CARP AQUACULTURE IN RICE FIELDS
Do you know a simple and effective way to breed fish with minimal investment costs? Have you heard of rice-fish farming, also known as rice-pisciculture? This agro-ecological practice makes it possible to benefit more from your water resources and rice fields by raising fish at the same time as growing rice. The rice paddies of Madagascar’s Highlands are particularly favourable for the development of rice growing, in which tens of thousands of family farms are involved. This comic strip, which shows how to raise carp in rice fields, is essentially aimed at young people living in rural communities, who already play an important role in food security and the consolidation of households’ agricultural income. Have a go – you’ll see!!

This comic strip has been produced and disseminated with the support of:

The Ministry of Fisheries and Halieutics Resources

and

The Ministry of National Education

and

Representation of the Food and Agriculture Organisation of the United Nations in Madagascar, Comoros, Mauritius and Seychelles

This comic strip was developed by:

APDRA Pisciculture Paysanne
Mahazoarivo Nord – Residence Social
BP 76 – 110 Antsirabe – Madagascar
Tel: +261 (0)20 44 489 89
www.apdra.org

and

IOC-SmartFish Programme, under the framework of the food security component of the United Nations
Food and Agriculture Organization
Blue Tower,
5th Floor,
Institute Road,
Ebène – Mauritius
Tel: +230 402 61 00

http://www.smartfish-coi.org/

Design
Cassidy Tiambahoaka

Technical support
Tsinhasina Randriampano, Vola Ratiariveloh,
Ralay Rakotomalala Mamianisoa, Fabien Cousseau,
Michel De San, Barbara Bentz Et Dominique Bouchet

Drawings, colour and desktop publishing
Pierre Rajaonarison

Printing
La Reprographie Antsirabe

Edition August 2016
Ce numéro a été imprimé dans le cadre du programme ASA (Agro Sylviculture autour d’Antananarivo) financé par l’Union Européenne
AMBOHIPIVOARANA
A VILLAGE IN MADAGASCAR’S HIGHLANDS
WHERE RICE AND FOOD CROPS ARE
PLENTIFUL.

WHERE HAVE YOU BEEN
BEMA, WE HAVEN’T SEEN YOU
FOR AGES?!

I’VE JUST BEEN AT HOME
FANJA. I HAVEN’T BEEN FEELING
VERY WELL LATELY AND I STILL
FEEL A BIT TIRED AND WEAK.

OH, LUCKY YOU! IN OUR HOUSE,
WE’VE HARDLY ENOUGH MONEY
TO PUT FOOD ON THE TABLE. I
DON’T KNOW YET IF I’LL BE ABLE
TO GO BACK TO SCHOOL WHEN IT
STARTS AGAIN.

MY PARENTS PAY FOR MY SCHOOL FEES
WITH THE MONEY THAT WE EARN FROM
RAISING CARP!

OH YES, I CAN SEE THAT YOU DON’T LOOK TOO
GREAT. YOU OFTEN SEEM TO GET SICK!
MY PARENTS ARE NOW GETTING THINGS READY FOR
ME FOR THE START OF THE NEW SCHOOL YEAR.

CARP?!
YOU MEAN YOU’VE GOT A POND?

YOU HAVE ALLWAYS BRED CARP IN OUR
RICE FIELDS.

OH, I DIDN’T KNOW THAT
YOU COULD BRED CARP IN
THE RICE FIELDS. I’M GOING
TO TELL MY PARENTS!

NO, WE’VE ALWAYS
BRED CARP IN OUR
RICE FIELDS.

MY DAD SHOWS PEOPLE HOW TO DO
IT AND EVEN PRODUCES SMALL FRY.

THAT AFTERNOON
YOU’LL NEVER GUESS
WHAT…FANJA’S FAMILY
ARE BREEDING CARP IN
THEIR RICE FIELDS...

I’VE ALREADY HEARD
ABOUT RAZAMA’S
RICE-PISCICULTURE! DO
YOU REALLY THINK THEY
MANAGE TO PAY THE
SCHOOL FEES WITH THE
INCOME FROM THAT?

AND WITH THE MONEY THEY
GET FROM THAT, THEY CAN
PAY FOR HER SCHOOL FEES.

YOU KNOW, RAZAMA EXPLAINS HOW
TO DO IT AND CAN EVEN SUPPLY
SMALL FRY.

ARE YOU SURE? OK, WE’LL GO AND SEE HIM
TOMORROW!

