REPORT OF THE NATIONAL WORKSHOP ON AQUATIC BIODIVERSITY AND NUTRITION FROM RICE-BASED ECOSYSTEMS: ENHANCING BIODIVERSITY AND AGRICULTURAL PRODUCTIVITY

Vientiane, Lao People’s Democratic Republic, 4–5 June 2008
National Workshop

Aquatic biodiversity and nutrition from rice-based ecosystems: Enhancing biodiversity and agricultural productivity

Workshop Report

Opening of the workshop

The workshop on *Aquatic biodiversity and nutrition from rice-based ecosystems: Enhancing biodiversity and agricultural productivity* was held in Vientiane, Lao PDR at the Novotel on June 4-5, 2008. Prospectus and agenda are attached to this report as Annexes 1 to 2. The workshop was attended by 34 participants from 7 international and 9 national agencies (see Annex 3 for list of participants).

The workshop was opened by Mr. Bounthong Saphakdy, the Director of the Fishery Division of the Department of Livestock and Fishery (DLF) of the Ministry of Agriculture and Forestry (MAF), who welcomed the participants in Vientiane.

Mr. Serge Verniau, the country representative of the FAO in the Lao PDR gave the first welcome address; he stressed that, while aquatic biodiversity from rice-based ecosystems has been long recognized as playing an important role for livelihood and nutrition, there is a pressing need to translate this knowledge in policies and action on the ground. He expressed concern on the increased use of pesticides in the country and the involvement of civil servants in the promotion of agrochemicals to be used in rice fields. The full text of his statement can be found in Annex 4 of this report.

Mr. Somphanh Chanphengxay, the deputy director general of DLF-MAF stressed in his welcome address the importance of aquatic biodiversity for nutrition and health of the people and urged the agricultural sector to take this into account. He recognized the need for a strategy to translate the findings of the various researches into government policies and action plans.
**Organization of the workshop**

The workshop was chaired by Mr. Somphanh Chanphengxay, DDG, DLF-MAF. Dr. Bounthom Phengdy from the Department of Hygiene and Prevention (DHP) and Mr. Bounthong Saphakdy from DLF-MAF led the discussions of the two working groups. The final agenda was presented and adopted.

**Presentations**

The first presentation was given by Dr. Matthias Halwart, FAO Rome. He gave an overview on the history of FNPP activities related to aquatic biodiversity in the region and summarized the findings. He then put the findings in context with international efforts and policies and presented the objectives of the workshop, namely:

- to share information and experiences on importance and management of aquatic biodiversity from rice-based ecosystems among various stakeholders;
- to discuss good management practices which combine the enhancement of aquatic biodiversity with an increase in the production of rice;
- to discuss the role and potential of aquatic biodiversity to alleviate malnutrition;
- to agree on recommendations for future activities and immediate steps to be undertaken in order to achieve an enhancement of aquatic biodiversity and an increased rice production.

In the second presentation, Ms. Khamphaeng Homsombath, LARReC, illustrated the methodology and findings of the FNPP sponsored household survey on catch and consumption of aquatic biodiversity in the Lao PDR. She explained that fish (49%) and amphibians (31%) were the most important animals caught by households while molluscs (19%) and insects (1%) were less important. Almost two thirds (65%) of all organisms caught by households originated from rice-based ecosystems, the remainder (35%) came from other sources (rivers, streams, lakes). These results impressively underline the importance of rice-based ecosystems for the livelihood and nutrition of rural households in the Lao PDR.

In the ensuing discussion it was noted that the study had excluded aquatic plants; plants further add to the value of non-rice products that originate from rice-based systems. Further, the importance of micro-organisms and plankton as food source for fish, frogs, crustaceans and molluscs was stressed; these would be affected by chemical inputs.

Adding to this, Mr. Serge Verniau, FAO, reiterated his concerns about the increased use of pesticides in the Lao PDR; he elaborated on the strict norms and regulations in place in European countries and encouraged the Laotians to follow this example.
The next study by Ms. Mulia Nurhasan on the *Nutritional Composition of Aquatic Species in Laotian Rice Field Ecosystems; Possible Impact of Reduced Biodiversity* was presented by Ms. Penroong Bamrungrach. The results of the research indicate that the aquatic species analyzed contained high protein, low fat and high ash (corresponding to a high mineral content). The examined species were considered a good source for amino acids, especially lysine, calcium, iron and zinc, and less so for lipids and Vitamin A. The study further revealed that *padek*, the typical Lao fish paste, contained high quality protein and essential amino acids (esp. lysine). Homemade *padek* was found to be richer in nutrients than the commercial product from the markets.

In response to the presentation, it was commented that content of both lipids and Vitamin A is species specific and also related to the selection and processing of the samples (the removal of bones, head and entrails analogous to the usual preparation done in a Lao household). It was further elaborated that a small Bangladeshi fish species (*Mola*) has been found extremely rich in Vitamin A and that the Vitamin is concentrated in the eyes and gut of the fish; eating it whole substantially adds to Vitamin A intake. These findings have led to a change in policy in Bangladesh which previously considered small fish as “weed fish” in fish ponds and originally recommended to eliminate them in pond aquaculture operations; this recommendation was subsequently reversed.

As next speaker, Mr. Boun-Oum Douangphrachanh, DDG of the Department of Agriculture, presented the efforts of his department in the field of IPM and the promotion of organic rice farming. He noted the lack of qualified staff, especially in provinces and districts. He stressed the need to produce information material both to disseminate information on new techniques to produce rice and properly apply IPM as well as to inform about the dangers of improperly applying agrochemicals.

The presentation was well received and attention was called to the possibility of the Lao PDR to become the region’s largest producer of organic agricultural products. The importance of cooperation between the various actors involved in the agricultural sector were undelined and the importance of proper regulations regarding agrochemicals emphasized.

The sustainable use of the rice field ecosystem was the topic of the next presentation by Ms. Nouhak Leipvisay. She presented the joint efforts of the DLF’s Aquaculture Improvement and Extension Project with volunteer student groups, the Center for Environment and Development Studies of the National University of the Lao PDR, the Nagao Environment Foundation and NARC, Japan. The project involved school children in the collection of samples from rice-based ecosystems, thus creating awareness among them about the biodiversity and importance of the organisms found in this
Mr. Somphanh Chanpengxay praised the study as a good example on how to convey knowledge on the importance of aquatic biodiversity to schools and school children, taking note that the education on these matters is of crucial importance for the future of the rice-based ecosystems and its associated biodiversity.

Dr. Gary Jahn, Coordinator for the Greater Mekong Subregion from IRRI was the next speaker; he aptly titled his presentation More than rice itself: rice, fish, and aquatic biodiversity. He warned to fall prey to the conflict mentality of agriculture versus environment, stressing that it is possible to promote both. His recommendations included to preserve existing natural wetlands, to enhance the connectivity between those wetlands and the wet paddy fields and to intensify rice production on these existing paddy fields without further expansion of the present paddy area. He stressed the need to enhance existing aquatic areas to become suitable habitats for aquatic life e.g. by creating eco-friendly canals for irrigation instead of underground pipes.

In reaction to the presentation, support for these recommendations was expressed by NAFRI, noting the lack of natural wetlands in some rice growing areas of the country and citing Savannakhet as an example as opposed to Champassak where natural wetlands abound. Thus it were essential to create small-scale habitats for aquatic organisms as shown in the presentation, e.g. by digging of pits and protecting them especially during the dry season. The usefulness of such pits as a water reserve for small-scale cultivation was noted. Other interventions from the floor included MRC stressing that there is scope for diversification also with other aquatic crops such as water chestnuts, kangkong (Ipomoea aquatica) and lotus for consumption and reeds for basket making and thatch.

Regarding the use of exotic species in irrigation canals and ponds, it was pointed out that this is mostly due to the availability of fish seed; while at the same time there is often no such supply for indigenous fish species. This is currently being addressed through research and development projects and constraints might be overcome in the future.

The next presentation by Mr. Seumsee Soulita, WWF, dealt with Participatory Fishery Monitoring and the Analysis of Rice Field Fisheries in the Xe Kong basin of the Lao PDR. Also this analysis showed the tremendous importance of rice-based ecosystems as source of food and livelihood for the people of the Lao PDR. A significant portion of the fishing effort is directed there, the rice-based ecosystems include a wide range of aquatic animals and the aquatic animal production from this environment makes up a significant part of the diet in the households surveyed for the study.

