheries Component, fishers used more than 20 different types of fishing gear and methods. The most frequently used methods were stationary, drifting gill net, long-line, cast-net, traps, hook with line, small scoop net and other traps. However,existing information and data on inland fisheries are limited due to limited funds, the plethora of fishing gear and methods and little government interest.Most boats in use are flat-bottomed riverine-style canoes; however, boats equipped with long-tail engines are becoming more common, similar to those in use in coastal zones in the region.

## Main resources

Most living aquatic resources in Lao PDR are heavily exploited. Average catch per unit effort is low (300 g/hour fished), and catches comprise predominantly small species. Community and co-management schemes for aquatic resources are common, and at least some have been shown to be effective in conserving stocks. However, the strong reliance of much of the population on fishery makes widespread adoption of stringent effort controls impossible.

Table 1. Topology of national inland fisheries in 2000.[3]

| Scientific Name | Family | Lao Name | Water Resources | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | MK | TR | RL | WSPO | RFPF | IW |
| *Akysis variegates* | Akysidae | Pa khao | × | × | × | × | × | × |
| *Amblyrhynehiehthys truncatus* | Cyprinidae | Pa khao tapo | × | × | × | × | × | × |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *A. bantamensis* | Babinae | Pa khao | × | × | × | × | × | × |
| *Acantopsis choirorhynchos* | Cobitinae | Pa it | × | × | × | - | - | - |
| *Anabas testudineus* | Anabantidae | Pa kheng | × | × | × | × | × | × |
| *Amphotistius laosensis* | Dasyatidae | Pa phahang | × | × | - | - | - | - |
| *Amyda*spp. | Soft-shelled turtle | Pa phaong | × | × | × | - | - | - |
| *Aaptosyax grypus* | Cyprinidae | Pa sanak (adult) | × | × | × | - | - | - |
| *Acantopsis*sp. | Cobitinae | Pa harkkoy | × | × | × | - | - | - |
| *Arius stomi* | Artidae | Pa khat ock soplem | × | × | × | × | × | × |
| *Achiroides*sp. | Soleidae | Pa pane | × | × | × | - | - | - |
| *Annamia normani* | Homalopteridae | Pa thihin | × | × | × | × | - | - |
| *Barbichthys laevis* | Barbinae | Pa cheork | × | × | × | × | - | - |
| *Bagrarius bagrarius* | Sisoridae | Pa ke | × | × | × | × | - | - |
| *Botia hymenophysa* | Cobitinae | Pa khieokai | × | × | × | × | - | - |
| *Bagroide macropterus* | Bagridae | Pa kihia | × | × | × | × | - | - |
| *Bangana behri* | Cyprinidae | Pa vananor | × | × | × | × | - | - |
| *Barbichthys nitidus* | Cvprinidae | Pa vahangdam | × | × | × | × | - | - |
| *Chitala blanci* | Notopteridae | Pa tonkay | × | × | × | × | - | - |
| *C. ornate* | Notopteridae | Pa tonqkouay | × | × | × | × | - | - |
| *Catlocarpio siamensis* | Cvprinidae | Pa kaho | × | × | × | × | - | - |
| *C. enoplos* | Cyprinidae | Pa khao | × | × | × | × | - | - |
| *Cirrhinus jullieni* | Cvprinidae | Pa dork ngyo | × | × | × | × | × | × |
| *C. molitorella* | Cvprinidae | Pa keng | × | × | × | × | - | - |
| *C. microlepis* | Cyprinidae | Pa phone | × | - | - | - | - | - |
| *Cirrhinus lineatus* | Barbinae | Pa soi | × | × | × | × | × | × |
| *Clarias batrachus* | Clariidae | Pa douk na | × | × | × | × | × | × |
| *C. macrocephalus* | Clariidae | Pa douk ouy | × | × | × | × | × | × |
| *Channa marulius* | Channidae | Pa kho na | × | × | × | × | × | × |
| *C. micropettes* | Channidae | Pa kado | × | × | × | × | - | - |
| *C. orientalis* | Channidae | Pa kouan | × | × | × | × | - | - |
| *C. striata* | Channidae | Pa ko | × | × | × | × | × | × |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Discherodontus ashmendi* | Cyprinidae | Pa seou | × | × | × | × | × | × |
| *Dngila spilopleura* | Cyprinidae | Pa khao | × | × | × | × | × | × |
| *Euryglossa panoides* | Soleidae | Pa pane | × | × | × | × | - | - |
| *Hypsibarbus lagleri* | Cyprinidae | Pa paktongpae | × | × | × | × | × | × |
| *H. mekongensis* | Siludae | Pa nang hang dam | × | × | × | - | - | - |
| *Heterobagrus bocourti* | Bagridae | Pa kagneng | × | × | × | × | - | - |
| *K. apogon* | Siluridae | Pa nangnoy | × | × | × | × | - | - |
| *K. schilbeides* | Siluridae | Pa nangleuang | × | × | × | × | - | - |
| *K. cheveyi* | Siluridae | Pa nanghangdeng | × | × | × | × | - | - |
| *Labeo erythrurus* | Barbinae | Pa va | × | × | × | - | - | - |
| *L. dyocheilus* | Barbinae | Pa vanoy | × | × | × | - | - | - |
| *Mekongina erythrospila* | Cyprinidae | Pa sa ih | × | × | × | - | - | - |
| *Morulius chrysophekadion* | Cyprinidae | Pa phia | × | × | × | - | - | - |
| *M. nemurus* | Bagrinae | Pa kot leuang | × | × | × | × | - | - |