THE NEXT DAY IN RAZAMA’S
COURTYARD
I WAS TALKING WITH MY SON BEMA LAST
NIGHT AND HE TOLD ME THAT YOUR CARP
BREEDING WAS OF GREAT HELP TO YOU.

CAN YOU REALLY PAY FANJA’S SCHOOL FEES WITH
THE MONEY YOU EARN?

ABSOLUTELY REDY! BREEDING CARP IN THE
RICE FIELDS REALLY HELPS US OUT AND ON
TOP OF THAT, IT DOESN’T REQUIRE A LOT OF
INVESTMENT!
I'm really interested in having a go at this. Could you explain to me what I should do?

The fact that Razama has mastered the techniques of carp breeding allows other villagers to share their experiences and enables Ambhipivoarana producers to eventually become autonomous.

These rice paddies are ideal for raising carp... because they never flood and they don't dry up quickly. They are close to where we live, which makes it easy to look after and keep an eye on them. They can also be drained, which helps dry out the plot and makes it easier to catch the fish.

These rice paddies are also in the sun. This is important, as the carp need warmth to grow.

Additionally, the clay in the paddy fields is good for better water management.

I think our rice fields match all these criteria! You've convinced me to give rice fish-farming a try.

It's good to put some fertilizer down when you're plowing the land...

...this allows natural foods to be produced for the carp.

What will that do?

Now you have to put in a refuge trenches and build up the small dikes.

Reinforcing and raising the small dikes makes it easier to fill the pond with water. It also allows the water to remain at a constant temperature, and finally, it reduces the risk of the walls breaking.

Great! I'll come over to your place to help you out.

A few days later, whilst Bema's family are working in the fields...
THE POND IS FINALLY READY TO RECEIVE IT’S FIRST FRY!

DON’T FORGET TO PUT IN A FENCE SO THE CARP CAN’T GET OUT

WATER SUPPLY CHANNEL
SMALL DIKE
REFUGE TRENCHES
SMALL DIKE
DRAINAGE CHANNEL

CONVERTED RICE FIELD

WATER IS DRAINED OUT AND THE FIELD IS LEFT TO DRY IN THE SUN

THE POND CAN NOW BE FILLED UP

THE POND IS FINALLY READY TO RECEIVE IT’S FIRST FRY!

THE WATER IS PUT BACK INTO THE FIELD AND THE LAND IS TURNED OVER…. AND LEVELED OUT…. AFTER THAT, THE RICE IS TRANSPLANTED

WILL MY RICE YIELD NOT GO DOWN WITH THIS BREEDING POND RIGHT IN THE MIDDLE HERE?

NO!

IN FACT, RICE-PISCICULTURE CAN EVEN INCREASE THE RICE YIELD BY BETWEEN 10% AND 20%. CARP ARE GOOD FOR THE AERATION OF THE SOIL AND THE ROOTS OF THE RICE. THEY ALSO EAT PARASITES AND THEIR EXCREMENT IS A VERY GOOD FERTILIZER.

HOW MANY FRY DO I NEED FOR A SURFACE AREA OF ABOUT 5 ARES?

… YOU SHOULD ALSO BE AWARE THAT …

THE NUMBER OF FISH IN THE POND WILL AFFECT THEIR SIZE!

THAT DEPENDS ON YOUR OBJECTIVE, THE NATURAL FERTILITY OF YOUR RICE FIELD AND YOUR ABILITY TO IMPROVE IT…

A FEW DAYS LATER AT RAZAMA’S CARP BREEDING POND

PLEASE COULD YOU SELL ME 100 SMALL FRY RAZAMA?

I’LL HAVE 200 PLEASE!

YOU’RE GOING TO TAKE 200 RALIVA? WE’VE GOT THE SAME SIZE RICE FIELD.

FOR A BETTER CHANCE OF SURVIVAL, IT’S BETTER TO TAKE THOSE FRY THAT ARE AT LEAST ONE MONTH OLD

THE FRY ARE TRANSPORTED IN AIRTIGHT CONTAINERS FILLED WITH A THIRD OF WATER

THIS IS AN AGRO-ECOLOGICAL PRACTICE…

5

6
If it is a long way back to the rice field they water must be changed but as you live near by, I’ll come back with you.

The container with the fry in should be placed gently in the pond so that the water in the container and the water in the pond gradually mix together.

Make sure there is always enough water in the field. Use the height of the rice as an indicator, the water should not cover more than a 1/5 of rice stalks.

You are also going to help the fish to grow.