Mr. Kent Hortle, MRC, introduced the rice-based ecosystems of Battambang in the neighboring Kingdom of Cambodia. In his presentation on ricefield yield and value he revealed that the value of the fish yield from rice field areas in Battambang exceeds two thirds of the value of the rice yield, stressing that this was the case without any management effort on the fishery side. And, while the rise in rice prices is well publicized, there is an internationally largely unnoticed rise in fish prices as well at a rate that partly exceeds that of the rice. In the near future, fishing in rice-based ecosystems could become more profitable than rice farming. Mr. Hortle continued to give
some ideas on how fish yield could be increased through simple management interventions. He emphasized the importance of black fish as well as frogs and stressed that they should be given special attention in research and extension. Furthermore he named several constraints to an increase in the rice-based fishery; most prominent among them the ownership question because fish are an open-access resource and farmers are unlikely to invest in the development of a resource they do not own.

Following this presentation, the FAO/MAF Lao PDR video on *Aquatic biodiversity and nutrition in the Lao PDR* was shown; the video is accessible at [http://www.fao.org/biodiversity/country-in-focus-laos/en/](http://www.fao.org/biodiversity/country-in-focus-laos/en/).

Mr. Phouvieng Latdavong, NAFRI, presented the status of the fishery legislation particularly as it relates to rice-based ecosystems. The fishery law of the Lao PDR is presently being developed in a consultative process supported by FAO. The preliminary results of the LARReC/DLF Household Survey (presented above) had been made available to the experts developing the legislation to ascertain that issues concerning ricefield fisheries are adequately covered. The legal problem surrounding fishery in rice-based ecosystems is that of ownership: while the rice fields have designated owners, the wild fish and other aquatic animals are property of the national community. However, the access to the rice field is allowed only with explicit consent of its designated owner. There is a marked difference in tradition between southern and northern Laos: While the northern Lao stress the private ownership of the land, the southern Lao stress the public ownership of fish and other aquatic animals. Access to a privately owned area may be governed by water level: as long as the bunds of the rice field are above the water level, the access to the field is restricted and requires consent of the owner; once the bunds of the field are under water, access to the field is public.

In response to the presentation concern was expressed regarding the rights of landless poor people in rural areas; they mostly depend upon wild resources for food and restricting access to rice fields may lead to conflict. The group was informed that the law was still in draft form and that a workshop would be held in the following week. A compromise was suggested in which the law may generally restrict the access to the rice fields, requiring the owner’s permission unless local customs and/or regulations say otherwise.

Dr. Bounthom Phengdy, DHP, gave the next presentation on human nutritional deficiencies in the Lao PDR. She pointed to a high prevalence of chronic malnutrition (41% stunting), the existing prevalence of acute malnutrition (7% wasting) leading to an overall picture of malnutrition (37% underweight). In addition she noted the “hidden” malnutrition manifested in micronutrient insufficiencies such as anaemia, Vitamin A deficiency and iodine deficiency disorders. Causes are, among others, a too low calorie intake, diseases and parasites, the increasing scarcity of wild meats, fish and other aquatic animals, low fruit consumption and limited bioavailability of fat soluble nutrients due to a low fat intake. Dr. Bounthom stressed that malnutrition does not only have consequences for the individual but also constrains socio-economic development of the nation as a whole. She recommended to make nutrition central in development through increased inter-sectoral cooperation, commitment and priority investment.

Dr Bounthom Phengdy continued to give also the next presentation on the National Nutrition Policy. She stated that the overall goal of the National Nutrition Policy is to substantially reduce levels of malnutrition, especially of vulnerable groups, and to mainstream nutrition in national socio-economic growth and poverty reduction policies and strategies. To achieve this, objectives, programs and targets were developed, the scope defined and partnerships sought. Implementation of the National Nutrition Policy should start once it has been endorsed.
This was the final presentation and concluded the first part of the workshop. In the following part, participants separated into two working groups for more specific discussions on selected topics.

**Working group discussions**

The working groups formed in the second part of the workshop discussed the following two topics:

1. Improving ricefield management to enhance aquatic biodiversity and produce higher yields
2. Aquatic biodiversity and nutrition: necessary developments to overcome malnutrition

Each group selected a moderator and rapporteur. The discussion lasted for about two hours and the results were subsequently presented by each group’s moderator.

The findings of the group focussing on how to improve the rice field management to enhance aquatic biodiversity and produce higher yields, included:

- A constraint to improved management of ricefield areas is the incomplete land-related legislation;
- The use of agricultural land should be better monitored;
- Capacity building for farmers as well as for staff of technical departments is required;
- Farmer groups should be used as entry point for training efforts and pilot projects; if not existent they need to be created;
- Curriculum development for appropriate training content is needed;
- Coordination between involved departments both in Vientiane and in provinces/districts is urgently needed.

The second group, discussing aquatic biodiversity and nutrition: necessary developments to overcome malnutrition, presented the following output:

- A marked discrepancy exists between the occurrence of malnutrition (highest in the south, lowest in the north) and the availability of rice and fish & other aquatic animals (highest in the south, lowest in the north).
- Several hypotheses were raised:
  - Due to unsafe food habits (eating uncooked fish) and high prevalence of parasites in the south
  - Lower food intake in the south due to marketing of fish
The group concluded that it is imperative to uncover the root cause of malnutrition when assessing the role of aquatic biodiversity for its alleviation. The geographic precision of the data on malnutrition needs to be improved, and the above hypotheses verified through further studies. A coordination team between MAF and DHP should be created for this purpose.

**Conclusions and recommendations**

Based on these results, the ensuing discussions, and consensus building among the workshop participants, the following recommendations were formulated by the Chair of the workshop, Mr. Somphanh Chanphengxay, DLF/MAF:

- Agricultural biodiversity in Lao PDR is the basis for food security of the Lao people. The ricefield ecosystem and its associated biodiversity, in particular the aquatic part, needs to be given highest priority in future research and development projects;
- Aquatic biodiversity from rice-based systems is too important for the nutrition of rural household members to be overlooked in agricultural development; increased efforts should be made to improve the database/statistics on aquatic biodiversity from rice based ecosystems;
- The lack of information on the root causes of malnutrition in Lao PDR needs to be addressed urgently;
- To enhance the rice/aquatic biodiversity resource base, cooperation between all involved departments is required;
- Awareness creation and law enforcement in the field of agrochemicals is urgently needed, and the relevant legislation may need to be updated;
- Existing experiences should be collected systematically and successful approaches multiplied throughout the country;
- Since connectivity between natural wetlands and rice fields is crucial for the migration of aquatic species, connectivity channels should be maintained where they exist and created where they don’t exist.
- A strategy for the dissemination of relevant information to farmers, schools and technical agencies should be established and used;
- Schools at all levels (including Farmer Field Schools) should be the target for information on the importance of aquatic biodiversity and its proper management;
- To address these issues, additional financial resources are urgently required and interested donors should be identified.

In his closing remarks, Dr. Matthias Halwart, speaking also on behalf of the FAO Representative, thanked the workshop participants and emphasized that the discussions had made everyone realize how much work still remains to be done. He stressed that further progress on the improved interaction between agricultural production and aquatic biodiversity will depend upon each participant present in the room. Recalling the importance of aquatic biodiversity for nutrition and livelihood, he underlined that it is too important to be overlooked in future developments. He further underlined that an increasing involvement of the National University in the research of rice-based ecosystems is desirable; studies on existing enhancement techniques in the Lao PDR could be conducted by students with the guidance and support of the University’s faculty. He suggested that subsequently a write-shop should be conducted during which such existing enhancement methods would be documented and compiled into a publication that can serve as a guide for practitioners. Citing the example of a joint write-shop among IIRR, FAO, IDRC, NACA, and WFC on Utilizing Different Aquatic Resources for Livelihoods in Asia (http://www.iirr.org/aquatic_resources/), he underscored the importance of proper documentation of existing knowledge for the benefit of the wider public. Dr. Halwart expressed his hopes that the above recommendations will be
picked up in the near future and adequate funding can be identified. He once more highlighted the importance of good cooperation and coordination between the various actors involved, expressed his gratitude to DLF for hosting and particular thanks to the FAO Netherlands Partnership Programme for the financial support. He ended by congratulating all participants for their valuable and fruitful discussions and excellent results which made the workshop an important milestone and memorable exercise on the way to enhancing aquatic biodiversity from rice-based ecosystem alongside with agricultural production.

