ENGAGE4 Sundarbans | Solution-oriented Research for Development Programme | Swiss National Science Foundation | Schweizerische Eidgenossenschaft, Confédération suisse, Confederazione Svizzera, Confederaziun svizra

PUKURE MACH CHASH: KATHA O KAHINI

(The Science and Lore of Pond Fish Farming)



ULAB UNIVERSITY OF THE FUTURE | UNIL | Université de Lausanne | SAJIDA FOUNDATION

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Project website: www.engage4sundarbans.org

Pukure Mach Chash: Katha O Kahini is a visually re/told training module that begins at a tube well, where women talk about their dwindling self-help group, a promised order that never came, and the difficulty of trusting anyone again. Then comes news of Sudha di, whose quiet success with a fish pond at her home turns worry into curiosity. Her flashbacks, with her daughter-in-law Minati, follow the pond through its seasons: preparing the pond, stocking and feeding the fish, and coping with summer heat, disease and cyclones. The story closes with the women's decision to farm fish collectively, and with an offering to Makal Thakur, the folk guardian of fish-rearing waters.

The exhibition invites visitors to notice how this knowledge was coproduced. Training manuals had been handed out to communities before, and set aside. This module grows instead from workshops at the Sundarban Bari, where fishers, *panchayat* members, fisheries scientists and researchers exchanged what they knew. Their disagreements stay in the story: when should lime be applied, why fertilisers are distrusted, how a laboratory equation explains what a fisher sees in the water. Science here is not delivered but re/done, argued over, and translated into everyday lived fishing experiences.

The community is the forerunner – fishers are the protagonists; their visions and instructions shape this output. Women fishers determine its colours, motifs and details, asking for the greens, reds and yellows of their own world. Vernacular and scientific knowledge blends in every page. Here, visual storytelling becomes a method, advancing citizen science and collective actions.

Production Team



Pratyasha Nath, a visual artist trained in biotechnology at IIT Kharagpur. Working through comics and paintings, she tells stories that connect science with the relationships between people and nature, and her research interests are rooted in the life sciences and shaped by a concern for the future of the planet. She illustrated *Pukure Mach Chash: Katha O Kahini* with fishers in Kumirmari, as part of the Swissnex-funded K2A project and SOR4D-funded ENGAGE4Sundarbans.



Jenia Mukherjee, teaches at the Department of Humanities and Social Sciences, IIT Kharagpur. Her work spans environmental humanities, political ecology and transdisciplinary waters, with a focus on livelihoods in coastal and delta ecologies. She wrote the story and developed the storyboard, gathering experience from her repeated visits to Kumirmari, where inland fish farming and visual storytelling grew out of conversations with local fishers.

The bank manager told us to close our self-help group (SHG)! I really don't know what to do now.

Why wouldn't they ask us to close it, Didi? How many members are left in our group? We are all elderly women. Last year, there were ten of us. Then three members withdrew their money and left the group. And Rama Didi passed away too. Now, only six of us are left.

And that's not all. Just last week, Sukkuri Karmakar passed away. Her family is putting pressure on us to withdraw all the money from her account and hand it over to them. They don't want her money to remain in the group anymore.



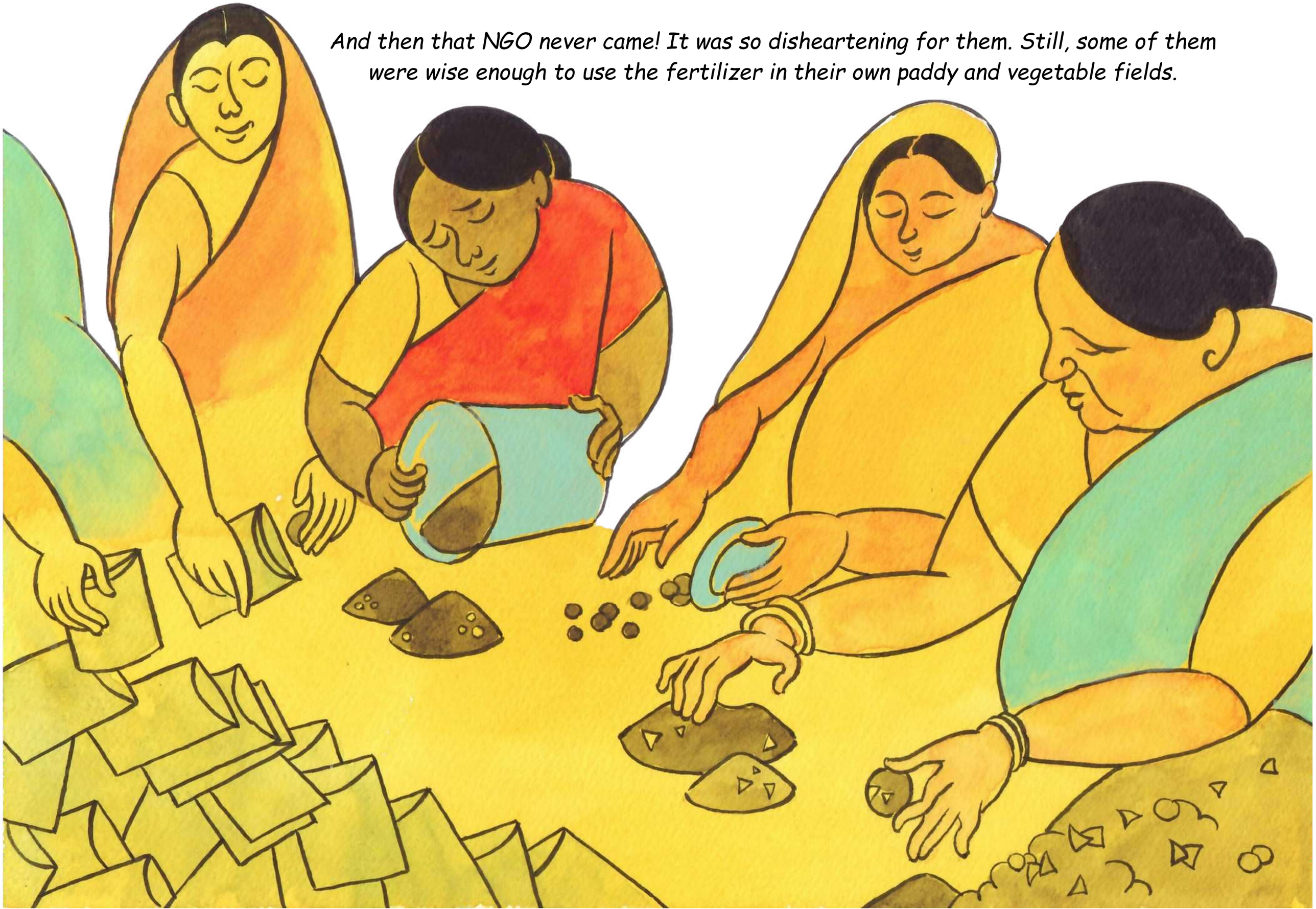
How happy Maya and her SHG members were when they received a bulk order from that Kolkata NGO to produce nature-based fertilizers...