Key:MK = Mekong River; TR = Tributaries; RL = Reservoirs and Lakes; WSPO = Water sheds and Ponds; RFPF = Rain fed paddy field; IW = Irrigation weirs; × = Available; – = Not available.

Source:DLF, 2001

## Management applied to main fisheries

In practice, there is little active management of natural aquatic resources by the Department of Livestock and Fisheries (DLF). Communities carry out most active management of natural aquatic resources. The right of communities to manage these resources is recognized by the government, and community management initiatives are encouraged and supported. However, as a result of the difficulties in sustaining such initiatives when several villages are involved, active management is largely restricted to small areas and individual water bodies.

In northern Lao PDR, more than half of the villages have effective traditional management systems in place, which include: (1) conservation zones, such as deep pools in rivers where fishing is limited to certain times. These are often of local religious significance; (2) seasonal restrictions (especially at spawning times); and (3) gear restrictions, not only for poisons and dynamite, but also for gears used to obtain excessive catches, especially of vulnerable migrating schools. There are also occasional restrictions on species, which can be imposed by restricting the use of species-specific gears or the timing of their deployment.[4]

However, a lack of statistical data and information on the economic significance of the fisheries sector has undermined their importance and the subsequent management of the resources.

Although there are regulations, for example banning the use of destructive fishing gear and the capture of fish during the spawning season, these can not realistically be enforced by the government. This should not be taken to imply that destructive fishing is rampant. Rather, fishing

is often regulated by local customary rules.

The Government of Lao PDR has banned the use of explosives, chemicals and electricity for fishing since 1975. Although these methods are not used in Khong District, they are still commonly used in bordering areas of Cambodia.

The system of fish sanctuaries is working well. Fish sanctuaries are types of aquatic protected or no-take fishing areas. These are locally supported community-based fisheries/co-management programmes. There are different kind of fish sanctuaries; 1) deep-water pools, which are believed to be spawning grounds; 2) deep caves in karst mountains, which provide refuge to fish in the dry season; and 3)*Pha Pa*or*Pha Nong* systems are generally not considered as fish sanctuaries, but they include seasonal fishing restrictions for deepwater parts of enclosed natural wetlands. The best-known fish sanctuaries in Lao PDR are known the so called Fish Conservation Zones (FCZs), usually established in deep-water pools. FCZs are mainly found in the South of Lao PDR in the mainstream Mekong River in Khong district, Champasak province.[5]

In the Siphandone area of southern Lao PDR, local fishers are complying extremely well with fishing regulations, despite a significant increase in demand for fish. Another example of high compliance is the controlled fishing in the back swamps of southern Lao PDR after fish stocking under co-management arrangements.

There is no reported occurrence of output controls in the form of total allowable catch (TAC) limits; or individual, group or community transferable or non-transferable quotas. Nor are there any reported economic incentives or taxes on output or inputs.

## Fisher communities

Most families in Lao PDR are involved in some kind of subsistence fishing.

## Aquaculture sub-sector

### General

Aquaculture in Lao PDR is a growing sector, though slowly. Aquaculture takes place in the central plains and highlands, but production is small in volume and value. Small-scale aquaculture is probably underreported, and more widely practiced among rural households than official aquaculture production figures suggest. Approx 8.3% of the households are involved in aquaculture, reportedly producing 5 378 t/yr (2000).[6]

Aquaculture provides fish during the dry season, allowing farmers to benefit from a good price for what is often a relatively low quality product. Fishponds that are able to hold water through the dry season until the Lao New Year are able to command premium prices.