In conclusion, Mr. Somphanh Chanpengxay equally conveyed his gratitude to the workshop organizers, the working groups and all participants. He underlined the need for a better cooperation in the future and expressed his hopes that this workshop may be an initial step to be followed by many others focussing on further improvements of the interaction between rice and ricefield fisheries. He reminded the participants of the workshop on the fisheries legislation in the coming week and officially closed the workshop.
Annexes

1. Prospectus
2. Agenda
3. List of participants
4. Opening remarks of Mr. Serge Verniau, FAO representative in the Lao PDR
5. Presentations
   5.1. National workshop on aquatic biodiversity and nutrition: the contribution of rice-based ecosystems - introduction and overview Dr. Matthias Halwart, FAO Rome;
   5.2. Importance of fish and other aquatic animals in rice-based ecosystems in Lao PDR, Khamphaeng Homsembath, LARReC;
   5.3. Nutritional composition of aquatic species in Laotian rice field ecosystems; possible impact of reduced biodiversity, Penroong Bamrungrach, FAO consultant, on behalf of Mulia Nurhasan, Tromsø University, Norway;
   5.4. Biodiversity in rice fields in Lao PDR, Boun-Oum Douangphrachanh, DoA, MAF;
   5.5. Sustainable utilisation of rice field ecosystems, Nouhak Leipvisay, DLF, MAF;
   5.6. More than rice itself: rice, fish and aquatic biodiversity, Dr. Gary Jahn, IRRI;
   5.7. Participatory fishery monitoring: analysis of rice field fisheries, Seumsee Soulita, WWF;
   5.8. Ricefield yield and value in Battambang Province, Cambodia, Dr. Kent Hortle, MRC;
   5.9. Development of Fisheries Legislation for Lao PDR, Rice field fisheries and related legislation, Phouvieng Latdavong, NAFRI;
   5.10. Undernutrition in Lao PDR, Dr. Bounthom Phengdy, DHP;
   5.11. National nutrition policy, Dr. Bounthom Phengdy, DHP.
Background

The Lao PDR is a country with a rich aquatic biodiversity in its rivers, lakes and wetlands. This richness has always been tapped by humankind for food, barter and income, and numerous studies have shown its importance for the nutrition and livelihood of the Lao people.

Rice-based ecosystems, that is, rice fields and the small water bodies in their immediate neighbourhood have been less recognized as a source of aquatic animals for human nutrition and food security; they are usually seen as a source of rice only. However, rice fields form part of the intricate system of wetlands that can be found throughout the country, and therefore also harbour a highly diverse set of aquatic organisms. The catch from rice fields usually is modest and only sufficient for a single day. For this reason, the fish and other aquatic animals caught from rice-based ecosystems go largely unnoticed – making it an “invisible” fishery. Nevertheless, since many people are involved in this type of fishery day after day, the total amount can be quite significant.

In an attempt to “make the invisible fishery visible”, a household survey has been conducted in a total of 240 households in three provinces of the Lao PDR. Beginning in October 2006, the survey has been conducted monthly until October 2007. The findings of the survey were astonishing: about two thirds of all aquatic organisms consumed by the targeted households originated from rice-based ecosystems. Among the organisms caught and consumed regularly were fish, frogs, snails, shrimps and aquatic insects. The findings of the survey have once again underlined the importance rice fields as source of non-rice foods.

In the course of its 20th Session, the International Rice Commission the Commission not only acknowledged the importance of aquatic biodiversity but recommended to its member countries the enhancement of this resource base and to give stronger attention to the nutritional contribution of aquatic organisms in the diet of rural people.

We are now faced with a situation where an increasing global shortage of rice leads to rising prices which in turn push for increased rice production. If this is done along the traditional lines of intensification, namely the increased input of chemical fertilizers and pesticides, as well as an expansion into natural wetlands this may worsen the overall nutritional situation of the rural people because the aquatic biodiversity in natural wetlands and the rice-associated biodiversity of the rice-based ecosystems are going to be negatively affected. Ways must be found which combine the desired increase in rice production with an enhancement of the rice-associated aquatic biodiversity for the benefit of the Lao people.
Goal

Goal of the workshop is to contribute to the sustainable development of rice-based ecosystems in Lao PDR that aims at enhancing the aquatic biodiversity while at the same time increasing the production of rice.

Objectives

Objectives of the workshop are:

1. to share information and experiences on importance and management of aquatic biodiversity from rice-based ecosystems among various stakeholders;
2. to discuss good management practices which combine the enhancement of aquatic biodiversity with an increase in the production of rice;
3. to discuss the role and potential of aquatic biodiversity to alleviate malnutrition;
4. to agree on recommendations for future activities and immediate steps to be undertaken in order to achieve an enhancement of aquatic biodiversity and an increased rice production.

Expected outputs

Output of the workshop will be the workshop report. This will contain a list of recommendations for future activities and interventions directed at the Lao government, FAO, and other stakeholders.

Online Resources

To find out more on the background for the Expert Meeting, the following documents can be found online:

First Outputs of the case studies in Cambodia, China, Laos and Viet Nam: 

Recommendations of the 20th Session of the International Rice Commission: 
http://www.fao.org/ag/AGP/AGPC/doc/field/comrrice/pages/sessions.html#01

Proceedings of the Regional Workshop on Traditional Use and Availability of aquatic biodiversity in rice-based ecosystems, held at Xishuangbanna, China: 

Presentation for the 8th SBSTTA Meeting of the Convention of Biodiversity in Montreal on Utilization of Aquatic Biodiversity in Mountainous Rice-Based Ecosystems of China and Viet Nam.

RAP publication 2003/11 on an Analysis of the Role and Nutritional Value of Aquatic Resources in the Livelihoods of Rural People:
www.fao.org/DOCREP/004/AD454E/ad454e00.htm

Aquatic Biodiversity: from research evidence to national policy towards a National Agricultural Biodiversity Programme for Lao PDR 


Collection of documents related to aquatic biodiversity in rice-based ecosystems in the Lao PDR: [http://h1.ripway.com/LaoDocs1/start.htm](http://h1.ripway.com/LaoDocs1/start.htm)

Flyer on aquatic biodiversity and human nutrition – the contribution of rice-based ecosystems: [http://h1.ripway.com/LaoDocs2a/Flyer5_FINAL_s.pdf](http://h1.ripway.com/LaoDocs2a/Flyer5_FINAL_s.pdf)

Video on aquatic biodiversity and human nutrition – the contribution of rice-based ecosystems: [http://h1.ripway.com/LaoDocs2a/html/start.htm](http://h1.ripway.com/LaoDocs2a/html/start.htm)
# Workshop Agenda

**Wednesday, June 4, 2008**

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<th>Time</th>
<th>Session</th>
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<tr>
<td>08:00 – 09:00</td>
<td><strong>Registration</strong></td>
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<td>09:00 – 09:30</td>
<td>Opening ceremony</td>
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<tr>
<td>09:30 – 09:45</td>
<td>Opening remarks (NAFRI or DLF)</td>
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<td>09:45 – 10:00</td>
<td>Opening remarks (FAO representative)</td>
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<td>10:00 – 10:30</td>
<td><strong>Coffee break</strong></td>
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<tr>
<td>10:30 – 10:55</td>
<td>Introduction and overview (M. Halwart, FAO)</td>
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<td>10:55 – 11:20</td>
<td>Importance of Fish and OAAs in rice-based ecosystems in Lao PDR</td>
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<td>(Khamphaeng Homsombath, LARReC)</td>
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<td>11:20 – 11:45</td>
<td>Nutrition content of selected species from Lao PDR (Penroong Bamrungrach)</td>
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<td>11:45 – 13:00</td>
<td><strong>Lunch Break</strong></td>
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<tr>
<td>13:00 – 13:25</td>
<td>Biodiversity in rice fields in Lao PDR (Dept. of Agriculture)</td>
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<td>13:25 – 13:50</td>
<td>Sustainable utilisation of rice field ecosystems (AQIP-2/DLF)</td>
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<td>13:50 – 14:15</td>
<td>More than rice itself: Rice, fish and aquatic biodiversity (IRRI)</td>
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<td>14:15 – 14:40</td>
<td>Participatory fishery monitoring: Analysis of rice field fisheries (WWF)</td>
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<td>14:40 – 15:05</td>
<td>Yield and value of the wild fishery of rice fields in Battambang Province, near the Tonle Sap Lake, Cambodia (MRC)</td>
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<td>15:05 – 15:15</td>
<td>Video presentation: Aquatic biodiversity and nutrition (MAF/FAO)</td>
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<td>15:15 – 15:30</td>
<td><strong>Coffee break</strong></td>
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<td>15:30 – 15:55</td>
<td>Development of Fisheries Legislation for Lao PDR: Rice field fisheries and related legislation (NAFRI)</td>
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<td>15:55 – 16:20</td>
<td>Nutritional deficiency in Lao people (Dept. Of Hygiene and Prevention, MoH)</td>
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<td>16:20 – 16:45</td>
<td>National Nutrition Policy for Lao PDR (Dept. Of Hygiene and Prevention, MoH)</td>
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<td>19:00 – 21:00</td>
<td><strong>Welcome dinner</strong></td>
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### Thursday, June 5, 2008