Oh, don't discuss that anymore. It brings tears to our eyes.

Also, don't you remember what happened to Maya's group.



And then that NGO never came! It was so disheartening for them. Still, some of them were wise enough to use the fertilizer in their own paddy and vegetable fields.



What means do we have? Taking loans is a risky venture? And whom can we trust anymore? We will again lose time, money, energies, and our very own wellbeing.

So, should we just remain victims of circumstances? Can we not start fresh?

Where are you coming from? Come sit here!



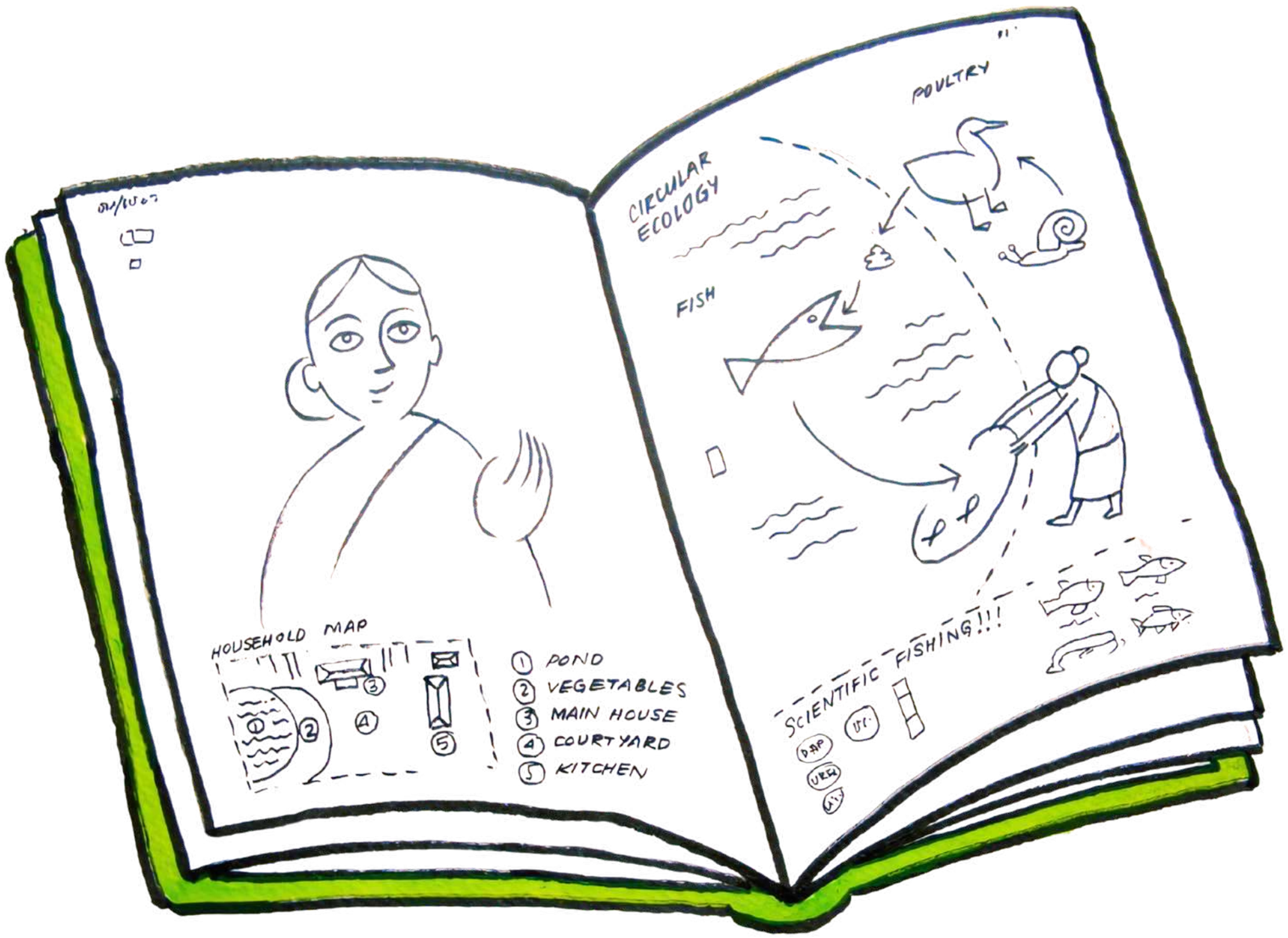
I cannot sit for a long time. The whole day we were busy cooking and taking care of the students and professors staying in our Sundarban Bari. We are very tired now!



Sudha di was the showstopper of the day! All of us felt so proud today when she was appreciated. No one knew about the inland fishing venture in her household pond – integrating scientific and traditional practices.



This was accidentally discovered when one of the students went to her house today and interviewed her as part of assignments given to them by the professors. The student came back and enthusiastically unfolded this secret – also showing her sketchbook, depicting Sudha di and her pond.



