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# Assessment of Fish Ponds in Vangkhone Village, Bualapha District, Khammouane Province, Lao PDR

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**Photo credit**

GIZ-HinNamNo/Thomas Wiedenmann

**Text**

Contributions of the contractor, Thomas Wiedenmann and Lorjong Lorfaijong, do not necessarily represent the position of GIZ.

On behalf of the  
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**Contents**

1. Introduction .....	3
2. Participants of the mission.....	3
3. Methodolgy .....	3
4. Results .....	4
4.1 General description of the state of the fish ponds and fish rearing .....	4
4.2 Location of the fish ponds.....	5
4.3 Basic data about the fish ponds .....	6
4.4 Portraits of fish raising pond owners .....	6
5. Findings .....	10
6. Lessons learned .....	11
7. Recommendations .....	12
References.....	13
Annex 1 – Checklist for the pond survey.....	14

## 1. Introduction

In 2012 the project “Nature Conservation and Sustainable Resource Management in the Hin Nam No Region” started to support interested households of Vangkhone village with the set-up of fish ponds. The area around Vangkhone village, located closely to the so-called Phanob Choekpoint, is highly disturbed from intensive bombing during Vietnam War. The result is a landscape with many bomb craters that were evaluated as suitable for raising fish in the past (Lutz, 2011).

Available documentation about all the support and input that has been provided since 2012 is probably not complete. But in 2011 Mr. Paul David Lutz did a consultancy for IP Consult and he mentions in his “Rural income generation survey report” the option of establishing fish ponds in Vangkhone village. The same consultant then recommends the establishment of fish ponds in another report called “Rural Income Generation Consultancy Report” from 2012. An undated paper called “Piloting Aquaculture in Ban Vangkhone”, probably written after September 2013 under the lead of IP Consult, mentions a training and study tour and the initial set-up of 5 fish ponds.

Due to the leave of IP Consult from the project in 2016 the aim of the present mission was to assess the existing livelihood development activities in order to develop plans for the future and for the identification of follow-up needs. Before heading to Vangkhone the team of the Livelihood Development Unit did not have much more information, than a list with names of the fish pond owners.

The visit of Vangkhone village was done with the following objective:

- Get to know the current situation of fish production in the **fish ponds** of Vangkhone village.
  - a. Check if the fish ponds are still used and identify how many families are participating.
  - b. Find out if they do produce fish and what are the inputs.
  - c. Inquire if the villagers have basic figures of fish production, especially about household consumption and selling.
  - d. Investigate about the species composition in the ponds.
  - e. Get to know the challenges for the villagers.

## 2. Participants of the mission

Livelihood Unit of Hin Nam No NPA: Mr. Sipaseurth Nasay, Mr. Soulideuan Xaysanaphomma

GIZ staff: Mr. Thomas Wiedenmann, Mr. Lorjong Lorfaijong

Fish pond owners: Mrs. Khoune, Mr. Vy, Mrs. Thee, Mr. Khao and Mr. Kataai

## 3. Methodology

The team of Hin Nam No NPA livelihood unit and GIZ-staff visited Vangkhone village on 21 of January 2018. First, a joint meeting of the Fish Conservation Zone Committee, head of village and the fish pond owners was held in order to explain the aim of the visit and inquire some general information in order to get familiar with the situation of the fish ponds, e.g. identify/ get to know the persons (families) that are working with fish

ponds, inquire about the quantity of individual fish ponds, let villagers freely explain their activity of rearing fish and the history of it. Then, the fish ponds were visited individually together with the owners. One-on-one interviews provided the necessary data, according to a previously developed checklist (Annex 1 – Checklist for the pond survey). GPS data and a photo of each owner were taken, additionally.

## 4. Results

### 4.1 General description of the state of the fish ponds and fish rearing

Based on the explanations of the villagers during the initial meeting the state of rearing fish and the performance of the fish ponds can be summarized as an extensive, natural food and supplementary feed-based polyculture production system, in stagnant water ponds.

