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A fallow rice field in Hai Thuong village

A participatory case study on Nutrition and Aquatic Resources in Quang Tri Province, Central Viet Nam

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Wild aquatic resources play an important role in the food security of rural poor people living in rice-based ecosystems. It is the wet rice cultivation area that provides the habitat for a variety of living aquatic resources such as fish, molluscs, crustaceans, reptiles, insects and plants. Rice farmers catch and collect aquatic animals in rice fields and surrounding water bodies and use them for their own consumption as well as for livestock feed, spices, green fertilizer and medicine.

This article contributes to the activities initiated by the FAO Inter-Departmental Working Group on Biodiversity, analyzing the existing agricultural biodiversity resource base and developing recommendations for the sustainable utilization of the given resources[1].

The first results of studies conducted in Cambodia and China showed an impressive variety of aquatic plants and animals and gave evidence to concentrate attention towards the often unrecognized importance of this aquatic biodiversity for the livelihoods of the rural poor[2]. One of the main findings indicated the nutritional role in terms of quantity and quality of the wild inland aquatic resources and raised the objective to get more detailed information on the consumption patterns.

The nutritional value of aquatic resources

Farmer families in rice-based production systems rely in their daily diet on rice as their main food. This may lead to an unbalanced

diet, lacking sufficient animal proteins and fats. Therefore fish and other aquatic animals are an important source not only of protein but also of essential fatty acids, which deliver a high amount of energy, allow the solution of important vitamins and provide the components that are particularly important for neurological growth and development of skin functions (Oller do Nascimento/ Oyama 2003).

In the daily nutrition a minimum supply of fat as it can be given due to the consumption of aquatic resources is necessary for healthy infant growth and is especially important for pregnant and lactating women.

Analyzing the diets of rice farmers should therefore consider the positive potential of wild aquatic resources providing cheaply a diversity of nutrients to poor rural farmer households.

Nutrition and aquatic resources in Quang Tri Province, Central Viet Nam

In collaboration with a poverty alleviation programme financed by the Finish Ministry for Foreign Affairs and the Vietnamese Ministry of Planning and Investment, the FAO Inland Water Resources and Aquaculture Service (FIRI) conducted its latest study on this issue in December 2003 combining health and nutrition considerations with the consumption and culture of aquatic biodiversity in the rice producing agro-ecosystem of Quang Tri Province, one of the poorest provinces in Central Viet Nam.

The Quang Tri Rural Development Programme (QTRDP) aims at the poverty alleviation and the sustainable improvement of rural people's livelihoods. In order to achieve this goal a study was initiated to analyse the food and nutrition situation in the villages situated in Quang Tri Province, with special attention to signs of malnutrition within the group of children under 5 years.

QTRDP, in collaboration with FIRI, designed the study with particular focus on the utilization of wild aquatic resources including environmental aspects influencing the availability of this living resource base.

The study was conducted following a participatory approach assessing the rural people's nutrition and health status and their use of the available aquatic resources. Specific attention was given to their self-perception related to poverty and malnutrition and discussions within groups offered the possibility to reflect on causes and possible problem solutions.

The study included three elements: a household questionnaire, anthropometric measurements of mothers and children under five, and focus group discussions. The communes were randomly selected, giving 5 communes in the remote, by ethnic groups inhabited and particularly poor Dakrong district, 2 communes in the lowland Hai Lang district and 1 commune in Cam Lo district. Per selected commune a sample of 15-30 percent of the total number of households was randomly chosen.

Poverty and food insecurity in Viet Nam

Viet Nam has the highest malnutrition rate among adults and children of the countries in South East Asia (FAO 1999). Malnutrition and food insecurity are signs of absolute poverty. Thereby the definition of poverty has been enlarged from income determinants to the question whether people have the opportunities and capabilities to satisfy their basic needs such as food security and hygiene. The detection of children being the most vulnerable group to malnutrition has led to use the status of child nutrition as one of the 5 Human Poverty Indices (UNDP 1997). Malnutrition of children is usually measured by three anthropometric indices: underweight (weight for age), stunting (height for age) and wasting (weight for height). These three indices show the existence

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Arrival of the project team at Hai Le Health Center

of chronic (stunting) and acute malnutrition (wasting) and prove that the basic nutritional needs of a children are not satisfied (Reinhard/ Wijayaratne 2002).