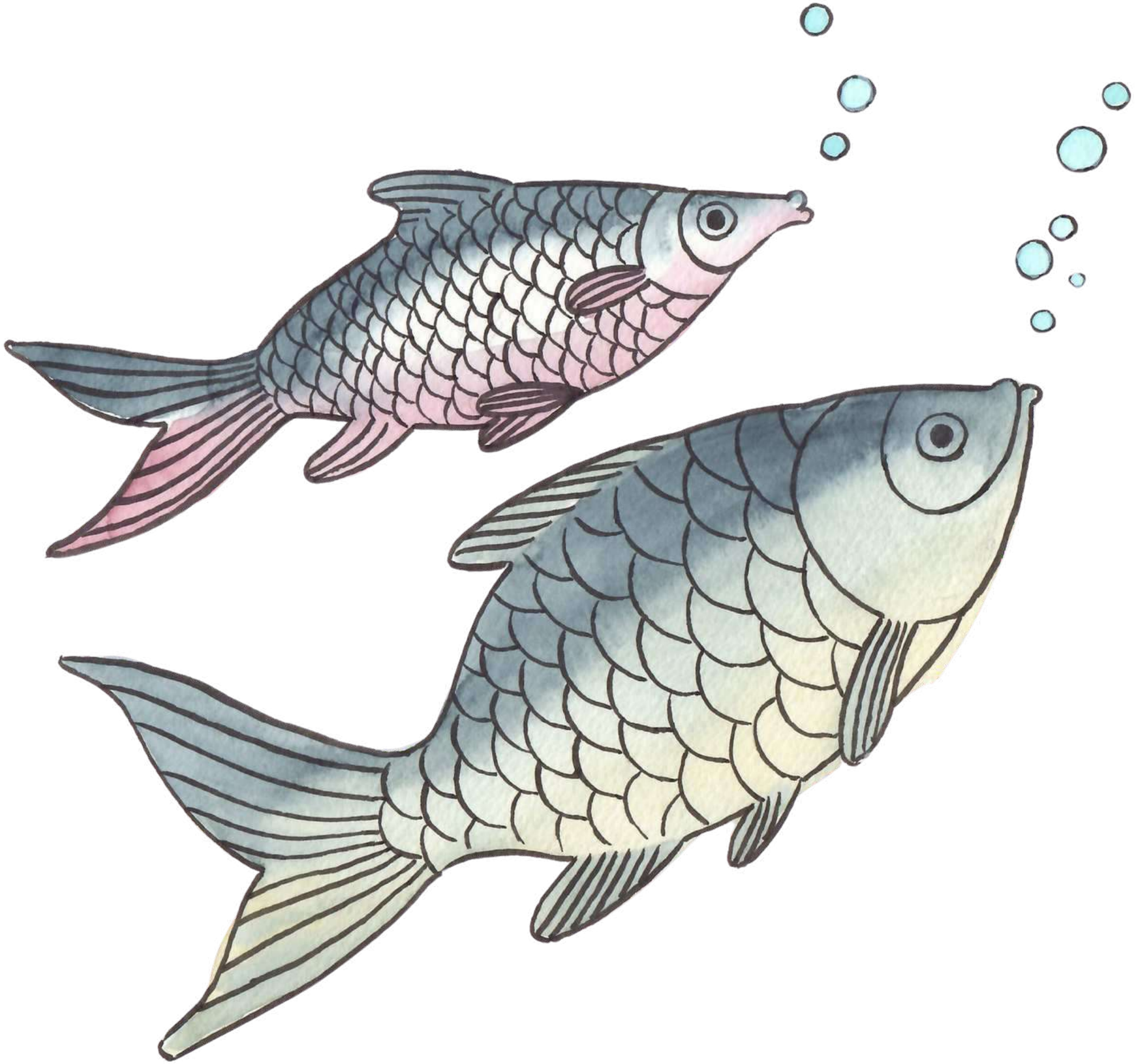
Really? So, what did Sudha do?

The pond looks so clean and productive – wow! I could just spot two fishes-- Did you start the activity from scratch? Can you tell me all the steps that you followed?



Of course, I will tell you everything!





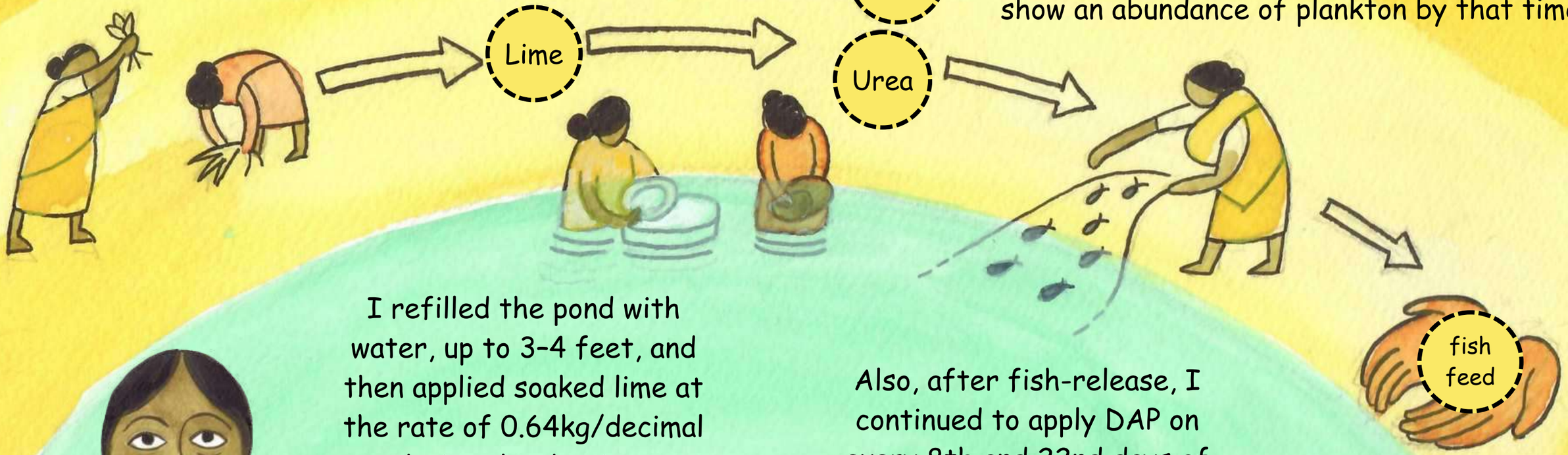
First, I cleaned the pondside, dewatered the pond bed using a pump set, and let it dried up for the next 15 days.