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<tr>
<th>Time</th>
<th>Activity</th>
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<tr>
<td>08:00 – 08:30</td>
<td>Summary of first day workshop</td>
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<tr>
<td>08:30 – 10:00</td>
<td>Division into two working groups:</td>
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<td>1. Improving rice field management to enhance aquatic biodiversity and</td>
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<td>2. Aquatic biodiversity and nutrition: necessary developments to</td>
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<td>overcome malnutrition</td>
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<td>10:00 – 10:30</td>
<td><em>Coffee break</em></td>
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<tr>
<td>10:30 – 12:00</td>
<td>Working group discussion continues</td>
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<td>12:00 – 13:00</td>
<td><em>Lunch break</em></td>
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<td>13:00 – 14:00</td>
<td>Group 1: Presentation of group work and discussion</td>
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<tr>
<td>14:00 – 15:00</td>
<td>Group 2: Presentation of group work and discussion</td>
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<tr>
<td>15:00 – 15:30</td>
<td>Summary of 2nd day</td>
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<td>15:30 – 16:00</td>
<td><em>Coffee break</em></td>
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<td>16:00 – 16:30</td>
<td>Way forward (DLF)</td>
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<td>16:30 – 16:45</td>
<td>Closing remarks (FAO representative)</td>
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<td>16:45 – 17:00</td>
<td>Closing remark (DLF)</td>
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# List of participants

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<tr>
<th>Name</th>
<th>Title</th>
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Annex 3 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

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Opening Remarks
Serge Verniau, FAO Representative
On the occasion of the joint DLF/FAO National Workshop
4 June 2008, Vientiane, Lao PDR

Distinguished guests, colleagues, ladies and gentlemen
I am delighted to welcome you all to the National workshop on aquatic biodiversity and nutrition from rice-based ecosystems here in Vientiane, Lao PDR.

Within these two days the delegates in this room will have the opportunity to exchange experiences and discuss a broad range of topics concerning the enhancement of the aquatic biodiversity in rice-based ecosystem. I am confident that this workshop will raise awareness on the current state of biodiversity in rice-based ecosystem in Lao PDR and come up with recommendations for future activities to be undertaken by involved agencies that aim at enhancing the aquatic biodiversity in rice-based ecosystems while at the same time increasing the agricultural productivity.

Aquatic biodiversity in rice fields has long been recognized in international fora, including the International Year of Rice (IYR) 2004, raising awareness that aquatic biodiversity in rice-based ecosystems needs to be more firmly integrated into a wide range of national, regional and international programmes to ensure that appropriate action plans on the conservation and sustainable use of these resources can be drawn up and implemented properly. More recently, in the course of its 20th Session, the International Rice Commission the Commission not only acknowledged the importance of aquatic biodiversity but also recommended to its member countries to work towards the enhancement of this resource base and to give stronger attention to the nutritional contribution of aquatic organisms in the diet of rural people.

We are now potentially facing the beginnings of a global food crisis, particularly a global shortage of rice which leads to rising prices. The rice shortage has recently become a big issue when previously rice exporting countries stopped exporting their rice. Like many other countries the Lao PDR may as well be affected by this situation. There is a rising pressure to intensify the rice production to meet global demand. Such an effort may well be accompanied by an increased use of chemical fertilizers and pesticides. This in turn will most certainly have a negative impact on both environment and human livelihood. Non-rice products of rice field ecosystems – fish, frogs, shrimps, snails and many others more - which are an integral part of the people’s daily diet as a source of protein, vitamins and minerals will also be negatively impacted by such a development.

Distinguished delegates, colleagues, ladies and gentlemen,
When we work towards an increase in the rice production, we need to work together to avoid these negative impacts while trying to jointly enhance the biodiversity and the productivity of our agricultural areas.

Thank you for your attention and may I wish you all fruitful and productive discussions.
Annex 5.1  Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

National Workshop on Aquatic Biodiversity and Nutrition
The contribution of rice-based ecosystems

Introduction and Overview

Background
- Rich aquatic biodiversity in rivers, lakes and wetlands of Lao PDR used for food, barter and income
- Rice-based ecosystems usually recognized for rice production only
- Fish and the fisheries are “invisible”
- Most fish catches are
  - in large area
  - by many people
  - regular daily activity
- Policy measures and decisions may negatively affect livelihoods
- Aim of LARSeC/DE/FAO activities: “Making the invisible visible”

Step 1 - Qualitative assessment of aquatic biodiversity in rice fields
- FAO-Netherlands Partnership Programme, Phase 1:
  - Studies on availability and traditional uses of aquatic biodiversity from rice-based ecosystems
  - Cambodia - 2001
  - China - 2001
  - Lao PDR - 2002
  - Viet Nam - 2002

Key finding: Amazing numbers of utilized aquatic species from rice fields!

<table>
<thead>
<tr>
<th></th>
<th>Cambodia</th>
<th>China</th>
<th>Lao</th>
<th>Viet Nam</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphibians</td>
<td>2</td>
<td>3</td>
<td>10</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Crustaceans</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Fishes</td>
<td>76</td>
<td>54</td>
<td>26</td>
<td>14</td>
<td>160</td>
</tr>
<tr>
<td>Molluscs</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Reptiles</td>
<td>8</td>
<td>9</td>
<td>7</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Plants</td>
<td>13</td>
<td>20</td>
<td>14</td>
<td>1</td>
<td>58</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>66</td>
<td>74</td>
<td>37</td>
<td>232</td>
</tr>
</tbody>
</table>

Policy framework – international level
The International Rice Commission (IRC) recommended that
- Member countries should promote the sustainable development of aquatic biodiversity in rice-based ecosystems and policy decisions and management measures should enhance the living aquatic resource base.
- In areas where wild fish are depleted, rice-fish farming should be considered as a means of enhancing food security and ensuring sustainable rural development.
- Attention should be given to the nutritional contribution of aquatic organisms in the diet of rural people who produce or depend on rice.

First key results ...
- About two-thirds of all the fish and the Other Aquatic Organisms (OAA) and
- >50 percent of fish caught by households come from habitats within the rice fields.
First key results...

- Amphibian catches (mostly frogs) are very high, ninety percent of these frogs come from rice fields habitats.
- Rice fields are also important for a wide range of crab and snail species, also important to the local diet, and, to a lesser extent, aquatic insects.

Nutritious value of fish and OAAs

- Apart from vitamins also the nutrient content of the consumed food items needs to be known.
- For many of the consumed organisms this information is not available.
- To address this problem, a study on the nutrient content of the major consumed species was commissioned.
- The study has been carried out in collaboration with Tromsø University, Norway.
- First findings point to particular importance of fish and OAAs for protein (amino acids), calcium, iron and zinc.

Policy framework – national level

- Incorporate information into the relevant sector policies – land use, fisheries, agriculture and National Nutrition Policy.
- Develop a specific strategy for sustainable management of rice-based ecosystems.
- Promote and raise awareness of the importance of rice-based ecosystems for the livelihood of the rural people.
- Integrate information from this study into the process of drafting the Laos Fisheries legislation, which is under preparation; first draft expected to be finished mid 2007.

Source: BF 2007

Current efforts at international level

- The Ramsar Convention is in the process of finalizing a resolution on enhancing biodiversity in rice paddies.
- This resolution will be submitted to the COP10 for adoption.
- The draft resolution calls upon the contracting parties – among other things – to:
  - identify challenges to managing the rice paddy;
  - identify farming practices and water management in rice paddies that would enhance the biodiversity, ecosystem services, and sustainability of rice paddies;
  - ensure that such farming practices and water management are implemented wherever applicable;
  - exchange information about such farming practices and water management with other rice-farming parties.

