



Rice-fish farming: a development lever for smallholder farming in Madagascar

Introduction

Madagascar is one of the poorest countries in the world and one of the top three countries considered the most vulnerable to the effects of climate change exacerbated by deforestation, natural disasters, chronic poverty, a high dependency on agriculture and a lack of adaptability. Madagascar ranks 154th (out of 185 countries) in the Human Development Index (UNDP 2015), having dropped 19 places between 2010 and 2014 reflecting a difficult internal economic, political and social situation.

In fact, according to international thresholds, the poverty rate is 91 per cent (INSTAT/ENSOMD 2012- 2013). According to the national poverty line, 71.5 per cent of Malagasy people are poor and 52.7 per cent are extremely poor, meaning that their resources do not allow them to meet their basic food needs. Poverty in Madagascar is predominantly a rural phenomenon mainly affecting farmers, given that almost 77 per cent of the working population is involved in agriculture.

Poverty also comes with another reality, that of the prominence of malnutrition. More than 40 per cent of infant mortality is caused by malnutrition; 47.3 per cent of children under the age of five suffer from acute malnutrition and the overall rate of acute malnutrition is 8.3 per cent (INSTAT/ENSOMD 2012-2013). Chronic malnutrition in children results in irreversible delays in physical and cognitive growth that are part of the vicious circle of poverty. Madagascar lost 14.5 per cent of its gross national product in 2013 because of malnutrition, amounting to 1,533.6 million US dollars and 66 per cent of working-age adults (15-64 years) suffered from stunting as a child, representing 8,287,508

people who were unable to reach their true potential¹.

In response to this challenge a project was launched in 2014 aimed at accelerating the spread of carp aquaculture² in the rice fields of Madagascar's Highlands (rice-fish culture) in the regions of Haute Matsiatra, Vakinankaratra, Itasy and Amoron'i Mania. The immediate objective of this project is to develop an innovative, inexpensive and far-reaching training circuit in rural areas. Secondary objectives are to both reduce household poverty by providing a source of income and contributing to the reduction of malnutrition through a targeted increase in the availability and consumption of fish. Rice-fish integration makes it possible to optimize the use of land and water resources, in addition to other available facilities, with little investment by combining the production of plant and animal products. Rice-fish farming can increase rice yields by 10 to 30 per cent and produce fish with an average yield of 205 kg/ha. In Madagascar, the actual production of fish in rice fields is an estimated 3-5,000 MT per year, but this could go up to 30 to 50,000 MT per year in 30 years with the expected impacts of combatting malnutrition and rural poverty.

Why the Highlands of Madagascar?

Several factors influenced the choice of the Highlands, the objective being to support the most fragile populations whilst increasing the initiative's chance of success.

1 The "Cost of Hunger" initiative <http://www.costofhungerafrica.com/country-reports/>
2 Carp are a suitable species for aquaculture in a relatively cool environment, a characteristic feature of the Highlands.

The fight against poverty. The project's four regions, Itasy, Vakinankaratra, Haute Matsiatra and Amoron'i Mania account for 23.3 per cent of the Malagasy population living below the poverty line (out of a total of 22 regions). Vakinankaratra and Amoron'i Mania are among the country's four poorest regions with a poverty incidence rate of 88.6 per cent and 85.5 per cent respectively. It is expected that rice-fish farming, through increased rice yields and fish production, will provide additional financial support to those families who are affected by destitution but armed with rice-growing traditions.

Acute malnutrition. Amongst the children suffering from acute malnutrition, those of the Highlands are the most affected: 65.2 per cent of children in Haute Matsiatra, 65.2 per cent in Vakinankaratra, 64 per cent in Amoron'i Mania for a national average of 47.3 per cent. Fish contains macro and micro nutrients. As such, it is recognised as being beneficial for the neurological development of newborns, when the mother eats it during pregnancy, and young children when they eat it directly³ (see SmartFICHE 27). One of the long-term objectives of introducing rice-fish farming to the Highlands is therefore the contribution to a more balanced diet. The availability and consumption of fish in these regions is poor due to, inter alia, their distance from marine production areas and overexploitation of existing water bodies.

High potential for rice-fish farming in remote areas. The Highlands have 200,000 ha of rice fields, of which, 34,000 ha would be very favourable for rice-fish farming, thus the aquaculture potential of these regions is very high.

Good social cohesion. There is potentially sufficient social cohesion to develop community strategies to prevent or limit the poaching of fish from rice paddies in these remote regions. On the other hand, experience has shown that it is very difficult to limit poaching near large cities or in areas where social cohesion is weak. The inability to prevent/limit poaching is a major contributor to project failure in the medium and long term.