I captured predatory fish species already inhabiting the pond, such as Shol and Tilapia – sold them in Budhbar Bazaar, and earned some money. I kept this money carefully in my almirah, as it was my capital to be invested later in fish cultivation

I also removed grasses and shrubs from the pondside. I did it together with my daughter-in-law.

Then after 15 days I applied Diammonium Phosphate (DAP) at the 0.4kg/decimal dosage, ensuring plankton boom...

...followed by urea after another 15 days. I did not skip the application of Urea at the rate of 0.16kg/decimal as my pond did not show an abundance of plankton by that time.



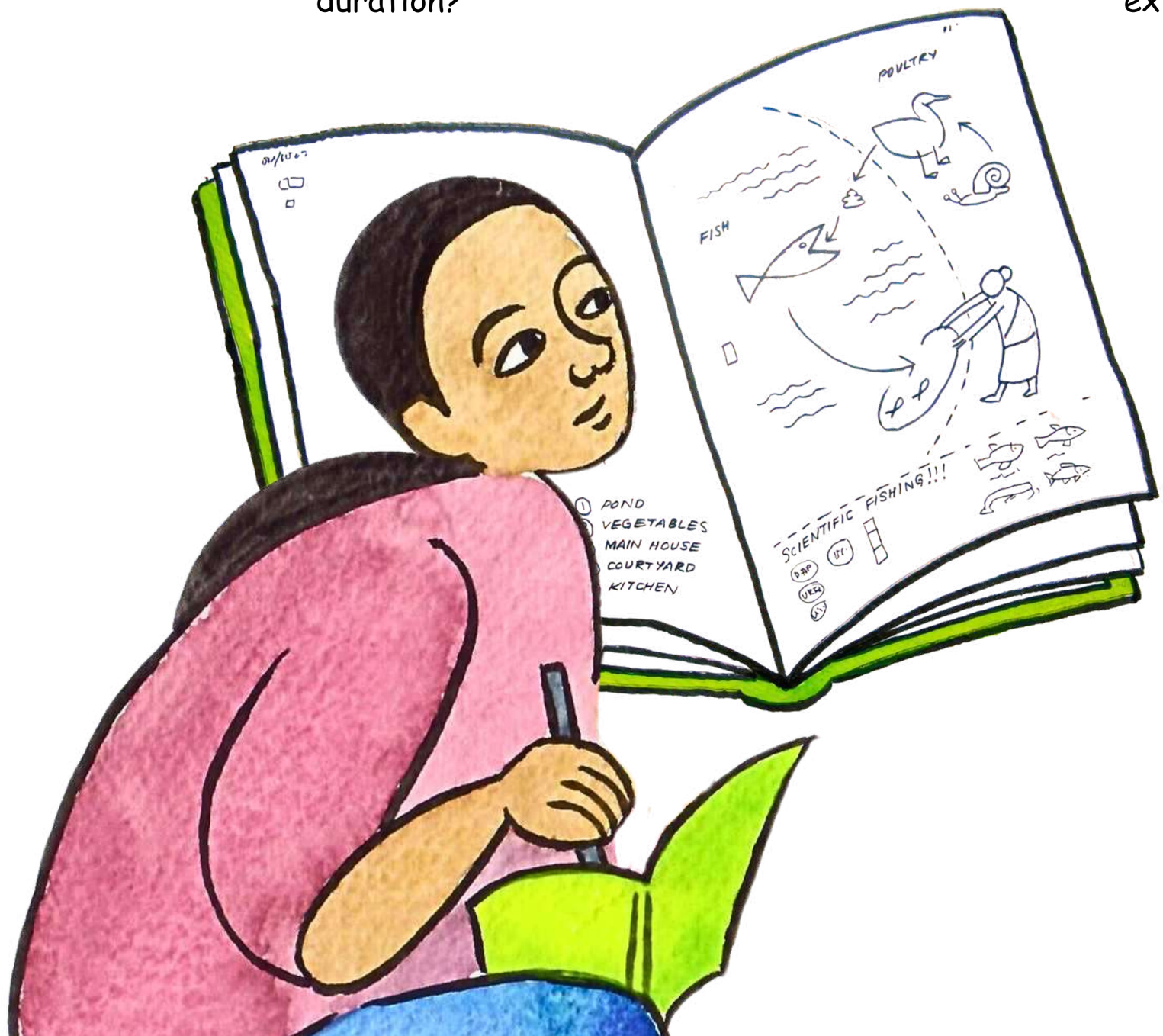
I refilled the pond with water, up to 3–4 feet, and then applied soaked lime at the rate of 0.64kg/decimal during the daytime.

Also, after fish-release, I continued to apply DAP on every 8th and 22nd days of every month for the next eight months.



I started last winter. Monsoon is not advisable as water can enter the ponds from adjacent water-flush paddy fields – impeding pond drying.

That is amazing! How did you learn so much – and these nitty-gritties of ingredients, their dosage, and duration?