Objectives of the workshop

- To share information and experiences on importance and management of aquatic biodiversity from rice-based ecosystems among various stakeholders;
- To discuss good management practices which combine the enhancement of aquatic biodiversity with an increase in the production of rice;
- To discuss the role and potential of aquatic biodiversity to alleviate malnutrition;
- To agree on recommendations for future activities and immediate steps to be undertaken in order to achieve an enhancement of aquatic biodiversity and an increased rice production.

Have a good workshop!
Annex 5.2 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

Importance of Fish and Other Aquatic Animals in Rice-based Ecosystems in Lao PDR

Data collection:
- Field surveys (questionnaires to 12-rice farmers) of survey were conducted over 2 periods of data collection.
- Survey was conducted once a month based on the 24 hours recall.
- Being a household food consumer, respondents were asked to recall:
  - all fish and other aquatic animals (AAAs) that had come in to the household in the last 24 hours.
  - where it had come from and how it was subsequently used.
- As the field had been prepared and watered, and additional information on household members allowed
  household livestock to be calculated on a household member basis.

Data analysis: data have already been analyzed, results will be later described.

Definitions:
- Habitat within the rice fields include rice field itself, canals, ditches, ponds, natural pond within the rice
  fields area.
- Habitat outside the rice fields include rivers, streams, lakes, reservoirs, private ponds, natural ponds
  outside rice field area, forests.

Catches of fish and OAAs

- Data collection:
  - Fish farmers caught the net at season (May/October): 40% of all fish caught through the water way.
  - In terms of per cent distribution, flathead catfish had highest catches representing 50% to 100% comparing
    to Steckel and New Khorung provinces.

- In terms of quantity collected, arhintonana fish.

- Overhead picture is showing the rice, both supplementary double the catches of Steckel and New Khorung
  had the most catches.

- In terms of quantity collected, arhiponana fertilizer

- Overhead picture is showing the rice, both supplementary double the catches of Steckel and New Khorung
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  had the most catches.
Annex 5.2 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

Species and biodiversity

- 46 fish species were identified, 77 species were caught within rice fields
- Crinidae species and Cladocera were most commonly encountered than any other species
- Marsupiomyase and Cladocera were also commonly found
- Very few species of Crustacea were identified — only 2 crustacean species
- 9 mollusc and 3 mite species were identified, but no actual species of aquatic insects were identified

Household consumption

- Fish (fresh) are consumed in the greatest quantities, followed by amphibian, molluscs, pork, and aquatic insects
- Consumption of fresh fish (brown fish) was the most frequently eaten source of animal protein
- Average fish (fresh) consumption per adult equivalent unit:
  - 0.7 kg/year
  - 0.7 kg/year
  - 0.7 kg/year
  - 0.7 kg/year

Concluding Remarks

- It is clear that fish and other aquatic animals are very important to households in the MRB.
- The study has clearly demonstrated the importance of rice-based ecosystems for enhancing biodiversity, which contributes to the conservation and sustainable use of aquatic resources.
- The vast majority of households rely on their own farming activities for their own household consumption needs.
- The importance of rice-based ecosystems in terms of their contribution to livelihoods and nutrition cannot be overstated.
- As it is particularly noted that the rich aquatic biodiversity in rice fields, in terms of number of species and their abundance, is dependent on good management practices.
Nutritional Composition of Aquatic Species in Laotian Rice Field Ecosystems: Enhancing Aquatic Biodiversity

Mullia Norhasan, Edel Elvavoli, David Jamas
Rennong Barmungrah

Increasing population needs more rice

Food security in Laos is generally synonymous with rice availability. Rice production in Laos rose 10% from 1.5 million tonnes (1990) to 2.6 million tonnes (2004).

Objectives of the study

- Gain knowledge on the nutritional value of the Aquatic Animals most consumed by Laotian.
- As an important element to assess the contribution of nutrients in AA to the diet of the average households.
- Understand the impact of ecosystem biodiversity to nutritional diversity.

Steps

Data collection Sampling

Food preparation Laboratory analyses Discussion

Sampling Activities

Community Arrangement and Market Sampling

Interview

Sampling; 21-30 August 2007

Champasak – southwest
Savanakhet – southern
Annex 5.3 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

### Food Items Analyzed

- Swamp eel (Monopterus albus)
- Walking catfish (Clarias australis)
- Small apple snail (Pila sp.)
- Big apple snail (Pila sp.)
- Fermented rice water (Fermented)

### Laboratory Analysis

- **In NIFH**
  - Protein
  - Vitater
  - Fat
  - Ash
  - Amino Acid
  - Faty Acid
  - Vitamin A

- **In NIFES**
  - Ca, Fe and Zn

### Proximate Composition

In general the measurements show that food items analyzed contained:

- high protein
- low fat
- high ash

### Protein

<table>
<thead>
<tr>
<th>Item</th>
<th>Protein (g/100 g)</th>
<th>Ash (g/100 g)</th>
<th>Amino acids of RDA (%)</th>
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<tr>
<td>Swamp eel</td>
<td>16.1</td>
<td>4.0</td>
<td>25.1</td>
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<tr>
<td>Walking catfish</td>
<td>10.2</td>
<td>1.8</td>
<td>21.4</td>
</tr>
<tr>
<td>Snakehead murrel</td>
<td>18.4</td>
<td>3.0</td>
<td>34.8</td>
</tr>
<tr>
<td>Small apple snail</td>
<td>12.2</td>
<td>7.0</td>
<td>32.4</td>
</tr>
<tr>
<td>Big apple snail</td>
<td>11.6</td>
<td>7.0</td>
<td>23.0</td>
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<tr>
<td>Fermented rice</td>
<td>17.1</td>
<td>5.0</td>
<td>10.3</td>
</tr>
<tr>
<td>Cricket</td>
<td>18.2</td>
<td>2.0</td>
<td></td>
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</tbody>
</table>

**Total: 37.8 + 7.5 + 29.0 + 14.0 = 88.3 %**

### Amino Acids

- **Total protein availability in Asian developing countries is almost half that of developed countries.**

- **The essential amino acid tyrosine is lacking in many areas of the world where diets are heavily based on cereals (FAO, 2008).**

### Champasak-2 x RDA level

- Savannakhet-80 percent x RDA level

(2356 mg/day with average body weight 60 kg)
Annex 5.3 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

**Padek**
- Homemade padek contained higher nutrient values than market sold padek.
- Padek contained high quality protein and essential amino acids (lysine).

**Fatty Acids**
- Not a good source of fat and fatty acid.

<table>
<thead>
<tr>
<th>Consumption of Fish OAA and padek in Champasak</th>
<th>Omega 3 (mg/kg)</th>
<th>Omega 6 (mg/kg)</th>
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</thead>
<tbody>
<tr>
<td>Fish</td>
<td>45.5</td>
<td>205</td>
</tr>
<tr>
<td>Bivalve and crustacean</td>
<td>103</td>
<td>21.6</td>
</tr>
<tr>
<td>Amphibian</td>
<td>56.4</td>
<td>56.4</td>
</tr>
<tr>
<td>Padek</td>
<td>21.6</td>
<td>21.6</td>
</tr>
<tr>
<td>Fortified Fish</td>
<td>110</td>
<td>261.6</td>
</tr>
<tr>
<td>Total</td>
<td>230.4</td>
<td>376</td>
</tr>
</tbody>
</table>

4% of AI for linoleic acid (17 g/day)
15% of AI for α-linolenic acid (1.6 g/day)

**Minerals**
- Animals eaten with bones/carapace contained high calcium.
- The analyzed food items are potential sources of calcium.

**Iron**
- Iron deficiency is the most common nutritional disorder in the world, including Laos PDR (FAO 2003).
- The analyzed food items are good sources of iron.
- Snails contain the highest level of iron.
- Cricket is also a potential source of iron.

**Zinc**
- Laos PDR has a high prevalence of stunting (42.4 percent, IZINC, 2008).
- Zinc content of the items analyzed was similar to comparable zinc level presented in CFOD 2002.
- Snails and crickets contained high level of zinc.
- Consumption in Champasak could cover up to 84.6% of AI zinc.