You have to keep an eye on the rice field both during the day and night…

This way the fish can slowly get used to the new water temperature.

Yum!

Make sure the dikes are kept clean to keep any unwanted pests out.

Close the water entry and exit points…

Don’t remove the fence.

Bema and his father prepare some fertiliser every morning.

And/or

And/or

By spreading the fertiliser throughout the rice field, food for the fish is improved.

They mix fertiliser and chopped up rice stalks with some water…

… and leave it to settle for at least one night.

As a fertiliser it contains a lot of nitrogen.

Azoilla can also be used…

Dry it.

Grind it.

As a fertiliser it contains a lot of nitrogen.
After a few days the water in the rice field is very fertile.

...at this point you can stop fertilising it as there should now be enough nutrients in there to feed the fish.

The water should always be green.

Fertilisation is good for the rice field's ecosystem.

Be careful! The water shouldn't be dark green. This means that there is too much fertiliser and the carp could suffocate. They will be coming up to the surface all the time to get air.

Ugh! That smells bad!

Early morning.

...food supplements should be given often, but a bit at a time.

Carp grow well when they are well fed.

DURING THE ‘TSARAKARPA’ ASSOCIATION MEETING

Someone stole almost half of my production!

During the ‘Tsarakarpa’ association meeting, someone stole almost half of my production!

You need to get an association set up for Ambohitsoa village, like we have here!

We've also got a lot of water management problems in Ambohitsoa.

It's true that our association, Tsarakarpa, makes it easy to keep an eye on our rice fields.

Without this kind of committee, it will be hard for you to come to any kind of agreement with other water users.

Indeed, there's no shortage of fry here in Ambohipivoarana.

We set up a water management committee here.

In our village this is a difficult subject to talk about.

That's true! And on top of that anything to do with the water is very important for us fry producers.

Without this kind of committee, it will be hard for you to come to any kind of agreement with other water users.
OH, IT’S NOT LIKE THAT IN AMBOHITSOA, WE HARDLY HAVE ANY CARP FRY

IN OUR ASSOCIATION WE HAVE SEVERAL SMALL FRY BREEDERS, WHICH ALSO ALLOWS FOR BETTER PRICE CONTROLS

THE ASSOCIATION IS VERY USEFUL. I’VE HAD HELP AND I’VE BEEN ABLE TO SHARE MY RICE-PISCICULTURE EXPERIENCES. I’D LIKE TO THANK RAZAMA FOR THAT!

IN ADDITION, THE ASSOCIATION GIVES US MORE WEIGHT WITH THE AUTHORITIES, WHO NOW HAVE A LIST OF ALL OUR MEMBERS

IN THE MONTH OF MARCH BEMA’S FAMILY HARVESTED THEIR RICE: 10 ARES WERE USED TO GROW RICE, 5 OF WHICH WERE USED TO RAISE CARP. THE HARVEST IS A SUCCESS

HEY, TELL ME SOMETHING RAZAMA, WHY ARE MY FISH SMALLER THAN REDY’S EVEN THOUGH BOTH OUR SMALL FRY CAME FROM YOU?

YOU TOOK TWICE AS MANY AS REDY, SO THEY Didn’T HAVE ENOUGH TO EAT

SO THAT MEANS IT’S BETTER NOT TO START OFF WITH TOO MANY FRY BUT ADJUST THE AMOUNT ACCORDING TO THEIR GROWTH.

EXACTLY! IN REALITY THERE ARE NO PRECISE DENSITY RULES TO FOLLOW, IT’S REALLY UP TO EVERYONE TO SEE WHAT WORKS BEST FOR THEM

250 GR EACH CARP!

RALIVA ALSO CHECKED THE SIZE OF HIS CARP AND TOOK A FEW FOR HIS HOLIDAY MEAL.

THEY ARE A BIT SMALL THOUGH! I THINK I’LL CARRY ON RAISING THEM UNTIL OCTOBER

200 Kg

220 Kg

A ROUND OF APPLAUSE FOR THE FISH!

CATCHING A COUPLE OF FISH ENABLES THEIR SIZE TO BE CHECKED

AND IN THE MONTH OF JUNE….THEY HARVESTED THE FISH JUST BEFORE NATIONAL DAY CELEBRATIONS

250 GR

125 GR

12

200

FISH

100

200

FISH

125 GR

RICE FIELD 5 ARES

RICE FIELD 5 ARES

FISH
WE HARVESTED 70 CARP FROM THE 100 FRY WE STARTED WITH. WE LOST SOME TO PREDATORS, LIKE THE BIRDS, THAT WE CAN’T DO MUCH ABOUT.