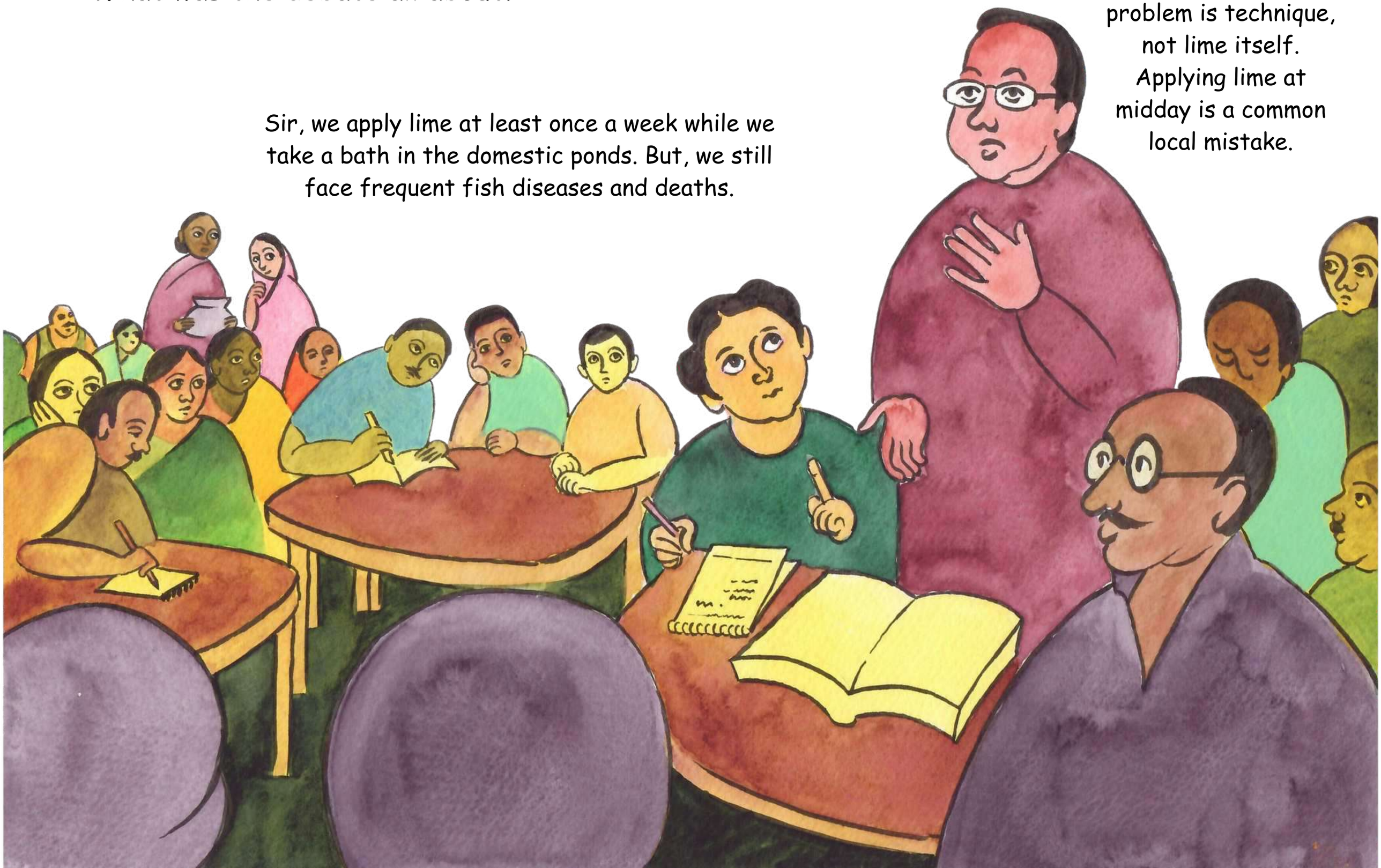
Oh there was such a big debate and discussion around the application of lime, DAP, and urea in the Sundarban Bari between our fisher villagers and the fishery experts. It went on for so long.



What was the debate all about?

Sir, we apply lime at least once a week while we take a bath in the domestic ponds. But, we still face frequent fish diseases and deaths.

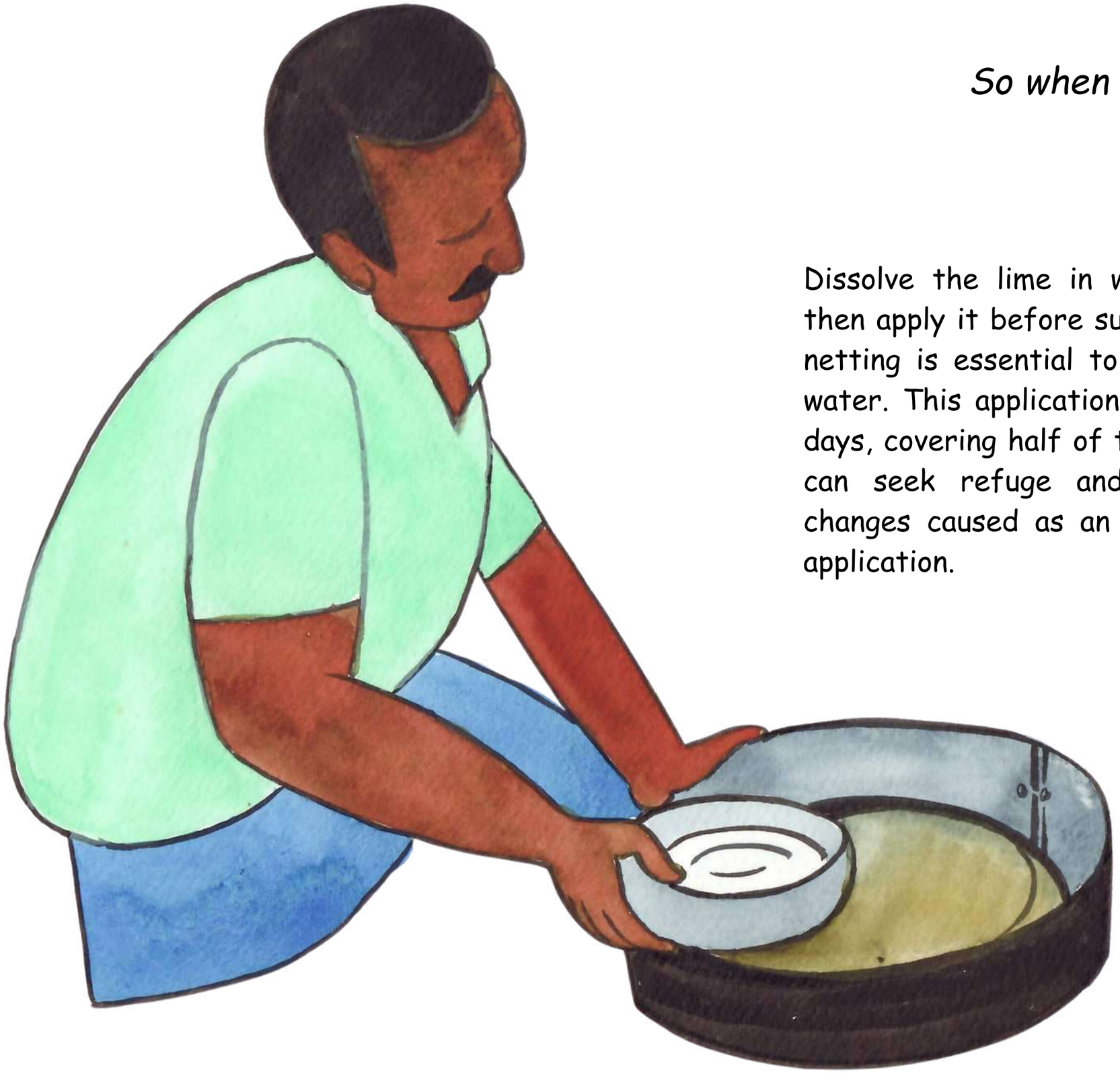
Madhab Da, the problem is technique, not lime itself. Applying lime at midday is a common local mistake.