**Vitamin A**
- In general fish and OAA analyzed are not good sources of vitamin A.

**Conclusion**
- Fish and OAA are good sources of protein and amino acids (esp. lysine), calcium, iron and zinc.
- Not the best source of lipids, and vitamin A.
- Methods of preparation influence the nutrient content.
- Homemade padek was always a better nutrient source than market padek.
- Further research on padek and cricket is needed.

**Acknowledgements**
- UN FAO
- University of Tromso
- NAFRI
- LARREC
- NIFES
- Mahidol University
Annex 5.4 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

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1. ដំណើរការ ការងារ និងបណ្តាញ
2. ការប្រកត្តិបត្ដិការការងារ
3. ការសំណង់សម្រាប់ការបង្កើតប្រភេទសម្រាប់ការងារ

II. ការធ្វើការ ការធ្វើការ និងការធ្វើការ

• សារព័ត៌មានប្រចាំឆ្នាំ សារព័ត៌មានប្រចាំឆ្នាំ (FAO Int. Country Programme for IPM in vegetable in South and Southeast Asia)
• សារព័ត៌មានដោយការប្រឈមប្រការ (Biodiversity Use and Conservation Asia Program-EUCAP)
• សារព័ត៌មានអំណាច (Promotion of Organic Rice)
Annex 5.4 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

• Thematic area
  - Aquatic biodiversity and nutrition from rice-based ecosystems
  - Enhancing biodiversity and agricultural productivity

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- โครงการพืชผลและพืชเศรษฐกิจ
  - โครงการพืชผลและพืชเศรษฐกิจ

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Programmes for Inter Country Programme in Vegetable in South and Southeast Asia

- โครงการพืชผลและพืชเศรษฐกิจ
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Survey project
SURE
(Sustainable Utilization of Rice Field Ecosystem)

Phase 1: Rice field ecosystem in Vientiane plain
(June 2007 – March 2009)
Interim report

Implementing agencies

- Main agency:
  Aquaculture Improvement and Extension Project
  Phase 2 (AQIP2), DLF

- Collaborating agency:
  Volunteer student groups and the Center for 
  Environment and Development Studies, National 
  University of Laos (NUOL group)

- Aiding agency:
  Nagase Environment Foundation and NARC, Japan

Objectives

- To make a list of animals and plants living in rice field ecosystem
- To collect information on utilization of animals and plants in rice field ecosystem by the people
- To raise awareness of the people on the importance of rice field ecosystem
- To build human capacity on ecological survey and awareness raising activities

Target site

20 villages in Nxaithong district, Vientiane Capital

Activities

1. Collection of aquatic animals and plants by 20 primary school children at each target village

Fishing gears to collect aquatic animals

2. Awareness raising campaign on rice field ecosystem protection

2.1. Activities by NUOL group

2.2. Tools for the campaign

notebook
T-shirt
Activities

3. Sorting of collected organisms and keeping samples
4. Taxonomical Identification of samples

Activities

5. Interview survey to villagers on utilization of aquatic animals and plants
6. Training on survey method, sample making and taxonomical identification of aquatic organisms by Japanese experts

Results-1
Collected fishes: Cyprinidae

Results-2
Collected fishes: Other than Cyprinidae

Results-3
Collected fishes: Other than Cyprinidae

Results-4
Collected insects
Annex 5.5  Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

Results-5
Collected insects

Results-6
Collected insects

Results-7
Collected other animals

Results-8
Collected other animals

Results-9
Table: Collection of aquatic animals per village

Results-10
Table: Results of interview survey by NCOIL group

Results of interview survey by NCOIL group
Season of collection of aquatic animals by villagers

Thank you very much!
Annex 5.6  Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

More Than Rice Itself: Rice, Fish, and Aquatic Biodiversity

Gary Jahn
International Rice Research Institute

Kevin Kamp
Swiss Development and Cooperation

- Avoid the "conflict" mentality of agriculture vs environment.

We can do both!

Presentation outline

- Goals
- Rice situation in Lao PDR
- By Ecosystem:
  - Irrigated
  - Upland
  - Rainfed lowland
- Aquatic resources assessed
- Intensification Strategy & Issues
- Strategy for aquatic biodiversity enhancement

Rice Production, Area, and Yield in Laos 1980-2000

The present situation

Arable Land in Laos

Goal: Increase rice production and biodiversity

A regional issue

Biodiversity Conservation Landscapes

Upland Strategy

<table>
<thead>
<tr>
<th>Rice</th>
<th>Biodiversity enhancement strategy</th>
<th>Anticipated impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortened fallow and crop rotations for upland rice</td>
<td>Increases quantity and quality of water resources, e.g. water storage, and fringes in tributaries, micro-watershed</td>
<td>Reduced slash and burn, increased forest cover, reduced erosion, increased access to water and food aquatic resources</td>
</tr>
<tr>
<td>Parity-rice in relation with PM</td>
<td>Increase water utilization, connected areas to perennial channels, wetlands, micro-watershed</td>
<td>Increase use and access to fish, frogs, aquatic plants</td>
</tr>
<tr>
<td>Managing with improved varieties, PM, and nutrient management</td>
<td>Increase aquatic ecosystems, fish, frogs, aquatic plants</td>
<td>Increase frogs, fish, aquatic plants, aquatic plant insects</td>
</tr>
</tbody>
</table>
Annex 5.6 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

Irrigated Rice

- Major products:
  - Modern rice varieties
  - Introduced fish, e.g. tilapia
- Intensification issues:
  - Pesticides
  - Fertilizer
  - Water use

Irrigated rice: tactics for diversity

- Ecologically friendly canals
  - Not a “clean” cement conduit
  - Has subaque
  - Serves as a natural habitat to plants, animals, insects

Rainfed Lowlands

- Major products:
  - Traditional rice varieties
  - Frogs
  - Mollusks, e.g. snails
  - Crustaceans, e.g. crabs, shrimps
  - Insects, e.g. water bugs
  - Wild fish
  - Aquatic plants

Rainfed Lowland Rice Intensification Issues

<table>
<thead>
<tr>
<th>Intensification Method</th>
<th>Potential Impact on aquatic biodiversity</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varietal improvement</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td>Water management</td>
<td>Positive</td>
<td>Connect wetland to rice paddy</td>
</tr>
<tr>
<td>Nutrient management</td>
<td>Negative, if too much nitrogen</td>
<td>Avoid excess nutrient, use IPM</td>
</tr>
<tr>
<td>Pool Management</td>
<td>Negative if using pesticides</td>
<td>Use IPM</td>
</tr>
</tbody>
</table>

Regulated dry season fish catch in WETLANDS

Rainfed Lowlands: Tactics for Agrobiodiversity Enhancement

- Bring the biodiversity into the rice paddy and use the rice paddy to increase agrobiodiversity.
- Connect riparian zones and wetlands to rice paddy thru channels.
- Community regulated use of wetlands
- Pits or rings for reservoir, collection, micro habitat enhancement.
Annex 5.6 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

Summary of strategy to intensify rice and enhance aquatic biodiversity

- Preserve current wetlands
- No expansion of wet season rice area
- Intensify wet season rice
- Link wetlands to rice paddies
- Expand dry season area, enhancing aquatic habitats for biodiversity, e.g. eco-friendly canals (ecology & economic)
- Sustainable production in uplands with systems to capture water and link to wild resources
**Annex 5.7 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity**

### ARL Xe Kong Basin Project
**Participatory Fishery Monitoring**
- Analysis of Rice Field Fisheries

**Information Collected Includes:**
1. Fish Habitats
2. Fish Species
3. Occurrence of migration and spawning
4. Seasonality of fishing
5. Fishing Gears
6. Levels of Yield
7. Consumption vs. sale
8. Location of fishing

**Analysis for Rice Field Fishery**
- "Rice Field Fishery" includes rice fields and adjacent flood plain water bodies (ponds, ditches, streams)
- 3 villages (15 Households) included in the analysis – (2 villages did not have rice fields, practice upland cropping)
- Initial look at 3 months of data (Sept to Feb) – Survey and Analysis is not complete

**Data Collected**
- 412 data entries recorded
- 119 data entries from rice field environments (29%)
  *Roughly represents effort*

**Catch**
- Total of 529.8 kg reported
- 143.5 kg reported from rice fields (27%)

**Fish Species**
- Total of 79 species reported
- 23 (29%) species reported from rice fields, including 5 non-fish aquatic animals

---

5 Locations Across the Xe Kong Basin
Annex 5.7 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

Fishing Gears
- Total of 16 gears reported as used
- 10 gears reported as used in rice fields

Market/consumption
- 46% (243 kg) of over-all catch sold
- 45% (64.6 kg) of rice field catch sold

Conclusions and Comments
- The rice field fishery represents a significant portion of the fishing effort and capture fishery production in many villages.
- The aquatic biodiversity in rice field environments includes a wide range of aquatic animals.
- Aquatic animal production from rice field environments make up a significant part of the diet in households included in this study.