## Aquaculture species

A diversity of fish species are cultured in Lao PDR, including tilapia, exotic carps (Indian carp, Chinese carp and common carp), and also indigenous silver barb (*Barbodes gonionotus*and other*Barbodes*species). The diversity of wild fish species (including snakehead,*Anabas*, catfish, eels,*Carassius auratus*,*Cyprinus carpio*and others) and the common occurrence of other small aquatic creatures (*Rasbora*, small shrimp, frogs and snails), which sometimes self-recruit in ponds, provide an important source of additional nutrition for farm households. This small-species by-catch does not have a high market value and is usually used for household

consumption only.

There are wild feral populations of giant goldfish (*Carassius auratus*)and*Cyprinus carpio*in the mountain areas of Lao PDR, including several variants (morphotypes) of*Cyprinus carpio.*

## Aquaculture systems

Basically there are four different types of aquaculture: rice-fish culture; pond culture; rain-fed and irrigated rice fields; and cage culture.

Rice-fish culture is successful in areas where irrigation is available, principally due to the increased availability of fish fry. In the uplands, common carp and goldfishspawn naturally in the rice fields and adjoining ponds. In some areas, farmers can produce their own fish seed and this is extremely popular as cash is not required. An FAO project found that rice-fish culture rapidly expanded once farmers were given some basic training in fingerling production. Previously, fingerling shortages had been a major constraint. Simple rice-field aquatic resource production systems are accessible to very poor farmers. Fingerling production is popular because it requires little investment or risk, and profits are made quickly. If farms are close to a provincial or district market, income can be easily generated from raising fish. Fish are raised during the rice-growing period (typically 90–100 days), harvested at the same time as the rice, and often used to reimburse labour or to celebrate the harvest. Having fish available is also popular since there is no time to fish during the rice-harvesting season.

Rice fields are an important source of aquatic products both from fishing and from aquaculture. However, raising fish in rice fields is more difficult in upland areas. Rain-fed and irrigated rice fields often require terracing, and because this limits the size of individual paddy fields, farmers are reluctant to cut channels or construct refuges (as recommended by most rice-fish culture experts). Where irrigation is available (usually from stream diversion), the requirement for deep water and refuges is reduced due to the continual flow of water into the paddy. Deep water and refuges are also less important in upland areas because temperatures are cooler. Where irrigation is available, rice-fish culture is more successful, principally due to the increased availability of fish fry.

The size of the fish harvested varies according to the size stocked. Farmers prefer to stock a larger, 5–10 g fish, although smaller fish are stocked in some cases due to their cheaper price. Stocking densities are typically low, reflecting the high price of fish fingerlings and the limited money farmers have to invest. Since most farmers do not generate cash, the purchase of fish fingerlings is frequently not possible.

Rice-fish culture is also practiced in lowland areas, primarily for household consumption. Species include*Cyprinus carpio,Carassius auratus*and*Oreochromis*sp.Risks to non-irrigated rice-fish culture are principally flooding, drought and theft. Access to a water supply increases the reliability of the system. Lack of success with rice-fish culture is typically due to the problems previously mentioned. This demonstrates that not all rice fields are suitable for fish culture, even though they may still provide a valuable source of other wild aquatic animals.

### Cage culture

In the Nam Ngum reservoir, cage culture has been practised since the 1990s. Currently there are around 300 cages. Usually the production cycle takes one year for filter feeders like silver carp.

Fish culture in ponds and rice fields is widely practised and a variety of systems are used depending on the agro-climatic characteristics of the area. The attraction of aquaculture to rural farmers is most obvious in locations where capture fisheries are inaccessible or require excessive effort for a limited catch. There is a small amount of cage culture in reservoirs and rivers, but this system currently makes only a small contribution to national production.

Environmental conditions, mainly due to natural climate changes, have significant effects on aquaculture.

Cage aquaculture is used for tilapia (90% sex reversed), snakehead (*Channa micropeltis* (10%) and *Channa striata*(90%)), silver carp (*Hypophthalmichthys molitrix*) and pangasius (*Pangasius bocourti*). Snakehead are typically grown in small bamboo cages (typically enclosing 5–6 $m^3$ of water), which are cheap, but last one or two years at most. They are also grown in net and wood cages, which are more expensive, but last longer. There has been a significant increase in intensive tilapia production in cages in recent years in Thailand, and this technology has been introduced to Lao PDR, largely unchanged. Steel-framed net cages are used, varying in size from 10 to 50 $m^3$.

## Pond culture

Most ponds are hand constructed and shallow, with water depths less than 50 cm. Low productivity figures for aquaculture ponds reflect the limited inputs applied, limited stocking of fish seed and a short grow-out season. Diverse species are cultured, including exotic carps and indigenous fish. Pangasius and tilapia are cultured in cages in ponds. Tilapia has 2–3 cycles per year. In Lao PDR, most fish ponds are seasonal as a result of a six-month dry season.