There are a total of 13 actively managed fish ponds in Vangkhone village run by 5 households (but during the meeting the villagers just mentioned 11 ponds). The ponds are around the houses of the owners or within close proximity. The individual owners claim to be proprietaries of the land but the aspect of tenure was not investigated in depth. All 5 households received training about setting-up and maintaining a fish pond, as well as a training on reproduction of fish in order to breed fry and raise own fingerlings, in 2012. A refresher training was provided in 2015/ 2016 (personal information from IP Consult, confirmed by the villagers). So far, only 1 household (Mr. Kataai) started fish breeding and has the technical equipment and the capacity to raise fingerlings for selling. This person built his own hatchery. In the past, this household already could sell fingerlings and generated a total income of 3 Mio LAK, so far. The other households buy fingerlings from a trader from Savannakhet province or from Mr. Kataai. The external trader visits the village during the dry season and the households can place their orders. Fingerlings are then delivered and released to the fish ponds in June/ July. The fingerlings are delivered in plastic bags. The price is 20.000 LAK per 1 bag which contains 100 fingerlings. The price of the fingerlings from Mr. Kataai is 50.000 LAK per 1 bag containing 100 fingerlings. The difference of price could not be explained, but the local demand seems to make it possible, although it is not exactly clear to whom Mr. Kataai sells his fingerlings, because during the individual interviews the other families only reported to buy from the external trader.

The villagers grow an undefined mixture of the following introduced fish species<sup>1</sup>:

- Pa Pha – “Javanese carp”
- Pa Nin – “Tilapia”
- Pa Kinja – “Gras carp”
- Pa Ketleb – “Silver carp”
- Pa Douk – “Catfish”

Further species that find their way into the ponds during the rainy season or by any other means can also be found. Mainly, fish are fed with rice husk/ rice bran, animal waste (dung), insects (e.g. termites, termite larvae, and termite eggs), home-grown plants/ greens and 1 family also buys special fish food<sup>2</sup>. Consumption and selling of fish can start around 1 year after the release of fingerlings. Although the fish are still small in size

<sup>1</sup> Note: The names of fish species are locally used terms. The exact species are not known to the authors. Basic translations were found through internet research; but these names might not be correct necessarily.

<sup>2</sup> During the field visit different bags of floating pellets from “INTEQC Group Thailand” could be seen/ were shown to the surveyors. Namely, the products “Fish First” and “Fish Mate”, both declared as “floating pellets for catfish and large herbivorous fish”.

(10-15 cm), locally it is considered as an appropriate size, already. It is not uncommon to have fish of different ages and sizes in one pond. Some owners empty, clean and disinfect their ponds with lime powder on a certain routine (rather unclear in terms of time intervals), but most do not. Theoretically, all the ponds can have water all year long. Even during dry season these ponds do not have to fall dry. Every rainy season the owners face difficulties because of flooding. If water levels get too high, then fish can escape. Except one fish pond of Mr. Kataai for raising fingerlings, no fish pond has any technical protection (fencing with nets, dike, lifted dam, etc.) against flooding and the prevention of escapes.

The time and labour that the owners have to invest depends on the number and size of the ponds and intensity of care but a figure could not be recalled or remembered. Mr. Kataai probably can be considered as “very busy” with his ponds, and the other families as “not so busy”.

When it comes to fish health and hygiene nobody applies any additional measures, except Mr. Kataai who vaccinates the fingerlings and disinfects his ponds, as he learned during the training. The lime powder for disinfection can be bought or ordered in Thakhek. The pharmaceutical product for fish vaccination was provided during the training and Mr. Kataai has still some left.

None of the fish pond owners keeps any written record of inputs or outputs of their ponds. Information they can provide is what they can remember at the moment of an interview.

In September 2017 the whole area of Vangkhone village was affected by the typhoon “Doksuri”. Flood levels were exceptionally high and according to the villagers most fish from all ponds, including fingerlings escaped. After the typhoon the fish ponds had to be started again, in some cases wild fish remained in the ponds after the flood. However, this information is rather contradictory, as later the individual pond operators mentioned that they feed and raise fish at the moment, but they did not release new fingerlings since the typhoon.

## 4.2 Location of the fish ponds

The following table provides the reference locations for the fish ponds of the 5 households.