In Viet Nam the prevalence of underweight among children under 5 years of age is 31,8 percent, that of stunting is 34,8 percent and that of wasting is 9 percent (Figure 1). According to WHO criteria these rates indicate important public health problems.

Adults are also strongly affected by malnutrition as indicated by the average Body Mass Index (BMI) value which is with 19.1 very low. 40 percent of the population, both men and women, do not meet the BMI of 18.5, which is the threshold value for underweight. Only a negligible proportion of the population is overweight or obese (NIN/UNICEF 1998).

Food insecurity and malnutrition are caused by various factors such as poor health, inadequate food supply and lack of access to food. It would be misleading to consider the access to food only by people's power of purchase i.e. the annual per capita income. As the aquatic biodiversity studies prove, the use of natural resources caught or collected from the wildlife are an important food source and should especially not be underestimated in remote areas where often due to bad infrastructure a lack of food supply prevails. Wild aquatic resources are particularly important in the food security of the very poor people who don't have the necessary income to satisfy their nutritional needs by purchase.

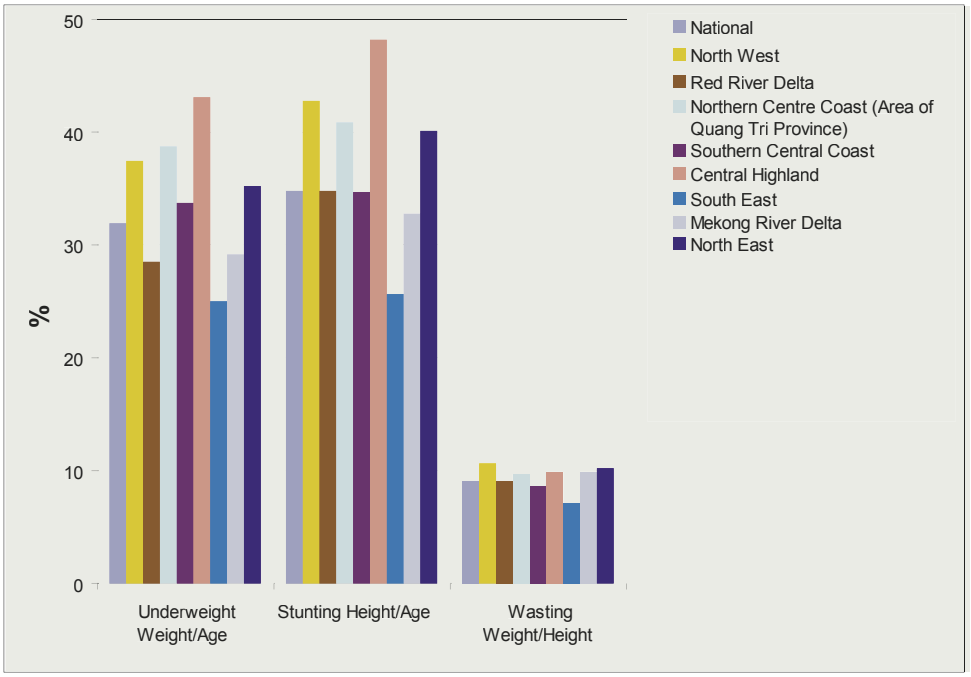
Results

Nutritional status: malnutrition and food shortage

The study results show a high level of malnutrition in all districts but especially in the remote mountainous Dakrong area (Table 1). In comparison with the regional data in Figure 1 (Northern Centre Coast) the study results show in Hai Lang and Cam Lo a *lower* or *equal* percentage of children suffering from acute and chronic malnutrition. The percentage of wasting is even only a third of the data indicated in Figure 1. In contrary to this Dakrong district shows compared to the national and regional data a *very high* rate of acute and chronic malnutrition. Only in some Dakrong communes the share for wasting is lower than the regional and national average. It is also in these remote communes that the importance of wild aquatic resources is estimated much higher than in the richer lowland areas. The malnutrition data did not show any significant difference of prevalence between female and male children.