The majority of Lao PDR fish ponds are rain-fed and shallow, with water depths of less than 50 cm. The ponds, constructed by hand, are small. Fish pond development is often rapid in areas where road building results in excavated ponds or ditches, but production is frequently constrained by lack of fingerlings. The productivity of rural aquaculture ponds is low and reflects the limited amount of inputs (feeds, manures) applied to ponds, and the lack of fingerlings for stocking. In colder areas, the reduced grow-out season also limits productivity.

Species such as common carp and tilapia are popular in part because they breed in ponds with perennial water and farmers do not need to purchase fingerlings. Productivity of these ponds is extremely low, but the low financial risk makes this approach popular.

Table 2.The main aquaculture species and the production systems used.

| English name | Lao name | Scientific name | System |
|---|---|---|---|
| Tilapia | Pa nin | *Orechromis* sp. | Pond culture, rice-fish culture, state & private hatchery, community ponds, reservoirs |
| Common carp | Pa nai | *Cyprinus carpio* | Pond culture, rice-fish culture, state & private hatchery, community ponds, reservoirs |
| Indian carp | Pa marican | *Cirrhinar mrigala* | Pond culture, state hatchery, community ponds, reservoirs |
| Javanese carp | Pa paak | *Puntius gonionotus* | Pond culture, state & private hatchery, community ponds, reservoirs |

| | | | |
|---|---|---|---|
| Bighead carp | Pa hua nyai | *Aristihthys nobilis* | Pond culture, state & private hatchery, community ponds, reservoirs |
| Silver carp | Pa kedleab | *Hypohpthalmychthys molitrix* | Pond culture, state hatchery, community ponds, reservoirs |
| Rohu | Pa rohu | *Labeo rohita* | Pond culture, state hatchery, community ponds |
| Snakeskin gourami | Pa salid | *Trichogaster pectoralis* | Pond culture |
| Catfish | Pa duc | *Clarias*spp. | State hatchery |

Source:DLF at[http://rfdp.seafdec.org.ph/meetings/manila-meetransb/report-lao.html](http://rfdp.seafdec.org.ph/meetings/manila-meetransb/report-lao.html)

### Aquaculture inputs

The composition of feed for carnivorous or omnivorous fish varies. In pond culture of Striped snakehead, by-products of Indo-Pacific mackerel and intestines from chicken plant processing are used. In the cage cultivation of*Pangasius bocourti*, waste from*Cirrhinus mrigala*and*Labeo rohita*processing are used as feed.In small-scale cage cultivation of sand goby, inland trash fish is used as feed. The use of inland trash fish as feed for Giant snakehead and Snakehead cage culture is practiced at Ban Xai Oudom, Nam Ngum Reservoir.

This cage culture relies mainly on small fish, Pla Keo and Pla Kao, as feed. Seasonal shortages of inland trash fish, and the availability of alternatives limit the potential of inland carnivorous fish culture in Lao PDR

Rural Lao fish culture requires a relatively low entry cost (self-construction of pond, fingerlings for stocking and occasional feeding or fertilization). Formulated fish feed (herbivorous fish and catfish pellet) are used and imported from Thailand. It is available in large cities and some provincial capitals, but is expensive. There is a possibility that commercial fish feed production may commence in Vientiane Prefecture if the market is found to be viable. Paradoxically, the high price of fish in markets makes use of formulated fish feeds economically viable. The tendency not to use feeds is probably due to perceive higher economic risks.

In comparison with downstream countries (Cambodia and Viet Nam), it seems that current usage of inland fish as trash fish is minor or negligible in the Mekong Basin in Lao PDR.[7]

### Recreational sub-sector

There is no developed recreational subsector.

## Post-harvest use

### Fish utilization

Aquatic products form a major part of the Lao diet. During the rainy season, these products are collected from all forms of water bodies and wetlands. During the dry season, there is a major effort to collect the remaining animals trapped in shallow ponds created by receding waters. Surplus aquatic products produced during the rainy season are preserved in a variety of ways according to cultural preference and prevailing local conditions. Common are fermenting (the major process), pickling, drying and smoking. Preserved fish products are generally more valuable than the fresh fish from which they are made. The preserved products (principally fish) are then utilized throughout the dry season, when food is relatively scarce. Fermented fish (*pa*

*daek*) is also a significant staple in all villages, particular during periods in the year when catches are poor or peak agricultural labour requirements reduce the time available for fishing.