Name of owner	Latitude	Longitude
Mr. Khao	17°30'33.93"N	105°43'24.57"E
Mr. Vy	17°30'28.94"N	105°43'21.38"E
Mrs. Thee	17°30'29.60"N	105°43'19.95"E
Mr. Kataai	17°30'32.70"N	105°43'21.95"E
Mr. Khoun	17°30'47.23"N	105°43'19.53"E

Table 1: Reference GPS data for the ponds.

All these fish ponds are located next to or around the houses of the owners. These are the ponds that are intentionally managed, somehow. As can be seen on the aerial photo below (Photo 1) there are many more water-filled bomb craters around the village but these craters are not taken care of on purpose. Normally, for raising fish on purpose in a bomb-crater the crater has to be emptied by using a pump, dug out to increase its depth, cleared of possible UXO, and disinfected by applying lime powder, at least. This was done with the 13 fish ponds supported by the project. All the other bomb craters around Vangkhone village are not taken care of, at all. What role these craters play for occasional fishing or collecting of aquatic wildlife, is unclear. During the time of the inspection it could be seen that several of these craters along the road were marked with poles and flags by an UXO demining team, meaning these craters are contaminated with unexploded ordnance.



Photo 1: Location of the fish ponds in Vangkhone village. Ngo River in the East, the road from Langkhan to Boualapha in the North-West. Further bomb-craters are spread all around the village, especially North and West, as indicated by the arrows.

### 4.3 Basic data about the fish ponds

The following Table 2 shows basic data about the fish ponds at Vangkhon village.

	Name of owner	No. of ponds	Average depth (m)	Approx. surface (m <sup>2</sup> )	Introduced fish species	Year of establishment
1	Mr. Kataai	8	3	5.000	Silver carp, Javanese carp, carp, tilapia, pa dokchan	2013
2	Mr. Khao	1	3	90	Carp, tilapia, silver carp	2013
3	Mrs. Thee	1	2	300	Carp, tilapia, Javanese carp, grass carp	2013
4	Mr. Vy	2	2	300	Carp, tilapia, Javanese carp, pa dokchan	2013
5	Mrs. Khoune	1	2	100	Tilapia	2013
<b>Total</b>		<b>13</b>		<b>5790</b>		

Table 2: Basic data about the fish ponds.

The 5 households that received support in the past work on a total of 13 ponds. In sum, about half a hectare of fish ponds are supposed to serve for rearing fish.

### 4.4 Portraits of fish raising pond owners

#### 4.4.1 Mr. Khao



Photo 2: Mr. Khao next to his pond.

Mr. Khao started to work with 1 fish pond around 5 years ago (2012/ 2013). The pond has a surface of approx. 90m<sup>2</sup> and an average depth of 2.5m - 3m. Calculated volume is 270m<sup>3</sup> (90m<sup>2</sup>\*3m).

In the past “Pa Nai”, “Pa Ketleb” and “Pa Nin” were released, but at the moment there can be found at least 7 more species, e.g. “Pa Kor”, “Pa Douk”, “Pa Kheng”, “Pa Kaar”, “Pa Xiu”, “Pa Khao” and “Pa Eeau”. Currently, the pond is under operation but fish are just growing. No harvest. 500 fingerlings (5 bags of fingerlings) were released in July 2017 (before the typhoon) with an investment cost of 100.000 LAK (20.000 LAK/ 100 fingerlings). Mr. Khao provides mainly insects/ termites and 1 bag (10 kg) of rice husk per week as fish food. Rice husk costs 10.000 LAK per bag (10kg).

Until December 2017 the pond served for household consumption and around 1kg/ day could be harvested, but it is not clear for how long. The last harvest for selling was in 2015 which provided an income of 700.000 LAK. With a price of fish of 30.000 LAK/ kg this equals roughly 20 – 25 kg of fish that were harvested on a yearly basis. Currently, Mr. Khao still struggles with the damages from typhoon Doksuri, as many of his fish escaped with the flood. He does not apply reproduction techniques, because he has only 1 pond. Raising and releasing fingerlings with only 1 pond is technically not possible. He would have interest and available space for extension. But his economic situation does not allow him to invest in building a hatchery and paying for operational costs, e.g. electricity for the aeration of fish tanks. It would cost him around 1 Mio. LAK.