As noon approaches, pond water's pH rises, peaking around 3 pm. Lime applied then triggers an exothermic reaction that releases more carbon dioxide, making the water more acidic and harming the pond.

$$CaO\,(s) + H_2O\,(l) \rightleftharpoons Ca(OH)_2\,(aq)$$
$$(\Delta H_r = -63.7\ kJ/mol\ of\ CaO)$$



So when should we apply lime?

Dissolve the lime in water the previous night, then apply it before sunrise. After that, a drag-netting is essential to mix it thoroughly in the water. This application should be done over two days, covering half of the pond each day, so fish can seek refuge and avoid sudden chemical changes caused as an immediate result of lime application.



Sir, you suggested using Urea and DAP to boost plankton growth in the pond. But we practice organic farming here and see these as harmful chemical fertilizers. Many fishers even refuse to use them. We've never used Urea in inland fisheries. Is it really safe, or would it affect the edibility of the fish?

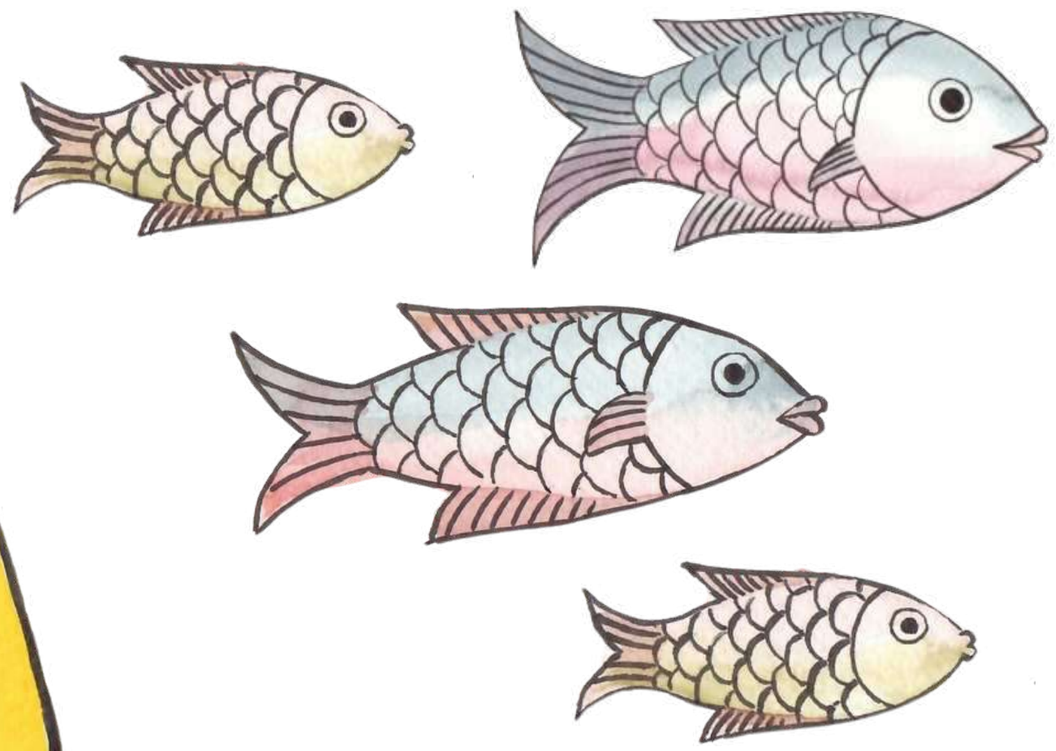


Urea and DAP get decomposed and contribute significantly to plankton bloom. If a pond already has optimal plankton bloom, skip the Urea - it may cause excess plankton!





After all these, I finally released fingerlings of Indian Major Carp (IMC) of an average 120 gm size.



If you want to make the most of your investment, release Catla: Rohu: Mrigal: Carps in 30: 50: 10: 10



And for the carps specifically, do not forget to release Grass Carp: Chinese Carp: Silver Carp following 3: 3: 4.