Table 3. Marketed fish products.

| Items | Consumption value, in million Kip | |
|---|---|---|
| | 1997–1998 | 1992–1993 |
| Fresh fish | 30 750 | 11 040 |
| Canned fish | 1 237 | 1 021 |
| Frozen fish | 1 351 | 500 |
| Dried fish | 2 183 | 1 208 |
| Prawns, crabs, etc. | 1 853 | 162 |
| Fermented fish | 2 934 | 1 519 |
| Preserved fish | 755 | — |
| Others | 4 995 | 3 626 |
| Own produced fish | 93 410 | 26 540 |

Source:Lao Expenditure and Consumption Survey (LECS I and LECS II). National Statistics Centre 1993, 1998.

## Fish markets

Most of the fish is consumed direct. FAO survey data suggest that most fish produced from rural aquaculture is consumed at home, or at least is not directly marketed. It is typical for a family to purchase fish from a neighbour in order to provide fish for celebrations. Since fish spoils quickly, and due to poor transport facilities and lack of ice, distribution of fish from the Mekong River system to more remote areas is restricted. As a result, during the seasonal migrations of fish up the Mekong, fish prices collapse in some areas (specifically southern Champassak), while relatively short distances away, markets for fish are still under-supplied.

However the completion of main roads has provided more access to fish resources and more fish is being transported to other areas, such as from the South (Siphandone area) to the capital Vientiane.

## Fishery sector performance

### Economic role of fisheries in the national economy

Fisheries play an important role in rural livelihoods in virtually all regions of Lao PDR. Most fishing is carried out as part of a diverse rural livelihood strategy, typically ranked as the second or third most important activity (after rice farming and animal husbandry) and contributing on average about 20% to rural household income. The estimated total number of rural households is 667 900, of which approximately 55 200 families (8.3%) are involved in aquaculture production. This figure has increased over the past decade and is expected to increase further. In Southern Lao PDR, up to 80% of rural households are involved in the fisheries sector. The bulk of fish caught is consumed within the household, but surpluses may be sold, and this

accounts for about a quarter of total catches.[8] Catch price at first sale vary according to the species and size of the fish and it is not recorded regularly. The average price across the country is estimated to range from 7 000 to 20 000 Kip/kg (US$ 1 = 15 000 Kip (2002)). Wild fish is in general priced higher for its taste than cultured species

## Demand

As fish provides a great part of the animal protein intake, the demand for fish is stable year-round. Demand, and therefore prices, peaks only during the Lao New Year festival (mid-April), which is in the dry season, when fresh fish is in short supply. Aquaculture provides fish during that season, allowing farmers to benefit from a good price for what is often a relatively low quality product.

## Trade

There is considerable trade in fish within the Mekong Basin and its neighbouring catchments. A lively trade takes place between Thailand and Lao PDR, with Lao traders sending high-value species over the river to Thailand, receiving in exchange tilapia and other species. Detailed figures of traded quantities and their values are not available. Most of the fish seed and feed is also imported from Thailand, especially for the areas bordering the Mekong River. In Lao PDR, economic factors are a major constraint and include a poorly developed market economy outside major towns and limited access to long-term credit.

Importation of marine fish (from Thailand and Viet Nam) is common, although quantities are relatively small. Cultured fish from Thailand also can be found in most markets along the Mekong River. In January 2000, the provincial authority of Champasak was given a special dispensation by the Lao government to allow the importation of Cambodian fish through Khong district, for export to Thailand. Previously, in large part due to the government's policy of food self-sufficiency, the export of Lao fish was illegal.[9]

Seventy percent of households involved in aquaculture sold some farmed fish. Most of the products produced from aquaculture are consumed in the basin, or nearby markets.

## Food security

Food security at household level derives principally from forestry, livestock and fisheries, with freshwater fish being the principal source of animal protein for the rural population. Estimates of average annual per capita consumption vary widely, from 7 to over 57 kg, depending on the area, but an overall average for most of the provinces lies between 15 and 25 kg/head/yr. Surveys carried out by the MRC Fisheries Programmesuggest that, in Lao PDR and Cambodia, the consumption of traditional dried and fermented products alone amounts to 10–14 kg/head/yr.

## Employment

Most fishing in Lao PDR is subsistence fishing, although there is significant commercial fishing in the Nam Ngum Reservoir. Both men and women are involved in fishing activities, with women especially prominent in the management of fish ponds and fish culture in the rice fields. Women play a key role in processing and marketing fish. Detailed figures on the amount of people depending on fisheries as a primary source of income are not available.

## Rural development

Fisheries may play a social role in maintaining populations in their native places.