Thank You
Annex 5.8 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity
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Wet-season ranfed rice, traditional 5-7 months

Methods

- Weigh and measure catches by fishers – from ricefields and other habitats in 25 hectares pots (500 x 500 m) to estimate catches (kg/ha/season). (4 times/month for 7 months; July - February).
- Pump 1 hectare ricefields dry to estimate standing crop (kg/hectare of fish and OAAs). (2 times during Sept-Nov).
- Collect market prices for fish and OAAs from Battambang market.
- Interview fishers about socio-economic aspects.

Objectives

- Estimate catch (yield) – kg/ha/season
- Estimate standing crop – kg/ha
- Estimate value of the catch ($/ha)

Other studies' estimates are per household or are very approximate for area, not easy to compare with agricultural data on production.
- Evaluate the significance for Mekong basin fisheries yield generally.
Annex 5.8 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

About 47% of total catch was from traps.
About 25% of all catches by hock and line, most by set lines.
Annex 5.8 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

About 10% of the catch was from cast nets.
Fishing activities

- Most effort and catch is in Oct-Nov when rice is vegetative, not during the recession.
- Fishing complements other activities.
- Fishing provides food prior to big catches from Tônò Sap – Great Lake recession.
- 82% males, 90% >15 years.
- Most households, 1-2 persons fishing.

77% of catch is fish, 35 species, black fish are dominant

23% of catch is other aquatic animals – OAAs, 6 main taxa

Carnivores are dominant

Value

- Prices $0.05-$1.36/kg Mean $0.87/kg
- Large carnivores >$1.20/kg
- Omnivores, crabs, snails low value

Catch (yield) 25 ha

Standing crop in ricefields (1 ha plots)

- Mean 65 kg/ha (40-86 kg/ha)
- Consistent with catch estimate
- About 30% OAAs and more carnivorous fish than in catches
- Growth rate of fish 2-4 cm/month
- Most fish are small, in 1st year of life
Implications for basinwide yield

- Wet-season planted rice is the largest area of aquatic habitat in Cambodia and the Mekong basin.

- Fisheries yield from ricefields is probably underestimated everywhere. In Cambodia yield could be 33,600 km². 10 t/ha = 336,000 tonnes/year. In the LMB, ricefields habitat covers at least 140,000 km².

- For any large-scale assessment, land-use data include other habitats within ricefields because resolution is typically ≈ 25 ha. Ricefield habitat is typically 1.5 x ricefield planted area.

Opportunities to increase fisheries yield

- Ricefield habitats offer the greatest opportunities to increase fishery yield, e.g., via traditional trap/tumble pond systems.

- Black fish and frogs should be given more attention, multiple benefits:
  - Indigenous, little management needed, so loss of crop area, simple to build trap ponds and improve connectivity to increase production,
  - Fewer possible benefits such as pest control,
  - Black fish and frogs are not affected by oxygen depletion, and are more valuable and culturally acceptable than introduced omnivores (as used in rice-field systems),
  - They are easier and can be transported alive, no need for refrigeration.

Constraints to increasing ricefield capture fisheries production

Any project developing rice-fish production should take into account that:

- The wild fish are state-owned, common property and targeted by numerous farmers who lack access
- Land holdings are small and fragmented, management of farming systems, including the fisheries, and security of production are problems.
- Capital costs, e.g., of pond construction and management.
- The level of production is not well understood.
- The 10% rule for ‘tooth’

If these constraints are not overcome we will see increasing problems with nutrition, food security and livelihoods. Population is continuing to grow, e.g., in Cambodia now about 4 million.
Development of Fisheries Legislation for Lao PDR

Rice field fisheries and related legislation

Objective of the law is to facilitate the development of the fisheries sector (capture fisheries and aquaculture) to contribute to poverty reduction, food security, and economic growth in Lao PDR through the sustainable utilization of aquatic resources and the promotion of adaptive and effective management mechanisms.

Fisheries Legal Framework

Article X – fishing in rice fields
In circumstances where an area is flooded, any person may fish in submerged rice fields without permission if water level is high enough to cover the bunds of the field.

Fisheries Legal Framework

Article X – Ownership of aquatic organisms
Stocked fish belong to the field owner. The owner of the field has inherent right to catch the wild fish and OAA. Other fishers must receive permission to harvest wild fish and OAA on private property from the owner.

Fisheries Legal Framework

Article X – Ownership of aquatic organisms
In situations where the rice field is flooded and wild fish and OAA are moving across the floodplain, the field owner is no longer entitled to exclusive fishing rights to the field, and permission to fish on private land is not required.

Fisheries Legal Framework

Development of fisheries legislation began in September 2007

• Single legislation for capture fisheries and aquaculture
• Consultative process with support from FAO
Annex 5.10 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

Presentation outline

1. Introduction: Central role of nutrition in development
2. Nutrition, diets, economic growth in the Lao PDR
3. Consequences of malnutrition
4. Need for prioritizing nutrition
5. Conclusion: Cooking up the future

Linking growth, diets, nutrition

Increased incomes

Better hygiene

Purchasing power

Improved diets

Reduction of malnutrition

Economic growth

Stunting: 41% nationwide

Underweight: 38% nationwide

Acute malnutrition and underweight

Wasting: 7% nationwide

Meaning: Stunting refers to long-term malnutrition. It’s when a child is shorter than the standard for its age.

Meaning: Underweight refers to short-term malnutrition. It’s when a child is lighter than the standard for its age.

Chronic malnutrition

Immediate causes for malnutrition

Micronutrient deficiencies

Anemia

VitA deficiency

Copper deficiency

Iodine deficiency

Nutritional Status

Diseases

Nutrient intake

Source: Data from ICPFP of the World Food Programme (WF1) and WHO (2008). WHO standards used in ICPFP (2008). WHO standard used.
Annex 5.10 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

Staples

- Glutinous rice 0.4
- Non-glutinous rice 1.3
- Cassava 0.7
- Maize 0.6

Staple consumption is sufficient. Calories alone are not sufficient for adequate nutrient intake.

Meats, fish, OAA, oil/lard

- Wild meat
- Cattle
- Sheep
- Poultry
- Fish
- Oil/lard

Wild meats, fish, OAA as important as domestic meats but are wild foods are increasingly under threat.

Vegetables and fruits

- Green leafy vegetables 0.7
- Fruits 1.7
- Olified 2.0
- Vegetables 3.0
- Mushrooms 1.3

Low fruit consumption and limited bioavailability of fat-soluble nutrients due to low fat intake.

Trends in stunting of children <5 yrs

- 47.3%
- 40.7%
- 41.2%
- 1993 PPF
- 2000 MCS I
- 2006 MCS III
- 28%

Trends in poverty and economic growth

- 48%
- 33%
- 34%
- 1992/93
- 1997/98
- 2000/03
- 2015
- 8.8%
- 7.8%
- 2001
- 2006
- 2020

Economic growth

Consequences on the individual

- Risk factor for increased mortality, poor cognitive and physical development
- Malnourished children might do badly at school and most likely have low productivity in adulthood
- Their full potential for well-being and poverty reduction cannot be used.

Consequences on the whole nation

- Malnutrition
- Economic growth

Malnutrition effects the growth and development of the individual, but also constrains socioeconomic development.

Challenge 2020

- Nutritional well-being
- Economic growth
- 2020
Annex 5.10 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

Making nutrition central in development...

...through increased inter-sectoral cooperation, commitment and priority investment.

New partnerships and links

...innovative agricultural production
...biodiversity and forest management
...nutrition education at all levels
...hydropower
...mining
...poverty reduction
...economic growth, trade, investments
...social inclusion

Conclusion

The cost of inaction is high, both economically and morally; the cost of action is modest by comparison. Solutions are affordable, cost-effective and sustainable.
Annex 5.11 Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

National Nutrition Policy

Government Consensus Meeting
January 11, 2008

Chapter I:
1. Background

The NNP should encourage the Lao government to assure that socio-economic development will be translated into the parallel reduction of malnutrition and poverty of all ethnic groups in the Lao PDR.

