The development of rice-fish farming, a catalyst for better water management in Madagascar

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1. Background

In the highlands of Madagascar, the combination of rice cultivation and fish farming in rice fields, or rice-fish farming, is an activity that has long been developed by smallholders (Oswald et al., 2016). *Cyprinus carpio* or *Oreochromis niloticus* (or other species) are introduced into the rice fields during the main rice cycle, in the rainy season, and sometimes kept in the plots after rice cultivation. When the fish are caught, they are sold locally and/or eaten by the family. The system is generally extensive or semi-extensive, with some improvements to the rice field (refuge channel, raising the dikes), stocking with purchased or self-produced fingerlings and possibly adding farm by-products to fertilise/feed the fish (manure, straw, processing waste, etc.; Andria-Mananjara et al., 2019). Rice-fish farming is being developed by many producers because it makes it possible to produce animal protein with few inputs while increasing rice yields (+10 to 20%; Mortillaro and Dabbadie, 2019). However, its development remains limited by a wide range of factors, from a lack of technical mastery, which limits production performance, to a lack of water or the risk of fish theft, which discourage producers from practising the activity.

To deal with the complexity of these situations, the NGO APDRA Pisciculture Paysanne implements a participatory approach to identifying and resolving problems, known as 'coactive search for solutions' (Trébuil et al., 2018), which makes it possible to work in depth with producers to remove the obstacles to the adoption of rice-fish farming and improve its dissemination (Maureaud, 2018). The obstacles identified and the solutions adopted can be of various kinds, and this is how, in the example of the Ampanory area that we are going to present to you, the actions carried out in favour of the development of fish farming ultimately benefited all the users of the irrigated perimeter concerned.

2. Description of the innovative practice

The story takes place in the Ampanory area, which is located in the highlands of Madagascar, in the centre of the island, in the commune of Ambositra 2, in the Amoron'i Mania region. It encompasses several villages, two of which, Tsaratanana to the south and Andranovory Miezaka to the north, share the same lowland (see Map 1). Developed as an irrigated perimeter covering 55 ha, it enables around 400 farmers to grow irrigated rice. In 2016, when APDRA began working in the area, there were fewer than ten rice-fish farmers within the area, and the development potential was estimated at more than 200 additional fish farmers. However, despite the awareness-raising and technical training sessions organised around fish farming, there were still only 12 in 2019.

This period coincided with the development of the 'co-active search for solutions' approach by the NGO (Mandresilahatra et al., 2021) and the technician working in the area therefore tested this method to try to remove the obstacles to the development of fish farming in the area. As described by Darré (2006), the aim is to work with local groups of producers (individuals who are geographically close to each other and who can regularly discuss their activities), bringing out the practical knowledge of each individual and the shared standards of the group. Specific facilitation techniques, such as active

listening, discourse analysis and problem reformulation, enable producers to better identify the difficulties hindering the development of the activity in a given area, and then to work out accessible solutions (see Picture 1). To implement this approach, the technician needs to change his posture and play the role of facilitator of discussions rather than prescriber of solutions.

3. The intervention

Initially, a group of 60 farmers from the village of Andranovory Miezaka were mobilised: fish farmers and non-fish farmers alike, all of whom were users of the 20-ha forming the north-eastern part of the perimeter and wanted to start fish farming or improve their fish farming activities. After several discussion sessions, the lack of water was identified as one of the main obstacles to be overcome. In the past, the 150 farmers operating in the perimeter used to grow rice and fish in the traditional way, but around twenty years ago, water started to run out and they began to have problems filling their plots. According to some of the elders in the group: *'Our grandparents grew rice and raised fish here. They could easily make a living. But because of changes in the climate, having enough water to produce has become difficult. Now we can only produce for a small part of the year, from November to March... We want to become productive again and be able to harvest all year round! We want to go back to the good old days, feed our children and have more money'*. 20 years ago, an earth dam provided a water reserve on the hills to the west of the perimeter, and a wooden canal bridge carried the water to the plots. The dam was regularly destroyed by flooding, and the farmers repaired it collectively before the start of the rice-growing season in August-September. However, when the canal bridge was also damaged, it could not be rebuilt due to a lack of funds, and both the dam and the canal bridge were abandoned. These structural problems of access to water have been exacerbated since 2018 by the increasing scarcity of rainfall as a result of climate change. These various factors combined have made the development of a fish farming activity too risky for most potential fish farmers...

To overcome this constraint, the group of 60 mobilised producers decided to embark on improving the infrastructure, rehabilitating the dam and canal bridge, in order to once again secure the water supply. They were soon joined in this project by the rest of the perimeter's users, all motivated to regain better access to water. With the help of an APDRA technician to set up a network and mobilise technical and financial partners, the farmers took a number of steps: a site visit by a rural engineering technician (see Picture 2) and the drawing up of an estimate for the work, the setting up and formalisation of the 'Lova' water users' community (WUC), the cleaning up of the canals in the perimeter by the fish farmers, etc. The €2,400 needed to carry out the work was provided by the Malagasy Agricultural Development Fund (see Picture 3), in return for a 10% contribution from the members of the Lova WUC (see Picture 4). Everyone also pitched in to help with the work: men and women helped transport materials to the site; the masons and labourers working on the site were members of the association and agreed to be paid a token sum by covering their meals (see Pictures 5-6). The rehabilitation of the infrastructure was completed in October 2021 (see Pictures 7-8).