Aquaculture is making a significant contribution to improving livelihoods and alleviating poverty, and will increase further. The government is targeting higher production.

## Fishery sectordevelopment

### Constraints – Capture Fisheries

- Despite the high coverage of areas by the Mekong River, very limited information is available in Lao PDR. Fisheries statistics are poor and not updated and there is a large gap in information on the production as well as value of inland capture fisheries in the country. The high dependence on agriculture and fisheries for livelihood and food security calls for more in-depth studies for better and more effective planning for sustainable management of the resources and poverty eradication.
- In general it is believed that fish stocks throughout the whole Mekong River Basin, including Lao PDR, are over-fished. Good management is often missing, and should be developed in close cooperation with neighbouring countries.
- There is a lack of statistical data and information on the economic significance of the fisheries sector.
- The construction of the Nam Theun hydropower dam in Nakai Plateau, Khamuane Province, has raised considerable concern among many NGOs. They think the dam will have a large impact on fish stocks in both Nam Theun and Xe Bang Fai rivers, and hence on the communities depending on them. Though the project has plans to replace the fisheries with aquaculture, the NGOs warn that, from experience in the past, they know that aquaculture is no substitute for freshwater fisheries and that the poorest people will lack the necessary land and capital resources to make such a business profitable. The dam should be completed in 2009.
- The liver fluke*Opisthorchis viverini* is one of the dangerous parasites found in fish. The extent of the problem is not fully known, though it is thought that around 74% of people living around the large reservoir are infected with parasites, and, of these, half have the liver fluke. Several other species of fish-borne parasites have been identified through faecal analyses. The spread of parasites is closely related to the traditional consumption of raw fish, which has increased in recent times as a result of the number of reservoirs and other permanent still water bodies. Combating this problem will require further studies on the extent of this problem, with information campaigns to change food habits and improve hygiene. Some parasites can survive the processing methods used in traditional fermented or dried products. A study of traditional processing methods is therefore warranted.

### Constraints – Aquaculture

- Fish culture is constrained by the lack of good inputs, like fish seed, supplemental feed and manures. Technical information and extension services are hard to obtain, due partly

to the low population density and poor communication between villages. Farmers also lack awareness of the potential of aquaculture.

- An important constraint for poor people is access to capital inputs such as credit. In Lao PDR, the credit systems in rural areas are undeveloped and difficult to access. Credit should be analysed as part of the process to support farm households entering aquaculture. The special difficulties faced by poor households should be recognized and addressed.
- Economic factors such as the poorly developed market economy outside of towns, poor road communications and the largely subsistence rural economy play an important role in constraining aquaculture development.

## Development prospects and strategies

In Lao PDR, the conversion of rice fields to aquaculture ponds has only been allowed in the last decade under changes in land use policy as part of a government concern to alleviate poverty in rural areas through rice farm diversification.

Aquaculture in ponds and cages has high potential in terms of both commercial development and small-scale family enterprises directed at poverty alleviation. From a financial perspective, aquaculture compares well with alternative traditional enterprises such as rice and capture fishery, and new enterprises, such as fruit and coffee production. Risk levels are necessarily somewhat higher than traditional activities, but generally similar to, or lower, than other new enterprise types.[10]

The two documents currently most influential in guiding policy by the DLF are the Bangkok Declaration and Strategy (BDS) for Aquaculture in the Third Millennium, and the FAO Code of Conduct for Responsible Fisheries (CCRF).

## Research

Fisheries research in Lao PDR is organized under the National Agriculture and Forestry Research Institute (NAFRI – see:www.nafri.org.la). The Living Aquatic Resources Research Centre (LARReC –www.mekonginfo.org/partners/larrec/index.htm) is a research centre under NAFRI. LARReC was established in 1999 and has three research units: capture fisheries, aquaculture and wetlands. Its mandate*inter alia*is to:

- organize assessments of the living aquatic resources and socio-economic studies of the fisheries in rivers, streams, reservoirs and wetlands.;
- organize research on fish propagation, especially culture of indigenous species and improvement of the brood stock of introduced species;
- identify appropriate aquaculture systems with due consideration for the potentials of different agro-ecological zones;
- provide data, information and technologies on fisheries for the implementation of government priority programmes; and
- contribute to the development of technical norms and regulations to promote fisheries, in collaboration with other institutions.

## Education

The national universities offer only a few fishery courses within agricultural programmes.

## Foreign aid

There are quite some international and regional organizations active in Lao PDR's rural development sector, and the fisheries sector in particular.