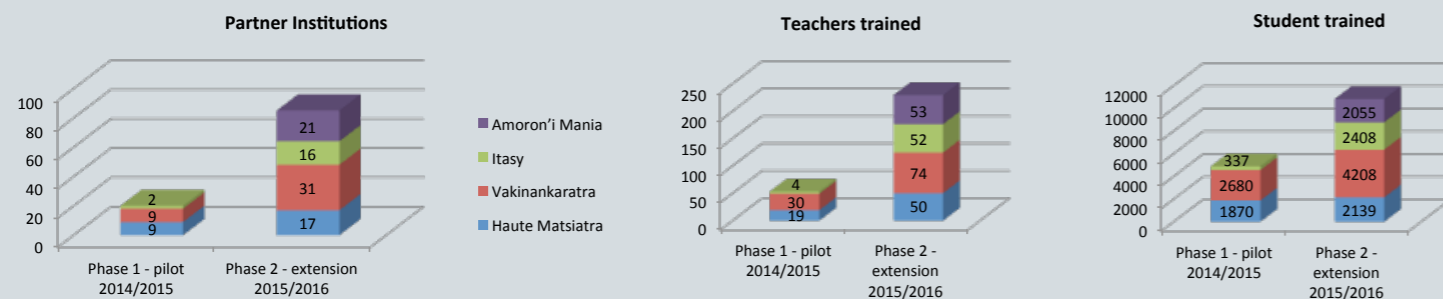
Competent human resources: The NGO, APDRA Rural Pisciculture has been supporting the development of rice-fish farming for about 10 years. Previous work carried out by this NGO, in collaboration with the Aquaculture Directorate, made it possible to start structuring the sector by developing a network of rural hatcheries and by training local technicians as a prerequisite for the development of this initiative on a larger scale. The project thus came into being with the help of their expertise and as a complement to other pre-existing and concomitant activities.

Innovation to disseminate the idea of rice-fish farming in the Highlands of Madagascar

The main idea was to invest in innovative methodologies to integrate large-scale rice-fish farming in the Malagasy system by proposing training courses in an educational project for rural colleges in the Highlands. It is expected that this approach will reach a large number of people at minimal cost since the scheme is already funded. It also makes it possible to reach out to parents, through the students, and contributes, albeit modestly, to addressing certain educational issues.

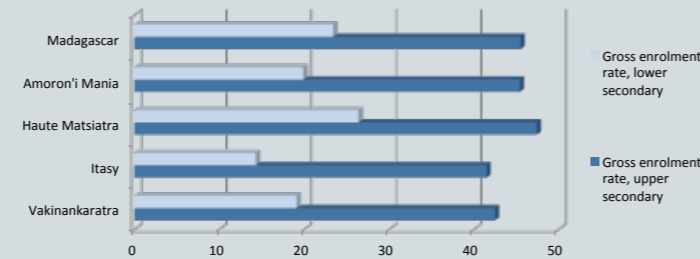
³ Haraksingh Thilsted Shakuntala, James David, Toppe Jogeir, Subasinghe Rohana, Karunasagar Iddya. 2014. Maximizing the Contribution of Fish to Human Nutrition. ICN2 Second International Conference on Nutrition Paper

Figure 2



Indeed, one of the challenges of the education sector is school dropouts. Less than 50 per cent of children go on to secondary school. Thereafter, only 23 to 25 per cent finish (or not) lower secondary school, but never go on to upper high school. In most cases, youth from rural areas drop out of the school system and end up working for the family without any vocational training. These elements, combined with the Ministry of Education's willingness to shift programmes towards more practical/vocational learning, were decisive for this project to promote rice-fish farming. These figures also explain why the project favoured a focus on lower high school rather than upper high school, in which less than 20 per cent of young people end up. (see Figure 1).

Figure 1. Enrolment rates, lower secondary school and upper secondary school



Establishing educational partnerships (Phase 1 = Pilot)

The first steps consisted of convincing regional education authorities and a number of schools (public, private and professional) to embark on the project, developing the learning tools to be used in schools and training a first group of teachers and students in carp rice-fish farming.

In order to establish educational partnerships, it was first necessary to obtain formal support from the Regional Directorates of National Education (DREN) and District Education Authorities (CISCO) in each of the regions involved.

The identification of participating schools was carried out with the DREN according to two main criteria. The first was proximity to four or five fingerling producers to ensure both competition in terms of fingerling supply and stability for the production of carp in the medium and long term. The second criterion was the voluntary commitment and motivation of head teachers and teaching staff to improve their educational project. Public, private and vocational schools were contacted to cover all types of schools in the targeted regions (see Figure 2). The initiative was launched in August 2014 and in December 2014 agreements were signed between APDRA and each of the 20 participating schools.