4. The changes expected as a result of the work

The 150 farmers in the rehabilitated area are now grouped together within the Lova WUC, and their plots have guaranteed access to water. Management rules have been defined and a water rotation system has been set up to organise the distribution of water to each user's plot, coordinated by the association's president. This approach is in line with the summary of COFI/2024/6, which encourages inclusive governance frameworks capable of making compromises in the management of water demand, in order to avoid exacerbating inequalities and conflicts.

Of these, 117 are practising rice-fish farming - compared with just 6 previously - and 18 have started producing carp fingerlings to supply their peers. The fish are reared during the rice cycle, but also in

the off-season, in harvested rice fields that have been re-watered. In 2023, 1.5 tonnes of market fish were produced in this way. But the rehabilitation of the infrastructure is not just benefiting fish farming. Whereas previously the water resource was only available for 6 months and was heavily dependent on the arrival of the rains, all the producers in the area now have access to water throughout the year. This enables them to start the main rice-growing cycle without delay, but also to grow off-season vegetables, thanks to irrigation: potatoes, carrots, courgettes, green beans and peas are sold on the local market. As the President of WUC Lova explains: *'Our capacity to produce rice, fish and market gardening has returned to what it was before. The production period is no longer limited because the water is there, even in the off-season, after the rice has been harvested'*.

5. Other unexpected impacts

The success of the Lova WUC has been emulated in the neighbourhood. For example, 57 users in the other part of the Ampanory irrigated area got together and also decided to start rehabilitating their water supply infrastructure so that they could develop rice and fish farming. They have also formed an WUC and, with the support of APDRA, have taken the same steps and carried out the same work.

The dam and canal bridge that they rehabilitated are now benefiting the 250 farmers operating in this part of the perimeter and have made it possible to revive off-season market gardening and develop rice and fish farming.

But the momentum doesn't stop there. In 2022, the presence of these rehabilitated water reserves also attracted the attention of the public water and electricity supply company (JIRAMA), which expressed its desire to use them to supply drinking water. The users of the two associations were united in their opposition to this idea, which once again risked jeopardising their production. That same year, the associations also went a step further in preserving their water resources. Grouped together with other WUCs within a regional union, they applied to the relevant government departments and obtained 30,000 tree seedlings, which were replanted around the springs that feed the dams, to help recharge the water tables.

6. Analysis and outlook

The issue of access to water, whether lack of water at the start of the season or excess water during cyclonic periods, has been identified by many local fish farming groups as a central problem. As described by Cofad (2023), in the current context of climate change, producers regularly have to cope with significant delays in the arrival of rain, which postpones stocking and reduces the length of the fish grow-out cycle. The production of carp fingerlings is also disrupted because there is often a shortage of water during the broodstock storage or carp reproduction period. Conversely, many rice and fish farmers also have to contend with torrential rainfall, which floods their rice fields, causing fish to escape and silting up their plots due to the increased erosion of the surrounding hillsides.

The strong mobilisation of some of the users of the Ampanory irrigated area around the development of fish farming has solved this problem and led to a real transformation in farming activities. Whereas the plots of land could only be farmed for 5 months out of 12, between November and March, they can now be used all year round, enabling a diversification of farming activities and sources of income. Market garden crops are grown throughout the off-season, and carp fingerlings production can be carried out without any problems in the months leading up to the rainy season. The continuous availability of fish in the rice fields, beyond the rice cycle alone, also has a direct effect on the nutrition of the farmers and their families, since it is customary for them to catch fish regularly for their own consumption (see Picture 9). Lastly, the impact of this rehabilitation has extended beyond the area of the lowlands and beyond agriculture, as it has also led to the restoration of hillsides affected by

erosion. The improvement in living conditions brought about by the development of rice and fish farming in the area means that this example fits in perfectly with the FAO's 4 betters: better production, better nutrition, a better environment and a better life.

It is also, of course, an emblematic example of the mobilisation and adaptation that small-scale farmers are capable of in the face of climate change. The governance set up within the framework of the WUCs has made it possible to organise the search for funding, carry out the work and defend the integration of agriculture and fish farming. Belonging to a regional body has enabled the project to interact inclusively with the regional departments of two different ministries - the Ministry of the Environment and Sustainable Development and the Ministry of Fisheries and the Blue Economy - to obtain their support for the purchase and transport of seedlings. It should be noted that the involvement of various partners, whether local authorities, regional directorates of the relevant ministries or technical and financial partners, also helped the producer groups to legitimise the implementation of the solutions found.