IT’S TRUE THAT BREEDING CARP DOESN’T REQUIRE A LOT OF INVESTMENT. WE’VE ALREADY GOT THE SPACE AND WATER REQUIRED IN THE RICE FIELD AND ANY WORK THAT NEEDS TO BE DONE IN THE FIELD WE CAN DO OURSELVES...

THE FERTILISER COMES FROM THE FARM ANIMALS AND THE FOOD SUPPLEMENTS CAN BE MADE FROM OUR DOMESTIC WASTE.

WE ONLY INVESTED IN THE SMALL FRY THAT WE BOUGHT HERE AND EARNED 120,000 ARIARY FROM THE 15 KILOS OF FISH WE SOLD.

THAT CAN PAY FOR MY SCHOOL FEES, DAD, CAN’T IT?

THE RICE HARVEST ALSO INCREASED BY 10% EVEN WITH THE REFUGE TRENCHES IN THE MIDDLE OF THE FIELD.

REGULAR CONSUMPTION OF FISH IS GOOD FOR THE HEALTH BECAUSE OF THE QUALITY OF THE NUTRIENTS IT CONTAINS.

IN WINTERTIME THERE IS NOT MUCH WATER

RALIVA’S LAND HOWEVER, IS VERY WELL IRRIGATED SO HE CONTINUES RAISING HIS CARP.

HE ONLY HARVESTS THEM IN OCTOBER

BY KEEPING THEM FOR LONGER THEY EVENTUALLY GREW BIGGER.

EAT FISH KIDS! WITH A HEALTHY BODY COMES A HEALTHY MIND! YUM!
EVEN IF IN WINTER, THE FISH DO NOT GROW AS MUCH AS THEY WOULD IN THE WARMER WEATHER.

TODAY I’M GOING TO SELL MY FISH AT THE MARKET

AS I TOLD YOU THOUGH AT THE ASSOCIATION MEETING, I ONLY SELL MY FISH AT THE END OF THE MONTH.

RALIVA GOES TO SELL HIS FISH AT THE MARKET IN THE NEIGHBOURING COMMUNE

THE ORGANISATION OF THE SALE OF OUR FISH IS WELL DONE ANYWAY. I MANAGED TO SELL MINE FIFTEEN DAYS AGO. I’LL COME TO THE MARKET WITH YOU, AS I HAVE TO GO THERE ANYWAY!

RALIVA GOES TO SELL HIS FISH AT THE MARKET IN THE NEIGHBOURING COMMUNE

IT’S 9,000 AR A KILO

WHY DON’T WE SET UP SALES POINT THAT WE COULD MANAGE TOGETHER?

WE SHOULD PROPOSE THAT IDEA AT THE NEXT ASSOCIATION MEETING

IN THE SCHOOL YARD

ARE YOU O.K. BEMA?

YEAH! I FEEL GOOD AND ON TOP OF IT I CAN CARRY ON WITH SCHOOL. MY DIET HAS IMPROVED – THANKS TO YOU FANJA!

THE RICE-PISCICULTURE OF CARP ENABLED BEMA’S FAMILY TO EARN SOME EXTRA MONEY. IT ALSO HELPED SOLVE QUITE A FEW OF THEIR PROBLEMS, PARTICULARLY THAT OF FOOD SECURITY. TODAY THEY ARE ALL IN MUCH BETTER HEALTH.

THE END
COMPARISON OF THE TECHNICAL AND FINANCIAL ASPECTS

Estimated budget for a rice field of 3 Ares

1st Step: Landscaping

If the work is carried out by a family member:

\[ \text{allow for 6 man days} \]

If hired labour is used:

\[ 6 \text{ man days} \times 3,000 \text{ Ar} = 18,000 \text{ Ar} \text{ (cost of labour)} \]

2nd Step: Fish stock (density = 20/Are)

Number of small fry required:

\[ 20 \text{ fry} \times 3 \text{ Ares} = 60 \text{ fry} \]

Cost of small fry required:

\[ 60 \text{ fry} \times 100 \text{ Ar} = 6,000 \text{ Ar} \]

3rd Step: Fertilisation

Use of resources available on site

- manure and rice stalks

Required quantity (6 kg/Are/jour):

\[ 6 \text{ kg} \times 3 \text{ Ares} = 18 \text{ kg/jour} \text{ (the amount given will depend on the fertility of the water)} \]