APDRA organized a teacher training in three of the project regions in the presence of the DREN, the Regional Directorates of Marine Resources and Fisheries, the Aquaculture Directorate of the Ministry of Marine Resources and Fisheries and the national media. The training included theoretical and practical modules as well as a presentation of



the pedagogical tools. A poster, to be put up in classrooms, and a comic strip, given to each student, were specifically developed for this initiative. With support from APDRA to develop and organize their lessons, teachers then implemented the educational project with their students in their respective schools. For the majority of the public institutions, student training, which included a mix of practical and theoretical sessions, was incorporated in Wednesday afternoon extra-curricula activities. Other institutions preferred to integrate the training in agriculture, civic education and sports education classes.

Twenty schools took part in this first phase, 53 teachers were trained who in turn, trained 4,887 students (see Figure 2).

Monitoring and evaluation

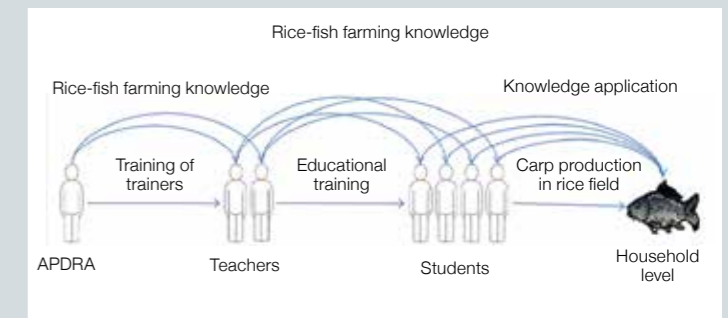
Beyond training the next generation, one of the challenges was to ensure the best transfer of knowledge from the APDRA trainers to rural households. Monitoring and evaluation functions therefore played a central role in analysing issues of understanding at each level and any loss of information throughout the learning chain (see Figure 3). Thus, a first evaluation was carried out after the initial teacher training. Subsequently, an APDRA trainer was present during theoretical or practical sessions to identify any errors or difficulties the teacher might have in presenting information to the students and to be able to go over any questions with them afterwards to improve following sessions. Finally, an individual assessment was handed in to each teacher at the end of the student training cycle.

The student's evaluation revealed satisfactory and homogeneous results, regardless of the classes, institutions and regions. After the first seven months, it was premature to expect an impact on stocking. Nevertheless, a survey of students and a sample of parents showed that: more than 75 per cent of students had discussed the training with their parents (except in Hautes Matsiatra where the rate is lower); the majority of parents questioned expressed an interest in learning or perfecting the technique and; parents already practicing rice-fish farming in these three regions had already adopted certain practices, mainly fertilization and feeding.

A third evaluation was carried out with all the partner institutions to decide which direction to take. In fact, this first phase was welcomed with great interest and a remarkable spirit of collaboration on the part of schools and institutional partners. Despite limited resources, institutions showed great responsiveness and professionalism. All partners recommended continuing and expanding the initiative, which was done with the

support of FAO through the IOC-SmartFish programme and the technical expertise of APDRA.

Figure 3. Method of knowledge transfer to start production



Expansion and development of the initiative (Phase 2)

This second phase was more ambitious given the addition of a new region (Amoron'i Mania), the number of partner institutions (85), and the number of teachers (229) and students trained per year (10,810) (see Figure 2). The pedagogical tools were refined and finalised based on the results of the pilot phase to better meet the dual objective of quality and ease of reproduction at minimal cost. Pedagogical tools now include demonstration rice paddies, an educational video, and an up-dated comic strip.

The overall process was the same as for the pilot phase. The main innovation was the set up of demonstration rice fields in 65 schools. These fields enabled teachers and students to complete a whole cycle of carp farming in the rice field. This new training cycle (practical and theoretical) enabled APDRA trainers to better identify the remaining stumbling blocks in the theoretical teaching as well as in the transition from theory to practice. On the whole, knowledge transfer from APDRA to teachers and teachers to students was found to be effective.

Educational empowerment within the national education system

One of the final stages of the initiative is to implant the training within the framework of the national education system to allow for the gradual withdrawal of external technical support. In agreement with the institutions concerned (DREN, CISCO, Head Teachers), 60 experienced teachers, who received more in-depth training in 2016, will serve as trainers and take on a liaison role

within the institutions.

In addition to the comic strip and poster, a video that explicitly details and illustrates the various themes covered in the school training was developed to facilitate the transfer of information. It is primarily aimed at teachers who will go on to train their colleagues at the start of the new school year. National education officials, who are required to train or build the capacity of teachers, can also use it. It can, of course, be used on its own.