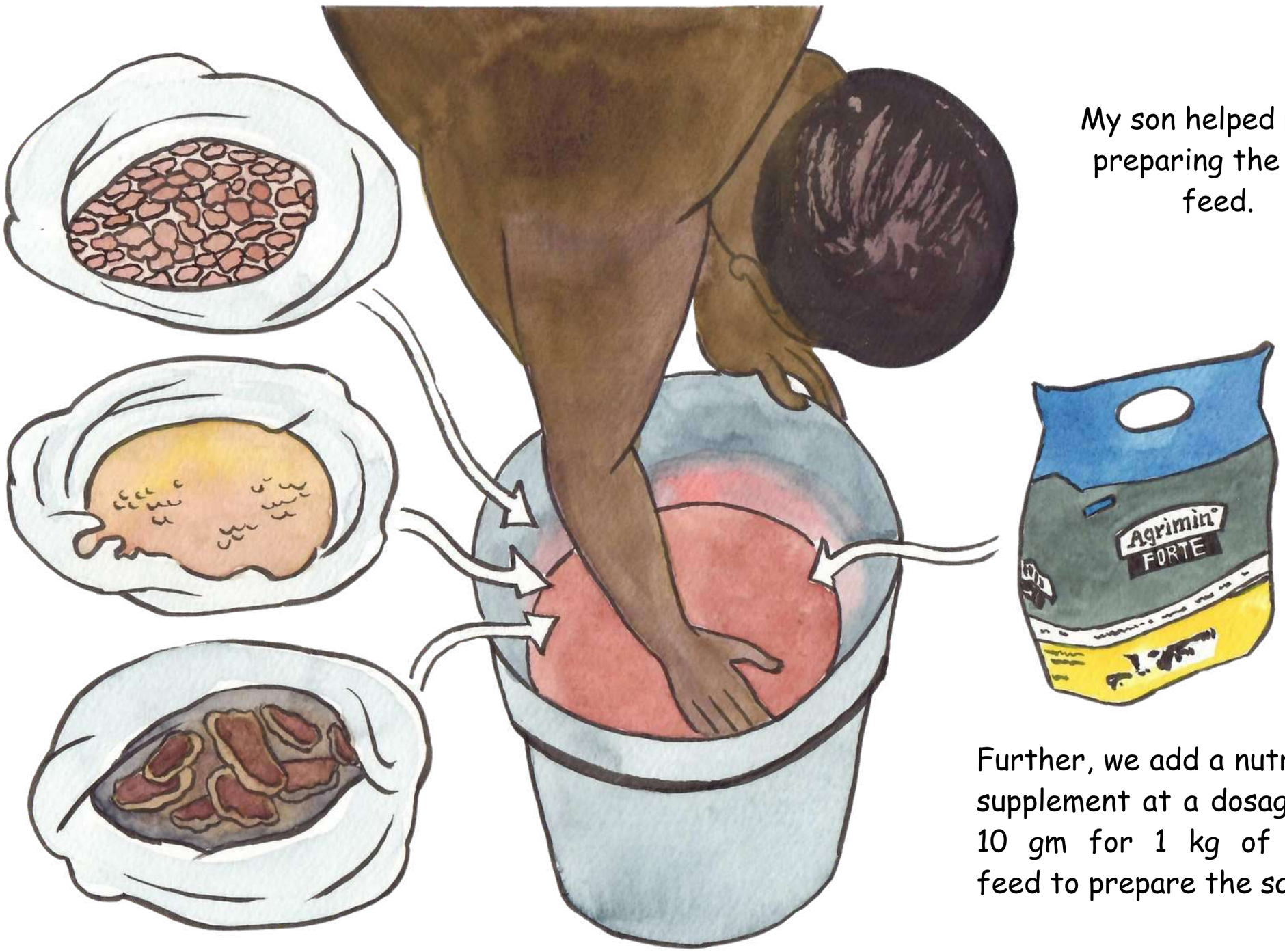
Sir also told us that for the first 15 days, the fingerlings will consume plankton only. It was a sigh of relief to gain this knowledge as I didn't need to spend on any other external food.



Mustard oil cake

Rice bran

Nut cake



My son helped me in preparing the fish feed.

Further, we add a nutrient supplement at a dosage of 10 gm for 1 kg of fish feed to prepare the same.

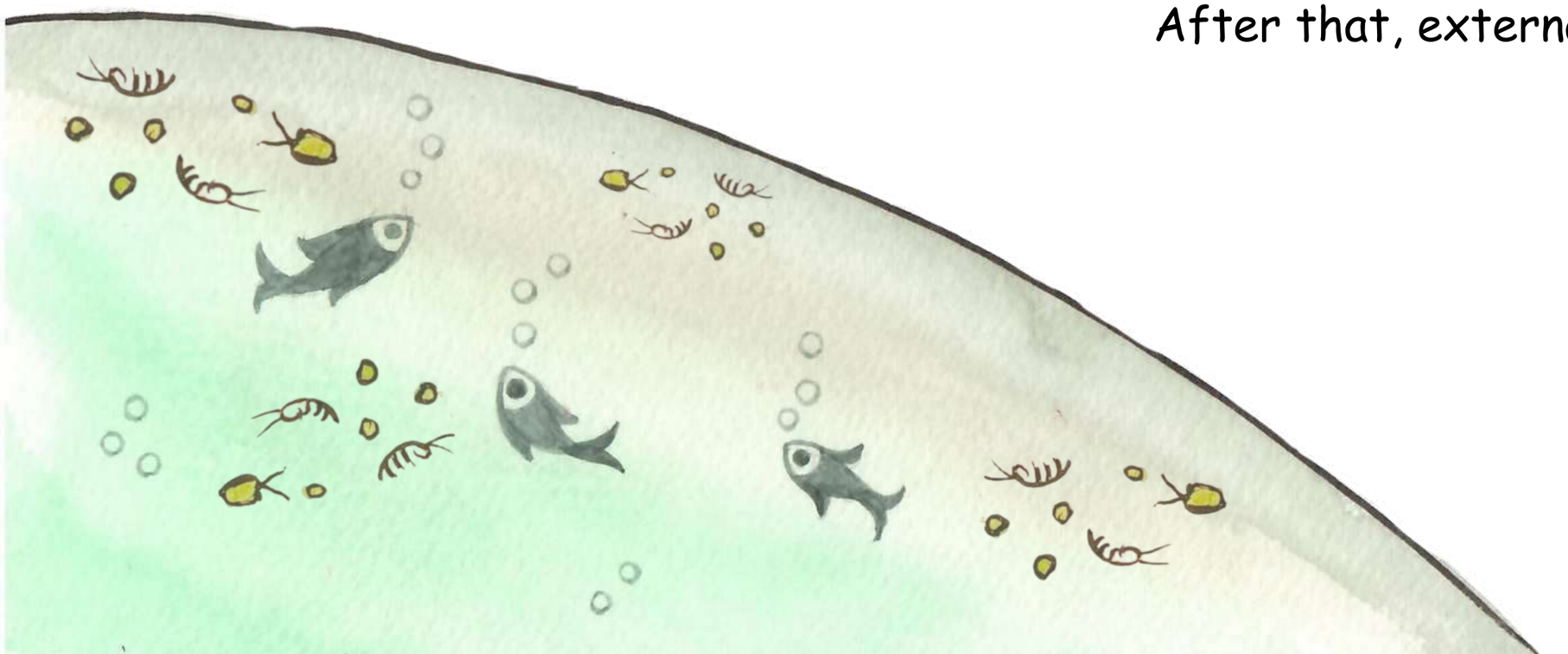
We mix mustard oil cake and nut cake (soaked in water for two days) with rice bran in a 4:3:3 ratio and