- Mekong River Commission (MRC). The main financers of the MRC are DANIDA, SIDA, ACIAR and DFID. MRC promotes and coordinates sustainable management and development of water and related resources for the countries' mutual benefit and the people's well-being by implementing strategic programmes and activities and providing scientific information and policy advice in the whole Mekong River Basin (see:www.mrcmekong.org).
    - Australian Centre for International Agriculture Research (ACIAR)www.aciar.gov.au. Projects include:
        - Lao agriculture research fund (LARF), 2006–2008; and
        - Stock structure of two important Mekong River carp species (*Henicorynchus*spp.), 2004–2006.
    - Australian Mekong Research Centre (AMRC). With the Mekong Learning Initiative 2005–2007. See:www.mekong.es.usyd.edu.au.

  There are some NGOs working directly in the field of aquaculture and fisheries:
    - World Conservation Union (IUCN)
    - Canadian Volunteer Organisation (CUSO)offers agriculture, pig rearing and fish culture loans (See:www.cuso.org).
    - World Concern (WS)gives microcredit loans foragriculture, fish culture, small-animal raising and land clearance (See:www.worldconcern.org).

## Fishery sector institutions

The governmental entity responsible for fisheries management is the Ministry of Agriculture, Forestry and Fisheries (MAF) (see:www.maf.gov.la). Under MAF is the Department of Planning (DOP), responsible for disseminating basic statistical information on agriculture, including crop production, crop area, crop yield, livestock population, animal production and fisheries. This information is prepared by technical departments and institutions such as the Department of Livestock and Fisheries (DLF), Department of Agriculture, Department of Forestry, Department of Irrigation, and the Living Aquatic Resource Research Centre (LARReC). Technical fishery management information, such as fishery production, topology of fisheries, number of fishing units, fishing gear, fish price, number of hatcheries, rate of fish consumption, rate of fry survival, fish feed production and type of fish farming, is collected and compiled by DLF, in collaboration with LARReC, Provincial and District Livestock and Fisheries Units. This includes specific information (standard of fish stocking in pond, rate of raising in rice field, etc.), and aquatic

animal health information. Trade data on fish and fish products are collated and reported by the National Statistical Centre. Their data clients are decision-makers, scientists, planners and vendors.

### Department of Livestock and Fisheries (DLF)

Formal responsibility for aquatic resources management in Lao PDR rests with DLF under the Ministry of Agriculture and Forestry. The situation is somewhat unclear for protected areas, for which the Department of Forestry has overall responsibility.

The government agency directly involved in the generation of fishery statistics is the National Statistical Centre, under the Committee for Planning and Cooperation.

## General legal framework

There is no specific fisheries law for the general regulation of capture fisheries in Lao PDR. However, there are three different laws that have clauses relating to wild fish resources management and the environment in general: the Water and water resource Law (1996,http://faolex.fao.org/docs/pdf/lao7478.pdf), the recently adopted Environment Protection Law (1999, full text:http://faolex.fao.org/docs/texts/lao18236.doc) as well as the Law on Agriculture (1998, http://faolex.fao.org/docs/pdf/lao18996.pdf). (Source:www.ecolex.org).

The Law on Agriculture establishes principles for the development, management and preservation of agricultural activities (defined in Part II) in Lao PDR. "Agriculture" is intended in a broad sense and thus the Act includes provisions relating to cultivation of crops, animal husbandry, fisheries, irrigation, management and conservation of agricultural land, use of fertilizers, protection of the environment, food supply, etc. Rights and duties of persons undertaking agricultural activities are outlined in Article 10. Land, divided into “land for cultivation” and “land for raising animals” shall be allocated by the State in conformity with “targets” (Articles 11 and 12). Articles 16 to 23 regulate irrigation and the building of waterworks for this purpose. Irrigation shall be carried out in conformity with the Water and Water Resources Law. Articles 22 and 23 provide for the protection of rights over land of neighbouring estates for purposes of irrigation. The Act defines seeds in Article 24, animal species in Article 25 and regulates the use of fertilizers in Articles 27 to 29. Other provisions concern use of animal feed (Article 30), use of insecticides (Article 32), and use of animal drugs or vaccines (Articles 33–35). Various provisions concern the promotion of agricultural production by way of investments, promotion of the use of agricultural machinery, training of farmers, storage and marketing of agricultural products, etc. Articles 65 to 68 concern protection of the environment against harmful agricultural operations, including fishing (Article 68). Article 69 specifies members of the Agricultural Activities Administration Agency and subsequent articles define their duties. Inspection shall be carried out by the Agricultural Activities Inspection Agency (Article 75). Offences and penalties are prescribed in the final provisions this Act.