Support for voluntary parent associations to improve the adoption of rice-fish farming

A preliminary assessment of the adoption of rice-fish farming in 2016 of those households whose children were trained in 2014-15 (pilot phase) showed that the adoption of the technique was still very poor and those households who had adopted it were not really using the technical standards taught to students. Nevertheless, one of the results of providing training during the 2015-2016 school year was the positive, spontaneous mobilization of parent associations to practice techniques for carp production in rice fields. This involvement was coupled with a strong demand for training, which resulted in the provision of support for these associations. This support includes:

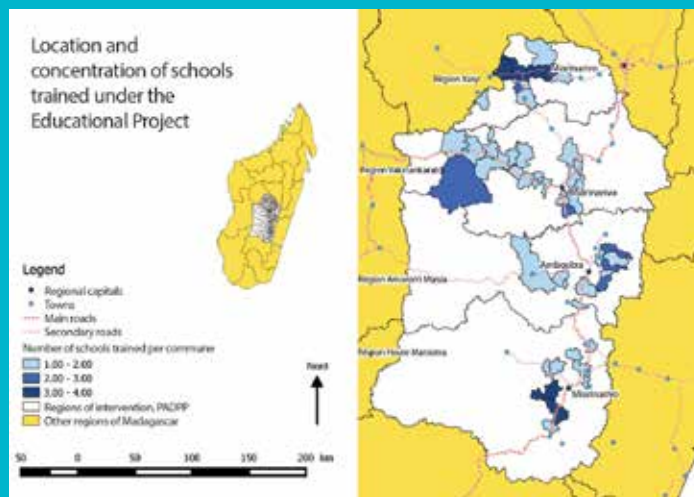
- Continued support for associations' pilot rice paddies during the development, stocking and grow-out phases. This support is provided in groups to strengthen exchanges between parents of students at one or two demonstration sites;
- Linking these same groups to other fish farmers supported by APDRA, so they can obtain fry;
- Exchange visits between parent groups and experienced producers.

This support is part of the knowledge transfer scheme and the establishment of a critical minimum network (producers and breeders) necessary for the sustainable development of rice-fish farming.

Conclusion: production, trade and nutrition

Since the 1970s the administration and various donors have supported rice-fish farming without much success or motivation on the part of rural communities. However, in the Highlands where the population has doubled, cultivable rice fields are limited and poverty has increased, there is a real interest in rice-fish farming from the Malagasy farmers who now find themselves in dire straits.

The promotion of rice cultivation is part of the dual problem of combating poverty and malnutrition. In Madagascar, rice is the main crop and source of household income (41.9 per cent). However, rice production is, for the most part, reserved for household consumption. Farming households consume, on average, about 69 per cent of their production (in value) per year and consequently only sell the remaining 31 per cent. In general, rice is the key commodity in terms of living conditions and household poverty. The comic strip, poster and video thus



include components and modules on economic aspects to both incite and reassure households of the benefits. The physical demonstration of the pilot rice fields and exchanges between established producers and interested agricultural households are essential elements for the adoption and development of this technique.

It was therefore very important that this initiative, aimed at developing the technique on a larger scale, could build on a pre-existing base at the local level: the presence of a large network of fingerlings producers; the presence of a few experienced producers in the region and; favourable geological and climatic conditions.

With this in mind, geographical distribution should not be planned either too quickly or outside those areas where these specific conditions are not met. The oil stain strategy, building on success in specific areas is probably the best way to go.

Another secondary expectation of this project is ultimately an increase in the availability and consumption of fish that contains proteins and micronutrients essential for combating malnutrition. However, the link between production and consumption is not automatic, even amongst producers. At the same time, nutritional information on iodine, minerals (calcium, zinc, iron, phosphorus) and vitamins (A, D, E, B) and omega 3, beneficial for pregnant women and brain development in small children, is poorly understood and little disseminated by those responsible for conveying nutritional messages in villages and households. It is for this reason that nutritional information has been added to the video and the updated version of the comic strip to highlight specific learning in the classroom. Addressing the problem of nutrition at the same time as promoting production technology is an essential factor in the hope for a significant impact. For both production and good nutrition, the school is an excellent vehicle for communication and progress.

IOC-SmartFish is a regional fisheries programme managed by the Indian Ocean Commission, funded by the European Union and co-implemented by the Food and Agriculture Organization of the United Nations. IOC-SmartFish, which operates in twenty countries throughout the Indian Ocean Region, Southern and Eastern Africa, focuses on fisheries governance, management, monitoring control and surveillance, trade, and food security.

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Based on APDRA *Pisciculture paysanne's* contract reports (2014-2016) and « SF-FAO/2017/39 Formation à la rizipisciculture dans les écoles des hauts Plateaux Malgaches : Un moyen de booster la production de poisson et d'améliorer la sécurité alimentaire ? »