Given the provided data an estimation of income and benefits of his fish pond looks the following for 1 year:

Number of ponds and productive surface	1 pond, 90 m <sup>2</sup>
Yearly production of 20 - 25 kg of fish with a value of 30.000 LAK/ kg	700.000 LAK
Stocking of 500 fingerlings (5 bags) with a cost of 20.000 LAK/ bag	-100.000 LAK
Monthly food-supplement (rice husk) worth 40.000 LAK	-480.000 LAK
<b>Cash income/ year</b>	<b>+120.000 LAK</b>
<b>Additional income in kind (household consumption) of unknown quantity, worth 30.000 LAK/ kg</b>	unknown

With his fish pond Mr. Khao can earn around 120.000 LAK/ year, plus fish for household consumption.



Photo 3: Mr. Vy between his two ponds.

#### 4.4.2 Mr. Vy

Mr. Vy owns two fish ponds that he started to operate in 2013. The two ponds next to his house are around 100m<sup>2</sup> and 200m<sup>2</sup> large, respectively. With an estimated depth of 3m of both ponds, Mr. Vy has 900m<sup>3</sup> of volume for raising fish. In July 2017 he released 1500 fingerlings (400 fingerlings to the small pond, 1100 fingerlings to the larger pond) that he purchased from Savannakhet at a price of 20.000 LAK per bag. He released “Pa Nin”, “Pa Dokchan”, “Pa Nai” and “Pa Park”. But he also has “Pa Douk”, “Pa Ketkhang”, “Pa Eean”, “Pa Kadeud”, “Pa Khor”, “Pa Xiu” and “Pa Kheng” that found their way naturally into his pond. He considers his ponds operational but at the moment fish still have to grow

and he does not catch any fish. Mr. Vy estimates and knows from experience that he could produce 20 kg of fish per year. In the past he got 600.000 LAK for selling his one year harvest at a price of 30.000 LAK per kilogram. That happened last time in 2016. He used to harvest fish for household consumption as well, but he cannot remember how many kilograms. Last time he harvested fish for household consumption in April 2017. As supplement-food he provides 1 bag (10 kg) of rice husk per month and he also uses cow dung which is for free. Mr. Vy can realize that his ponds are not performing well and besides flooding there are suspected problems of turbidity and water contamination (unknown from what). This results in slow growth of his fish. To apply the techniques he learned in the trainings he feels too old and not confident enough.

In the case of Mr. Vy the calculation of benefits is the following:

Number of ponds and productive surface	2 ponds, 300 m <sup>2</sup>
Yearly production of 20 kg of fish with a value of 30.000 LAK/ kg	600.000 LAK
Stocking of 1500 fingerlings (15 bags) with a cost of 20.000 LAK/ bag	-300.000 LAK
Monthly food-supplement (rice husk) worth 10.000 LAK (1 bag)	-120.000 LAK
<b>Cash income/ year</b>	<b>+180.000 LAK</b>
<b>Additional income in kind (household consumption) of unknown quantity, worth 30.000 LAK/ kg</b>	unknown

Mr. Vy would be able to earn 180.000 LAK per year, plus an unknown amount of fish for household consumption.

#### 4.4.3 Mrs. Thee



Photo 4: Mrs. Thee in front of her pond.

Mrs. Thee tries to maintain one fish pond. She started the pond in 2013. Approximate volume of the pond is 400m<sup>3</sup> (200m<sup>2</sup>\*2m). In 2013, she introduced about 1,500 fingerlings that were supported by IP consult. The following species were released by that time: Javanese carp, carp, tilapia and grass carp. Other fish species that she can find in her pond are Pa Khao, Pa Kadeud, Pa Khor, Pa Douk, Pa Eean, Pa Kheng and Pa Xiu. In 2015 she harvested 20 kg of fish and sold them for 600,000 LAK (30,000 LAK/kg). Additionally, the pond supplies fish for household consumption but she does not remember how much. As supplementary-feed she provides 10kg of rice husk per month. Sometimes termites and dung

are provided as well. Her pond was affected by flooding from the typhoon Doksouri in 2017 and some of her fish escaped. As the fish pond is only 2m deep it falls dry every year around May or June. She also participated at the fish reproduction training in 2015, but she never applied the techniques because she did not understand well.