Most of the households in the various districts suffer from rice shortage up to 5 months per year with the remote Dakrong area having even higher numbers of households who experience up to 8 months of rice shortage. In Dakrong

Figure 1. Anthropometric status of children (in %) under five years of age in different regions of Viet Nam



Source: NIN 2002

Table 1. Nutritional status of children under 5 years of age in the 3 study districts by severity and commune (in %)

Districts (number of children measured)	Hai Lang (241)		Cam Lo (50)	Dakrong district (282)					Regional average (data 2002)
Communes/ Indicators of malnutrition	Hai Thuon	Hai Le	Cam Lieu	Trieu Nguyen	A Ngo	A Bung	Huc Nghi	Ta Long	
Underweight Weight/age	11.9	30.2	28	45.8	46.2	64.6	50.0	39.3	38.7
Severity (low-very high)	medium	very high	high	very high	very high	very high	very high	very high	very high
Stunting Height/Age	20.1	29.5	42	44.7	53.8	68.8	61.5	50.0	40.9
Severity (low-very high)	medium	medium	very high	very high	very high	very high	very high	very high	very high
Wasting Weight/Height	3.0	3.8	2	6.3	7.7	14.6	6.4	10.7	9.7
Severity (low-very high)	low	low	low	medium	medium	very high	medium	medium	medium

Table 2a. Consumption frequency (%) of fish and other aquatic organisms among the surveyed households in **Hai Lang district**

Hai Lang (n=70)	**Never**	**1x /month**	**2-3x /month**	**1x /week**	**2-5 x /week**	**Every day 6-7x/week**	No answer
Fish	2.9	-	1.4	5.7	61.4	18.3	10.3
Snakes	84.3	8.6	4.3	-	-	-	2.8
Snails	45.7	21.4	8.6	10.0	1.4	1.4	11.5
Field crabs	54.3	15.7	7.1	5.7	4.3	-	12.9
Shrimps	5.7	1.4	4.3	4.3	67.1	4.3	12.9
Insects	92.9	1.4	1.4	-	2.9	0.1	1.3
Frogs	60.0	7.1	4.3	5.7	1.4	-	21.5

Table 2b. Consumption frequency (%) of fish and other aquatic organisms among the surveyed households in **Cam Lo district**

Cam Lo (n=35)	**Never**	**1x /month**	**2-3x /month**	**1x /week**	**2-5 x /week**	**Every day 6-7x/week**	No answer
Fish	-	2.9	-	8.6	71.4	17.1	-
Snakes	94.3	-	5.7	-	-	-	-
Snails	68.6	8.6	8.6	-	2.9	-	11.3
Field crabs	51.4	2.9	8.6	11.4	11.4	-	14.3
Shrimps	20.0	8.6	5.7	25.7	37.1	-	2.9
Insects	88.6	-	-	5.7	2.9	-	2.8
Frogs	62.9	2.9	5.7	8.6	8.6	-	11.3

Table 2c. Consumption frequency (%) of fish and other aquatic organisms among the surveyed households in **Dakrong district**

Dakrong (n=158)	**Never**	**1x /month**	**2-3x /month**	**1x /week**	**2-5 x /week**	**Every day 6-7x/week**	No answer
Fish	1.3	21.5	27.8	10.1	33.5	5.1	0.7
Snakes	87.3	5.1	3.2	-	0.6	-	3.8
Snails	26.6	27.8	16.4	5.1	9.5	-	14.6
Field crabs	46.2	20.9	10.8	4.4	1.3	-	12.4
Shrimps	21.5	23.4	19.6	8.9	11.4	-	13.2
Insects	58.2	11.4	12.0	4.4	4.4	0.6	9
Frogs	48.1	21.5	9.5	5.7	1.3	-	13.9

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Interview on household food consumption

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Farmers draw the availability of aquatic resources in a village map

reported coping strategies include the use of other staple foods (cassava), gathering wild biodiversity and the reduction of the number of meals. Unlike households in Hai Lang and Cam Lo district, who mostly reduce the food amount and try to get loans in periods of rice shortage.

Consumption preferences and quantities

Fish is a very common food and proves to be the most consumed aquatic animal, with 79 percent of the households in Hai Lang (Table 2a), 88,5 percent in Cam Lo (Table 2b) and 38 percent in Dakrong district (Table 2c), eating fish twice or more times per week.

Fish is among the various aquatic animals the most preferred food, indicated for its good taste, easy availability and healthy qualities. The study shows that taste is in general the main reason for consuming aquatic animals, and most of the households say that they eat snakes for their healthy qualities and frogs, insects and field crabs because of their easy availability.