- Labour required per Are: 2 man days  
  Daily salary: 3,000 Ar

POTENTIAL PROFIT FROM A RICE FIELD OF 3 ARES

After 4 months

Cost and profit per kilogram

If work is carried out by a family member:

\[ \begin{align*}
\text{Income:} & \quad 8,6 \text{ kg} \times 8,000 \text{ Ar} = 68,800 \text{ Ar} \\
\text{Expenses:} & \quad 60 \text{ fry} \times 100 \text{ Ar} = 6,000 \text{ Ar} \\
\text{Profit:} & \quad 62,800 \text{ Ar} \\
\text{Cost price per kilo:} & \quad 698 \text{ Ar/kg} \\
\text{Profit per kilo:} & \quad 7,302 \text{ Ar/kg}
\end{align*} \]

Cost and profit per kilogram

If worked is carried out by hired labour:

\[ \begin{align*}
\text{Income:} & \quad 8,6 \text{ kg} \times 8,000 \text{ Ar} = 68,800 \text{ Ar} \\
\text{Expenses:} & \quad 6 \text{ days} \times 3,000 \text{ Ar} = 24,000 \text{ Ar} \\
\text{Profit:} & \quad 44,800 \text{ Ar} \\
\text{Cost price per kilo:} & \quad 2,790 \text{ Ar/kg} \\
\text{Profit per kilo:} & \quad 5,209 \text{ Ar/kg}
\end{align*} \]

Rice production surplus

\[ \begin{align*}
\text{Rice grown with carp:} & \quad 82,5 \text{ kg de paddy} = 49,500 \text{ Ar} \\
\text{Only rice:} & \quad 75 \text{ kg de paddy} = 45,000 \text{ Ar} \\
\text{Additional rice production:} & \quad 7,5 \text{ kg de paddy} = 4,500 \text{ Ar}
\end{align*} \]

Cost of paddy: 600 Ar/kg  
Cost of carp: 8,000 Ar/kg 
Additional rice production 10%  
Carp survival rate: 80%
**THE NUTRITIONAL VALUE OF FISH**

→ **The nutritional elements of fish**

- Fish is a great source of protein
  - Contains amino acids essential for the body
  - Provides fatty acids (omega-3) beneficial for health
  - Contains vitamins A, B, D, E and other minerals

→ **Benefits of fish consumption**

- Contributes to the development and stimulation of the brain
- Is good for embryogenesis and foetal development
- Improves the functioning of the cardio-vascular system
- Strengthens the immune system

**TRY TO ENSURE A VARIED DIET**

→ **The different food groups and their nutritional elements**

**Vary your diet**
- Dried grains (beans, Bambara peas, lentils, etc.)
- Vegetables
- Leafy vegetables

These foods provide:
- Proteins
- Carbohydrates
- Minerals (iron, calcium, etc.)
- Vitamins (A, C, K, etc.)

*It should be noted that red rice and red beans are very rich in nutrients*
Founded in 1996, APDRA is an international non-profit solidarity association that supports the development of rural farming in southern countries and educates northern stakeholders of the challenges this activity represents for the development of family farming. APDRA has been active in Madagascar since 2004. Its aim is to strengthen the rural dynamics around fish farming, within a framework of activities that support training, professional development and research, in partnership with the Ministry of Fisheries and Halieutics Resources, professional agricultural organisations, local communities and all stakeholders involved in Malagasy fish farming.

The Indian Ocean Commission (IOC) is an intergovernmental organisation that was created in 1982 in Port Louis (Mauritius) and institutionalized in 1984 by the Victoria Agreement (Seychelles). The IOC brings together five countries of the Indian Ocean region: The Union of the Comoros, France/Reunion, Madagascar, Mauritius and Seychelles. Its main mission is to strengthen the bonds of friendship and solidarity between the populations of Indianoceania, to protect them, improve their living conditions, to build regional projects for sustainable development, and to preserve the natural resources upon which they strongly depend. As an African regional organisation composed exclusively of islands, the IOC defends their insular interests on the regional and international scene and promotes a more sustainable and united development.

The Indian Ocean Commission SmartFish Programme 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. 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.

Le programme Agro sylviculture autour d'Antananarivo, met en œuvre une série de projets destinés à la population malgache. Financé dans le cadre du 10ème Fond Européen de Développement, son objectif est de réduire durablement la pauvreté et de contribuer à la préservation de l’environnement, à travers l’amélioration de la production agricole autour d’Antananarivo et de l’accès des populations à un marché sécurisé de produits agricoles et de bois énergie.