The co-active solution-seeking approach implemented by APDRA to support producers in their endeavours has been developed in all of the NGO's intervention zones in Madagascar (Mandresilahatra, 2023). It aims to address all the concerns faced by rice-fish farmers, but it is the solutions linked to water management that have the greatest impact. This situation shows that if we seek to develop integration between fish farming and rice production, we can improve water management for an entire lowland.

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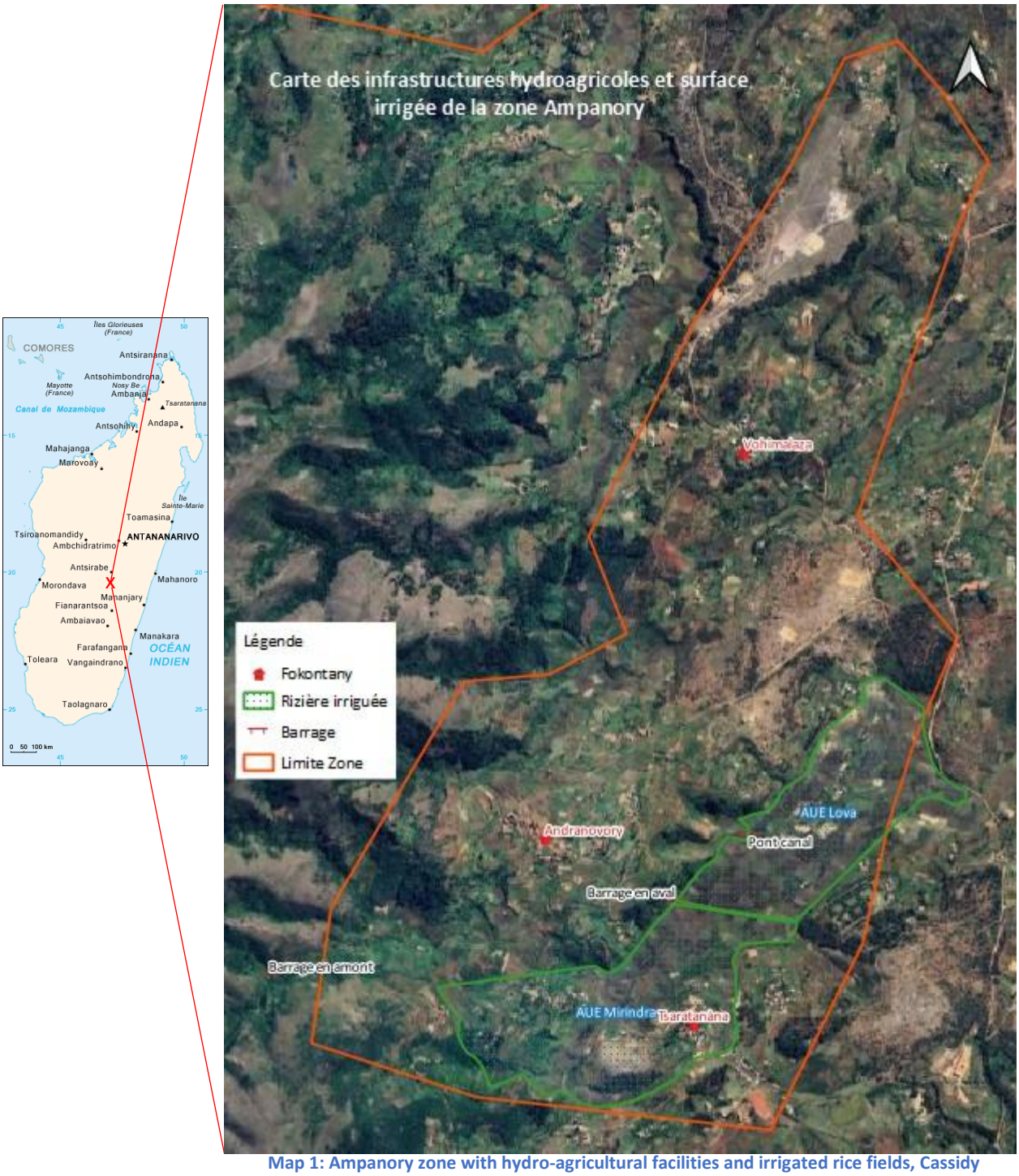

Map 1: Ampanory zone with hydro-agricultural facilities and irrigated rice fields, Cassidy Tiambahoaka, APDRA, 2024.

Picture 1: Search for solution brainstorming

Picture 1: Site study carried out by APDRA with beneficiaries

Picture 2: Assistance from APDRA in filling in applications for funding

Picture 3: Presentation of work quotation to members of WUC Lova

Pictures 4-6: Stones transport by WUC members and workers

Pictures 7-8: Infrastructure inauguration by regional authorities, APDRA, FDA and WUC

Picture 9: Overview of a part of the lowland