Frogs are part of the villagers' diet with 38 percent in Dakrong, 18.5 percent in Hai Lang and 24.8 percent of the households in Cam Lo.

Field crabs are mentioned to be consumed by 37.4 percent of the households in Dakrong, 32.8 percent of the households in Hai Lang, and 34.3 percent in Cam Lo.

Snakes are in all districts rarely eaten whereas insects are a basic food of almost the half of the households in the mountainous Dakrong district

Analysing the average consumption of aquatic animals per household and day in terms of weight, the study results show that households in Hai Lang and Cam Lo district consume more fish, crabs and shrimps than the households in Dakrong district. Insects, snails and frogs though are consumed in higher quantities in Dakrong than in Cam Lo or Hai Lang district (Table 3).

Compared to the amount of other eaten aquatic organisms, fish is the most consumed animal with an average of 370 gram per day in Hai Lang (with an average household size of 5 persons) district, and 260 gram in Cam Lo (with an average household size of 5 persons) and 260 gram in Dakrong district (with an average household size of 6 persons).

Child nutrition and aquatic resources

A high percentage of women report to feed their children between 4 and 12 months of age, with fish, small shrimps and field crabs.

Table 3. Consumption of aquatic organisms (in kg) per day per household (average household size: 5 persons)

	Aquatic resources amount (kg)						
District	**Fish**	**Snakes**	**Snails**	**Field crabs**	**Shrimps**	**Insects**	**Frogs**
Hai Lang *(n=70)*	0.39	0.08	0.05	0.05	0.2	0.03	0.03
Cam Lo *(n=35)*	0.26	0.03	0.04	0.15	0.21	-	0.06
Dakrong *(n=158)*	0.26	0.02	0.24	0.10	0.17	0.06	0.08

In Hai Lang district up to 80 percent of the households stated to prepare 2-5 times per week the children's food with fish and 64 percent with small shrimps. A difference can be noted between the richer and poorer districts, with only 30 percent of the households in the poorer Dakrong district feeding their children with fish twice or more times per week.

Compared to other studies there was no particular evidence that pregnant women were avoiding the consumption of aquatic food (Meusch *et al.* 2003). In some cases it was stated that the consumption of animals that were already dead when purchased, and the consumption of sour food (lemon etc.) was believed to harm during pregnancy.

Purchase versus wild aquatic resources availability

More than half of all households catch and collect various aquatic animals such as fish, frogs, snails, mussels, snakes and insects.

Fish caught in the wildlife plays not only a role for the own consumption but also for the generation of income with 9 percent of the households in Cam Lo and Hai Lang districts selling fish from the wildlife on the market, and more than 75 percent of the households in the remote Dakrong district selling fish and other aquatic resources from the wildlife directly among each other in the villages.

Most of the households get their fish and shrimps from the market, except from the households in the remote Dakrong district where many of the households collect fish and shrimps from the wildlife for their own consumption. Other aquatic animals such as snakes, snails and frogs are in all districts mainly collected from the wildlife, especially by the households in Dakrong.

Focus group discussions revealed that the importance of purchasing fish and other aquatic animals have become more important during the last years as, although being surrounded by rivers and ponds, the availability of the wild aquatic animals has decreased impressively over the last ten years.

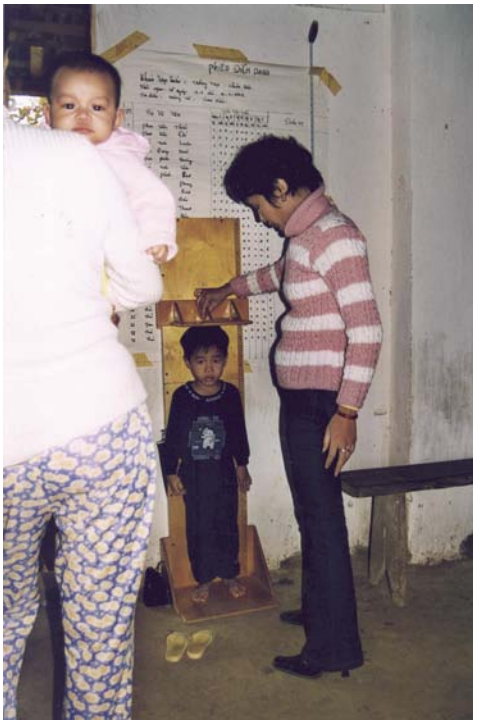
Traditional knowledge and division of labour

With regard to the activities involved in the utilization of wild aquatic animals the study shows that fishing is mainly done by men and children, whereas women and children collect the various aquatic organisms during their work on the fields.