Number of ponds and productive surface	1 pond, 300 m <sup>2</sup>
Yearly production of 20 kg of fish with a value of 30,000 LAK/ kg	600,000 LAK
Stocking of 1,500 fingerlings (15 bags) with a cost of 20,000 LAK/ bag	-300,000 LAK
Monthly food-supplement (rice husk) worth 10,000 LAK (1 bag)	-120,000 LAK
<b>Cash income/ year</b>	<b>+180,000 LAK</b>
<b>Additional income in kind (household consumption) of unknown quantity, worth 30,000 LAK/ kg</b>	unknown

Mrs. Thee could earn 180,000 LAK per year, plus an unknown amount of fish for household consumption.



Photo 5: Mrs Khoune sitting next to the fish pond.

#### 4.4.4 Mr. Khoune (Mrs. Khoune)

In 2013, Mr. Khoune started to work on his fish pond. The pond is around 2m deep and covers 100m<sup>2</sup> of surface, which provides a volume of 200m<sup>3</sup>. Every year, the pond gets restocked with 500 fingerlings (tilapia) from Savannakhet. Other than tilapia, there are further species in the pond that were never released: Pa Khor, Pa Park, Pa Douk, Pa Kadeud, Pa Kapode, Pa Eean, Pa Xiu, Pa Ka, Pa Ketkheng and carp. In 2015, he could harvest 10 kilograms of fish for selling and earned 300,000 LAK (1kg = 30,000 LAK). He considers his pond as an important source for household consumption. As supplementary-feed 40 kg (4 bags) of rice husk worth 40,000

LAK are provided on a monthly basis. Fish pellets are irregularly provided, but no further details can be remembered. The pond was heavily flooded in 2017 and a part of fish escaped. Mr. Khoune would be able to extend the fish raising activity, because he has 2 more ponds available. So far, his economic situation did not allow him to do so. His worries about future flooding also make him hesitant. The techniques of fish reproduction that he could learn during the trainings are not applied. For his small fish pond he finds it more suitable to buy the necessary fingerlings.

Number of ponds and productive surface	1 pond, 100 m <sup>2</sup>
Yearly production of 10 kg of fish with a value of 30,000 LAK/ kg	300,000 LAK
Stocking of 500 fingerlings (5 bags) with a cost of 20,000 LAK/ bag	-100,000 LAK
Monthly food-supplement (rice husk) worth 40,000 LAK (4 bags)	-480,000 LAK
<b>Cash income/ year</b>	<b>-280,000 LAK</b>
<b>Additional income in kind (household consumption) of unknown quantity, worth 30,000 LAK/ kg</b>	unknown

The figure in the table illustrates that Mr. Khoune is losing money with his fish pond. Household consumption is considered as very beneficial, but data is not available. To outweigh the loss of money at least another 10 kg of fish would be needed for household consumption (calculating with a market price of 30,000 LAK/ kg).

#### 4.4.5 Mr. Kataai



Photo 6: Mr. Kataai in front of his largest pond.

Mr. Kataai started his ponds in 2013. By now, he has 8 ponds for rearing fish, 3 small ponds for fingerlings and a hatchery for breeding fry.

The 8 ponds for raising fish cover 5,000m<sup>2</sup> all together. With a depth of 3m the volume for fish is 15,000m<sup>3</sup>.