Decree on Fisheries (1949) (Ordonnance royale nº 34 fixant le régime de pêche). This decree contains 5 articles on fishing methods on river fish.The mandate of DLF is determined in the Ministerial Decree on Fisheries. Apart from enforcing a set of rather detailed operational rules for fishing in the Nam Ngum reservoir, DLF is mainly practising a hands-off policy on capture fisheries. This reflects the limited need for regulatory intervention at the national level (no major

conflicts over access to fish resources, no report of overfishing, etc.) and the lack of resources for such intervention.

Decree for the Management and Protection of Wild Animals, Fisheries and for Hunting and Fishing (1989). This Decree aims at protecting and developing the breeding and use of fisheries and wild animals populating the territory. To this end, the Ministry of Agriculture and Forestry shall study plans and policies and make provisions for their implementation. As far as fishing and hunting are concerned, the Decree places restrictions on the use of certain methods and devices, and forbids hunting or fishing endangered species, pregnant animals, animal's with newly born offspring and during the fish ovulation season. Trade in wild animals, dead animals and parts are thereof subject to authorizations and certification as listed in Article 4. The full text is available at http://faolex.fao.org/docs/pdf/lao6334.pdf

Council of Ministers Decree in relation to Wildlife Trade (1986). With a view to protect the natural forest resources of the country, this Decree prohibits “all kind of wildlife trade, trade in animal articles, trophies, live or dead specimens of wild animal” (Article 1). The Decree is followed by a list of animals, forestry products and non-timber products whose trade is forbidden. The full text is available at http://faolex.fao.org/docs/pdf/lao6336.pdf.

In Lao PDR there is constitutional support for local management and customary law. A new decentralization policy, launched in 2000, represents a conscious effort to empower provincial and district authorities to actively manage local financial and natural resources to optimize the local development process. The province is the strategic unit, the district is the planning and budgeting unit and the village is the implementing unit. This decentralization process gives formal recognition and status to a process that has been underway for a number of years.

## Treaties related to fisheries

- United Nations Convention on the Law of the Sea (1982). See: http://www.ecolex.org/en/treaties/treaties_fulltext.php?docnr=2649&language=en
- Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin (1995). Full text available at: http://www.ecolex.org/en/treaties/treaties_fulltext.php?docnr=3145&language=en
- Convention on Biological Diversity (1992). Full text available at: http://www.ecolex.org/en/treaties/treaties_fulltext.php?docnr=3070&language=en
- ASEAN Agreement on the Conservation of Nature and Natural Resources (1985). Full text available at: http://www.ecolex.org/en/treaties/treaties_fulltext.php?docnr=2722&language=en
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973). Full text available at: http://www.ecolex.org/en/treaties/treaties_fulltext.php?docnr=2343&language=en

[2] Sverdrup-Jensen, S. 2002. Fisheries in the Lower Mekong Basin: Status and Perspectives. MRC Technical Paper No. 6, Mekong River Commission, Phnom Penh. 103 pp. ISSN: 1683-1489

[3] FAO/MRC/Government of Thailand/Government of the Netherlands. 2003. New approaches for the improvement of inland capture fisheries statistics in the Mekong Basin. RAP Publication 2003/01. 145 p.

[4] Coates, D., Ouch Poeu, Ubolratana Suntornratana, N Thanh Tung & Sinthavong Viravong. 2003. Biodiversity and fisheries in the Lower Mekong Basin. Mekong Development Series No. 2. Mekong River Commission, Phnom Penh. 30 p.

[5] Baird, I.G. 2006. Strength in diversity: fish sanctuaries and deep-water pools in Lao PDR.*Fisheries Management and Ecology*, 13: 1–8.

[6] Phillips, M.J. 2002. Fresh water aquaculture in the Lower Mekong Basin. MRC Technical Paper No. 7. Mekong River Commission, Phnom Penh. 62 p.

[7] Hambry, J. Financial analysis and risk assessment of selected aquaculture and fishery activities in the Mekong Basin. MRC Technical Paper No. 5. Mekong River Commission, Phnom Penh. 67 p.

[8] Lorenzen*et al*. 2003.Lao PDR Summary Report. Understanding livelihoods dependent on inland fisheries in Bangladesh and Southeast Asia (DFID/FMSP project R8118). 14 p.

[9] Bush, S.R. 2004. Scales and sales: Changing social and spatial fish trading networks in the Siiphandone Fishery, Lao PDR. *Singapore Journal of Tropical Geography*, 25(1): 32–50.

[10] Hambry, J.. Financial analysis and risk assessment of selected aquaculture and fishery activities in the Mekong Basin. MRC Technical Paper No. 5. Mekong River Commission, Phnom Penh. 67 p.