It is mostly the women who sell the aquatic animals at the market and prepare the daily meals. They own the traditional knowledge of food preparation such as the typical fermentation to fish paste. Most households in the lowland areas boil the fish and other aquatic animals whereas the mountainous ethnic groups use to grill or ferment their catch. Fish proves to have an important traditional role at the celebration of festivities and is a main component of the menu at special events in the survey area.

Decline of wild aquatic resources

The participants of the discussion groups indicated an average of 40 different fish species known to them from the wildlife and partly used for aquaculture activities. Nevertheless they feel that the availability of aquatic resources in the wildlife is declining and that they have more difficulties to catch or collect wild aquatic animals compared to ten years ago. The villagers state that possible reasons are the more intensive use of pesticides and herbicides in the agricultural production and confirm growing demand because of an increase of the population over the years. Furthermore the output of the group discussions shows that in most of the districts unsustainable fishing methods such as electro-fishing, poisoning



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Low body height as an indicator for chronic malnutrition

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A day's catch

and the use of mosquito nets for fishing are practiced, endangering the stocks and reproduction capacities of the aquatic animals.

Conclusion

The study shows that the given aquatic biodiversity in rice-based production systems contributes to an important extent to the food security of the rural population in Quang Tri Province. The anthropometric data reveal that the negative nutritional status, caused by malnutrition and poor hygiene, is particularly dominant in the remote mountainous areas. People in these communes are more exposed to staple food shortage and rely to a big extent on wild resources with low purchase power and bad connection to market infrastructure.

The richer lowland areas Hai Lang and Cam Lo are less exposed to rice shortage, and have better infrastructure and better access to extension and micro-credit schemes. These communes are therefore less vulnerable to periods of household food shortage and can afford to purchase aquatic resources and to rely on a much lesser extent than people in Dakrong district on what is available in the wildlife.

The study reveals a drastic decline of the aquatic resources over the last years in the survey area, a result which confirms the observation of similarly conducted studies in other SE Asian countries with rice-based ecosystems (Halwart M. 2003b). Consequently development activities that focus on the alleviation of malnutrition and poverty should include the consideration of these resources in agricultural management decisions and aim at their conservation and sustainable use. Further studies are needed to better understand the nutritional value of aquatic biodiversity for rural people and to assess how this value can be better used for increased food security in various ecosystems without compromising the natural resource base[3]. The pressure on wild aquatic resources could be reduced *inter alia* through the further development of aquaculture activities and their integration into agriculture. This offers an important potential to improve the household's income and food security, for which property rights and women's work load have to be carefully considered and incorporated in an equitable plan of agri- and aquaculture management. On the community level management activities may have to address the improvement of irrigation facilities and the better use of already existing aquaculture infrastructure.

[1] The aquatic biodiversity activities have been co-sponsored by the FAO Netherlands Partnership Programme (FNPP).
[2] A compilation of the study results can be found in: M. Halwart 2003a, M. Halwart 2003b and T. Balzer and P.&S. Pon 2002.
[3] Further studies on nutrition and aquatic resources have been recommended by the International Rice Commission at its 20th Session (FAO 2002), and by FAO/NACA 2003.

Ca Thu a traditional way of fish preservation

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Ms Fleischer joined the FAO Inland Water Resources and Aquaculture Service (FIRI) in February 2003 as a consultant to assist in the implementation of the Service's programme on aquatic biodiversity, especially through the FAO Interdepartmental Working Group on Biodiversity. Her consultancy is supported through the FAO/Netherlands Partnership Programme on Biodiversity. In FIRI Ms Fleischer contributes to an awareness-raising campaign on the importance of aquatic biodiversity in rice-based ecosystems, nutritional aspects of aquatic biodiversity and the responsible use and control of alien species in fisheries. Currently she is focusing on updating the FAO Database on Introductions of Aquatic Species (DIAS).