The ponds are only partially under operation at the moment but none is ready to harvest fish, nor is the hatchery. Mr. Kataai can produce up to 200kg of fish per year, and when he

sold his fingerlings in 2017 he could earn 3 Mio LAK. He sells the fingerlings for 50,000 LAK/ bag of 100 fingerlings. Thus, he could breed and raise 6,000 fingerlings in his hatchery for selling. For household consumption he estimates an additional 40 kg of fish per year. According to him he never introduced fingerlings, which is not logical as he had to start his business at some point. But he stated that to stock all his ponds he would need 15,000 fingerlings. As supplementary food he provides vegetables, grass and greens and “Man pao” (yam bean, *Pachyrhizus spp.*), all home-grown. Additionally, he provides fish pellets, worth 180,000 LAK/ month. He is the only farmer that also mentioned lime powder for regular disinfection of the ponds. The powder he has to purchase in Thakhek and he spends 500,000 LAK/ year on that. All his ponds, including the hatchery got badly affected by the last typhoon in 2017. At the moment of the field visit Mr Kataai was working on several ponds to clean and enlarge them and make them deeper. He is the only person who applies some of the techniques learned at the trainings, especially for breeding and fingerling production. He not only has enough land around his house, but he also has the will to have more fish in the future. His motivation originates from fish farms that he has seen at other locations and he wants to have the same. When working with his ponds, especially cleaning or digging deeper, he frequently encounters UXO which he has to dispose, somehow.

The simplified benefit calculation is the following:

Number of ponds and productive surface	8 ponds, 5000 m <sup>2</sup>
Yearly production of 200 kg of fish for selling (30,000 LAK/ kg)	6,000,000 LAK
Production & selling fingerlings worth 3 Mio LAK/ year	3,000,000 LAK
Supplement-food input (pellets) of 180,000 LAK/ month	-2,160,000 LAK
15,000 fingerlings worth 20,000 KIP/ 100 fingerlings	-3,000,000 LAK
Lime powder for disinfection	-500,000 LAK
<b>Cash income/ year</b>	<b>3,340,000 LAK</b>
<b>Household consumption of 40 kg worth 30,000 LAK/ kg</b>	<b>1,200,000 LAK</b>
<b>Total yearly income</b>	<b>4,540,000 LAK</b>

Mr. Kataai is able to get cash income on a constant basis. Given the size of his fish farm and the extension of his operations, there must be other expenses which Mr. Kataai does not consider, e.g. fuel for the pumps, electricity for the aeration in his hatchery, pharmaceutical products to induce spawning and for vaccination, investment of time, etc. On the other hand there might be other income opportunities that are not yet made fully use of. Especially, from the hatchery.

## 5. Findings

Reliable data about the inputs and outputs for the fish ponds are not available. Only Mr. Kataai seems to try to raise fish and fingerlings in a target-orientated way. Mr. Kataai invests time and money to increase the number of fish ponds and to achieve a constant production of fish and fingerlings. The other owners buy and release fingerlings once in a while. With the techniques demonstrated during previous trainings they do not feel familiar enough to apply them or they are not able to invest money for the improvement of their ponds and their business. If there is a surplus of fish that can be sold, these owners take the opportunity to do so. But also the ponds provide fish for household consumption which is not monitored. A proper management of fish ponds, like separated ponds for different species or different ages and sizes of fish does not exist. It is not even sure, if the mix of fish species is beneficial or concurring. It might be the case that the ponds also contain predatory fish species from the wild which feed on the herbivorous fish stocks (and released fingerlings).

Regular maintenance of the ponds, like cleaning and disinfection is not guaranteed. The production of fish can be best described as rather natural. There is a prevalent reluctance for intensification and further investment, as every rainy season the fish production is put under the risk of flooding and the escape of fish. This is especially true after the experiences that villagers made with typhoon Doksuri in 2017. Calculating with the provided numbers additional cash income is insignificant, except for Mr. Kataai. In the case of Mr. Khoun it is even negative but the amount of fish for household consumption is unknown. As a true benefit it can be seen that fish from the ponds contribute to household nutrition in all families and it might relieve some pressure from fishing at adjacent Ngo River. Compared with international standards and information that can be found online<sup>3</sup> the overall impression of the fish raising activity in Vangkhone is sub-standard. There is not only a lack of technical skills (or at least the skills obtained during the trainings are not applied<sup>4</sup>), but also of supervision and maybe personal motivation. For example, the pond of Mrs. Thee falls dry every year which gives some indication towards the latter. Basic calculations for input and output are not done, because nobody keeps records. Stocking rates and capacities of the ponds seem rather chosen by chance. It is not clear on which criteria the pond owners base their decision on stocking the ponds. It can be assumed that the quantity of fingerlings they buy is just as much as they can afford at the moment of placing their order, regardless of any calculations. Parameters about growth performance of fish (e.g. food conversion rates), and water quality (e.g. oxygen levels, organic matter, etc.) were not mentioned at all and seem to be unknown.