Chapter I:
2.1. The nutrition and poverty link

Despite socioeconomic development and poverty reduction there are still significant differences in poverty and unemployment between upland and lowland rural remote and urban areas ethnic groups women and man.

Making malnutrition reduction new corollaries in poverty reduction requires long-term priority investment by the government in alliance with the international organization and the private sector.

Chapter I:
2.2. Current nutritional status

- Children’s nutritional status is a good reflection of a country’s health status
- The major problem is chronic malnutrition
- Stunting is very high and remains largely unchanged over the last 10 years
- Especially vulnerable are children in remote upland areas and non-Ta ethnic groups.

Chapter I:
2.2. Current nutritional status (continued)

- Chronic malnutrition (stunting): 41% (children under 5)
- Underweight: 30% (children under 5)
- Wasting: 7% (children under 5)
- Anemia: 37% (women reproductive age)
- UIA: 45% (children under 5)
- iodine deficiency: 27% (school-aged children)
- Vitamin B1 deficiency (BerIBer): vulnerability and affected incidences in case studies.

Chapter I:
2.2. Nutritional status

Consequences of malnutrition:
- Diminished learning ability
- Reduced work capacity
- Hampered economic growth
- Increased risk for infection
- Greater risk to death.

Chapter I:
2.3. Constraints and challenges

- Priority investments in economic growth, limited in nutrition programming and surveillance
- Lack of institutionalization of nutrition within the GoL (lack of a Nutritional Institute, Nutrition Center) and low capacity (number of staff, trained)
- Lack of active nutrition networking between development sectors: agriculture, education, environment, forestry, trade, industry - apart from health.
Annex 5.11: Aquatic biodiversity and nutrition from rice-based ecosystems: enhancing biodiversity and agricultural productivity

Chapter 1: 2.3. Constraints and challenges (continued)

- Narrow concept of food security with too strong focus on calorie intake, neglecting other nutritional guidelines.
- Lack of programming in nutrition and in dietetics (e.g., hospitals) together with inaccurate monitoring and evaluation (M&E).
- Low understanding of the diverse food cultures (knowledge, belief, and practices) of the various ethnic groups.

Chapter 1: 2.3. Constraints and challenges (continued)

- Ethnic and linguistic diversity creates communication challenges for information and education campaigns.
- No compensation for the destruction and loss of wild food resources in local diets and its negative impact on nutrition by national and international investors in the field of agro-business, hydropower, mining, etc.

Chapter 1: 2.3. Constraints and challenges (continued)

- Limited access to and availability of arable land and contamination with UKG.
- Lack of understanding of the long-term impacts of other development policies (stabilization of shifting cultivation, land use planning and allocation, relocation and village consolidation, energy production) on food and nutrition security.

Chapter 1: 3. Rationale and need for a NNP

Three causal levels:
1. Individual level: Immediate causes
2. Community level: Underlying causes

Chapter 1: 3. Rationale

- Root causes of malnutrition: poverty, inequality, lack of nutrition knowledge
- Need to tackle the problem at all three causal levels and of all sectors through efficient cooperation and coordination.

Chapter 1: 4. Legislation related to the National Nutrition Policy

- The NNP makes special reference to Article 3 in the Constitution.
- The NNP will also follow the directions identified during the 8th Party Congress.
- Lao governmental laws, policies, strategies, and regulations are detailed in the Appendix (4).
- International conventions (MDG 1: “The right to food”) are detailed in Appendix (5) and will be covered in the NNP.

Chapter 1: 3. Need

- It is imperative that every level within the Lao PDR, within the civil society and within their organizations actively take up their respective roles and responsibilities.
- Urgent action at household, community, and national levels is paramount.
- Involving different Ministries, ministerial equivalent organization, various stakeholders of key sectors, and other social institutions are very crucial.

Chapter II: 1. Goal

The overall goal of the National Nutrition Policy is to substantially reduce levels of malnutrition, especially of vulnerable groups, and to mainstream nutrition in national socio-economic growth and poverty reduction policies and strategies.
Chapter II: 2. Objectives

The National Nutrition Policy formulates ten objectives. Appendix (3) gives an overview:

1. Sufficient, balanced and varied food intake
2. Reduction of food and water borne diseases
3. Sufficient intake and equal food access and food availability
4. Improved mother and child care and nutrition education
5. Improved environmental health
6. Improved and comprehensive child welfare framework
7. Establishing institutional poverty nutrition co-operation mechanisms
8. Priority investment in nutrition
9. Institutionalizing nutrition in the SCL
10. Facilitating nutrition related research and information systems

Chapter II: 3. Programs

The ten objectives will be tackled in seven programs:

1. Food and nutrition (including objectives 1 and 3)
2. Care and education (including objective 4)
3. Environmental health (including objectives 2 and 5)
4. Nutrition surveillance (including objective 6)
5. Nutrition advocacy (including objectives 7, 8, and 10)

Chapter II: 4. Definition of terms

Definition of Nutrition:

Nutrition is defined as the science related to food and the relationship between food and nutritional well being determined by the way our bodies take in and use food through body metabolism and nutrient absorption. The definition also includes food composition, dietary guidelines (for different age groups, special physiological needs, and different physical activities), and the roles that various nutrients have in maintaining health.

Chapter II: 5. Target by 2020

<table>
<thead>
<tr>
<th>Data</th>
<th>Chronic Malnutrition (stunting)</th>
<th>Target by 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>50% (2000)</td>
<td>15%</td>
</tr>
<tr>
<td>Anaemia in WRA</td>
<td>37% (2000)</td>
<td>15%</td>
</tr>
<tr>
<td>Anaemia in CUS</td>
<td>45% (2000)</td>
<td>20%</td>
</tr>
<tr>
<td>Vitamin A deficiency</td>
<td>45% (2000)</td>
<td>20%</td>
</tr>
<tr>
<td>ECD in school children</td>
<td>27% (2000)</td>
<td>10%</td>
</tr>
<tr>
<td>ECD in WRA</td>
<td>15% (2000)</td>
<td>8%</td>
</tr>
<tr>
<td>Infant mortality</td>
<td>2% (2000)</td>
<td>1%</td>
</tr>
<tr>
<td>Undernourishernity</td>
<td>15% (2000)</td>
<td>5%</td>
</tr>
</tbody>
</table>

Chapter II: 6. Scope

This National Nutrition Policy is targeting all people of the Lao PDR with special focus on the following vulnerable groups:

1. Ethnic groups living in rural and/or remote upland areas with high levels of stunting
2. Women of reproductive age (focus on pregnancy, puerperium, and lactation) and children (focus on early childhood before 2 years, children under five years, school age children)

Chapter III: 1. Strategic principles

The policy will apply the following strategic principles:

1. Prioritized targeting
2. Decentralization
3. Integration and effective cooperation
4. Institutionalization nutrition within GoL
5. Capacity building
6. Awareness and cultural sensitiveness
7. Empowerment of gender
8. Sustainability and resilience
9. Prevention and treatment
10. Accountability
11. Surveillance
12. Cultural identity
Chapter III: Rights and responsibilities

The Ministry of Public Health will be assigned as the lead agency for overall coordination and effective implementation of the National Nutrition Policy.

Chapter III: Institutional partnerships within the GoL and the private sector

Key partnerships include:
- Health
- Agriculture
- Education
- Planning and investment
- Mass organization (women, youth and trade)
- Lao Front for National Construction
- National Commission for Mother and Child
- Justice
- Industry and Trade
- Information and Culture
- Water resource and environment
- Land Management Authority
- Energy and Mining and others...

Chapter III: Institutional partnerships within the GoL and the private sector (continued)

- With the approval of the National Nutrition Policy, a National Nutrition Committee (NNC) will be established under the leadership of the National Commission on Mother and Child (NCMC). The National Nutrition Committee will comprise of various GoL key partners.
- A nutritional network at central, provincial and district level will also be established.

Chapter IV: Implementation

After the endorsement of the National Nutritional Policy, immediate action should be taken:

1. The Ministry of Public Health in coordination with relevant key sectors shall disseminate the NNP and shall cooperate with relevant key sectors to continue to draft the National Nutrition Strategy and Action Plan (specific details for each relevant sector).

2. Various ministries, ministry equivalent organizations, Provinces, vulnerable regions, Capitals, shall subsequently implement the National Policy through effective coordination.

Thank you for your kind attention.