## 6. Lessons learned

- Yes, fish can survive and grow rather naturally in bomb craters but a professional (business) approach requires skills and personal motivation. This is only the case for Mr. Kataai at Vangkhone village.
- Raising fish and producing fingerlings can be a source of additional income, if it is taken serious and with a business minded approach, like Mr. Kataai. Any fish obtained from a fish pond for household consumption is a surplus for nutrition. If the profit that can be obtained from such an activity is high or low, probably depends on the availability of (better or worse) alternatives. It is has to be seen more in the context of local conditions and circumstances than in absolute numbers.
- Generally, raising fish the way it is done in Vangkhone can be considered as environmentally extremely friendly, as there is not much artificial input. The state of the ponds in Vangkhone is far from intensive production. But, it also has to be mentioned that maybe there could be a risk from introduced fish species that escape during rainy season and mix with the native populations of fish in the Hin Nam No freshwater ecosystems.
- Considering the consultancy input, the provided trainings, study tours, in kind support, etc. the results after more than 4 years still leave room for improvement. There is not even 1 family that could make a living from the fish ponds and only 1 person tries to improve and professionalize. As there is not much data available (especially input during the past) an in-depth analysis cannot be done with the existing information.
- Raising fish in stagnant ponds that are prone to flooding every year is probably not the best option, even if it might seem suitable during dry season. The topography of the terrain around Vangkhone does not provide locations where fish ponds would never be affected by floods. At least, if no technical measures are taken that prevent fish from escaping with the floods. The technical possibilities in order to do so would require an expert assessment.

<sup>3</sup> As a reference, the FAO Fisheries and Aquaculture Department provide a lot of online information (<http://www.fao.org/fishery/en>)

<sup>4</sup> The exact content of the training or the schedule is unknown to the author and villagers were not able to recapitulate what they were supposed to learn during these trainings.

- Year-round water supply (either ground water or by pumping water from adjacent Ngo River or by increasing the depth of the ponds) has to be secured. Otherwise, the attempt of continuously raising fish is not even worth the effort.
- Economically, raising fish should provide benefits and not a loss of resources. As households do not keep any records about their inputs and outputs, it is very hard to come up with reliable figures. In order to figure out and monitor the economic performance of each fish pond it would be necessary to keep records, somehow. As for each family the situation is different, basic calculations and considerations have to be done on an individual household basis.
- The extent to which the fish ponds contribute to food security and nutrition remains unclear. However, it is clear, that fish from the ponds are consumed on household level. But if this makes any significant change in terms of food security or improved nutrition is not known. It rather would depend on the available alternatives and considerations. For example, if fresh water ecosystems cannot provide enough fish, then the fish from the ponds would contribute to the improvement of food security and nutrition. But if enough fish can be obtained from nature, then fish from the ponds will not change the nutritional conditions remarkably. On the other hand it is supposed that catching fish at a fish pond is easier than fishing at the river. Villagers might spend less calories and maybe less time for fishing at their pond, compared to fishing at the river.
- To rear fish in an aquaculture system is not a short-term activity. Maintenance work has to be done all-year long and several parameters have to be monitored and adjusted by active intervention. To achieve considerable results several years of intensive work are necessary. And this has to be followed up regularly. From people that are not familiar with the techniques it cannot be expected that 1 or 2 trainings are enough to be able to make business. Even if willingness is strong and motivation high, constant expert supervision is necessary.

## 7. Recommendations

- A re-evaluation of topographic landscape suitability for fish ponds should be done. The guiding question has to be if the landscape around Vangkhone allows to have fish ponds at locations that are not prone to flooding every year. This would be especially of interest for possible investments in new fish ponds.
- For the existing ponds, which are flooded frequently, suitable technical measures to protect from flooding should be investigated and designed, at least if fish are supposed to be reared for more than one dry season.
- Basic means for record keeping, e.g. household logbooks for inputs and outputs should be introduced and people trained in the use. This would provide a better insight into the economic performance of the ponds. Additionally, it could enhance the business sense of people, demonstrating them if their ponds provide (economic) benefits, or if they only cause costs. Even, if the ponds would not provide cash income, it would be satisfying to know the amount (and value) of fish for household consumption.
- The exact state of the ponds and parameters, e.g. amount of fish inside (stocking rates), composition of fish species, possible hybridization resulting in e.g. stunted growth, presence of parasites, etc. are not known. Based on the information provided by the pond owners it has to be assumed that at least it would be necessary to empty the ponds once, taking out predatory species that came into the ponds with the floods and separate the age classes in order to prevent unnecessary loss of fish due to possible cannibalization. Doing so, it would be a great occasion to disinfect the ponds and increase the depth, if necessary and possible.

- One pond is not enough to rear fish, continuously. To run an aquaculture system with fish growing and fish ready to harvest on a constant basis, a minimum of 2 ponds per owner would be necessary. Or different pond owners would have to cooperate.
- Mr. Kataai could be supported and motivated to raise more fingerlings and become more skillful. He already has several ponds and a small hatchery. With a constant technical advice and supervision he could have the potential to make a living of his ponds and be an example of a successful local business.
- It might be worthwhile to consider a certain specialization of fish rearing. Rearing and selling fingerlings maybe is more profitable than just raising very common fish species to marketable size. If it is profitable for traders to bring fingerlings from Savannakhet, then locally reared fingerlings could be even more profitable. Also, certain fish species might yield higher prices than others, because they are more sought-after. Generic fish from aquaculture, like Tilapia or catfish can be found for 20.000 LAK/ kg on the market in Thakhek (the reported price at Langkhan market is a little bit higher with 30,000 LAK/ kg). Whereas for example wild catch of certain catfish species from the Mekong are sold for up to 80.000 LAK/ kg. Further inquiries would be necessary, especially to find out about the preferences and choices of customers at the market in Langkhang.
- Supposed, raising fish with a purely business-minded orientation for generating cash income, is an option that villagers are still hesitant to accept or to work for, the role of fish ponds for household consumption deserves deeper investigation. It would be interesting to know if and to which extend a family-run fish pond can contribute to self-sufficiency and nutrition. Maybe, in that sense Vangkhone village could serve as a reference for other Hin Nam No target villages and deliver necessary figures in order to think about the promotion of fish ponds in other villages.

## References

- Lutz, Paul-David. 2011: Rural Income Generation Survey Report. IP Consult, Thakhek.
- Lutz, Paul-David. 2012: Rural Income Generation Consultancy Report. IP Consult, Thakhek.
- Unknown author (probably IP Consult). Unknown year (probably after September 2013): Piloting Aquaculture in Ban Vangkhon – An alternative source of income and food security in the Hin Nam No region.

## Annex 1 – Checklist for the pond survey

Survey of fish ponds (1 data sheet per fish pond):						
Name of owner:				Date:		
GPS point of pond recorded?	Yes	No	Diameter of pond:		Average depth of the pond	
What year did the operation of the pond start?						
Fish species that are intentionally grown:						
Other species that came naturally into the pond:						
Is the pond currently in operation?		YES	NO	If the pond is not in operation what is the reason?		
Is there any commercial production of fish?		YES	NO	How many kg of fish can be produced by this pond per year?		
Last harvest for selling (month & kg):				Last harvest for consumption (month/ kg):		
How much money was made?			What is the price of fish per kg?			
Last introduction of fingerlings (date):			How many fingerlings/ how many kilo were introduced? Which species?			
What is the cost of fingerlings?						
What kind of food is provided?				How many kg/ or bags are used per month?		
How much does the food cost (per kg or per bag)?						
Any problems with disease, flood, draught, etc.						
Are fish reproduction techniques applied?				Did the owner participate at the training of fish reproduction?		YES NO
If the owner does not apply the techniques learned at the training, what are the reasons?						