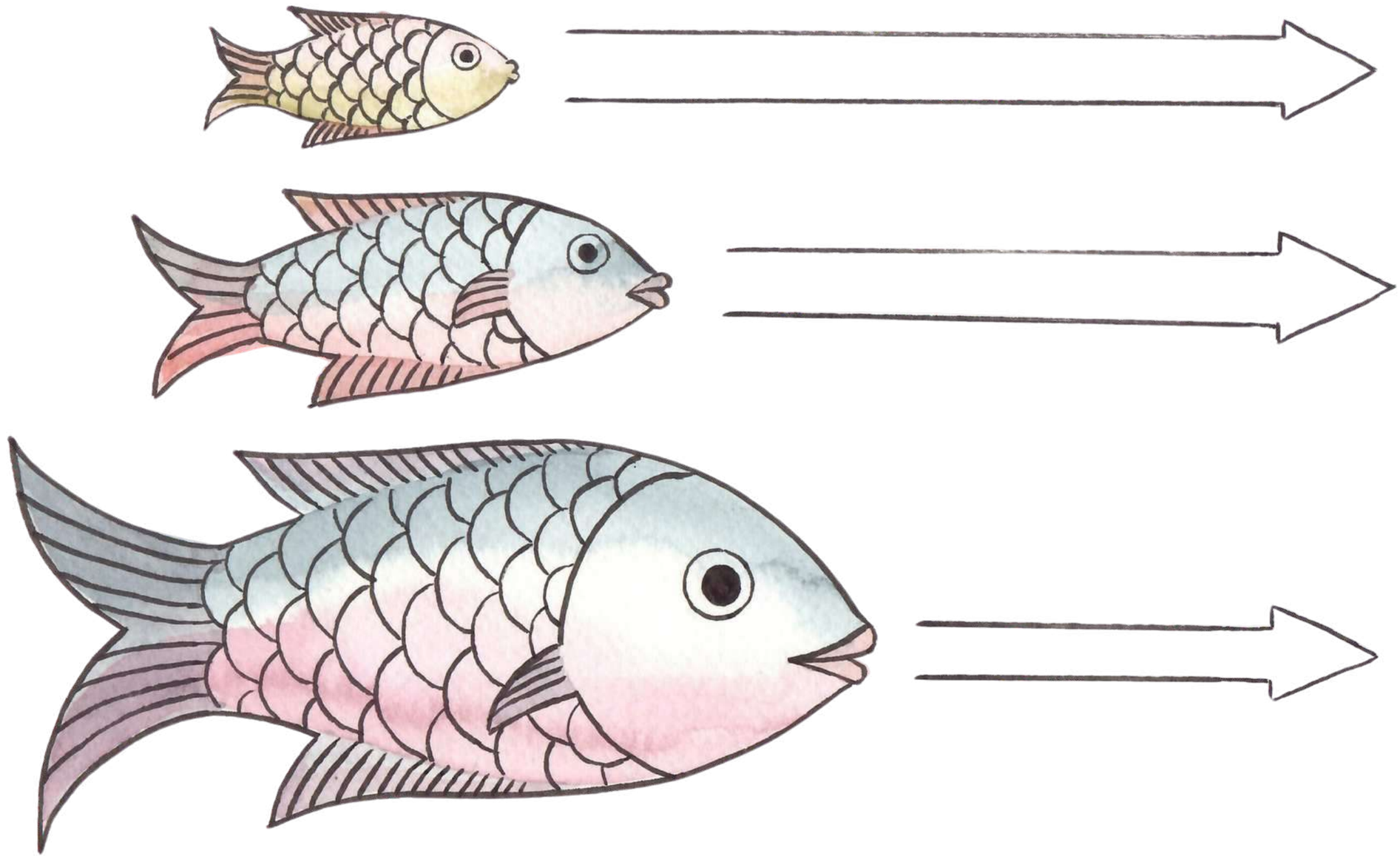
Then we make mounds of this mixture contained in porous shacks, clumped with bamboo sticks; they are applied in the four corners of the pond on alternate days. We avoid the cloudy days and rainy days as fishes do not tend to consume feed on those days.



Generally, spawns and fingerlings feed on plankton in the water.
After release, they need no external feed for up to two weeks.
After that, external feed can be given.



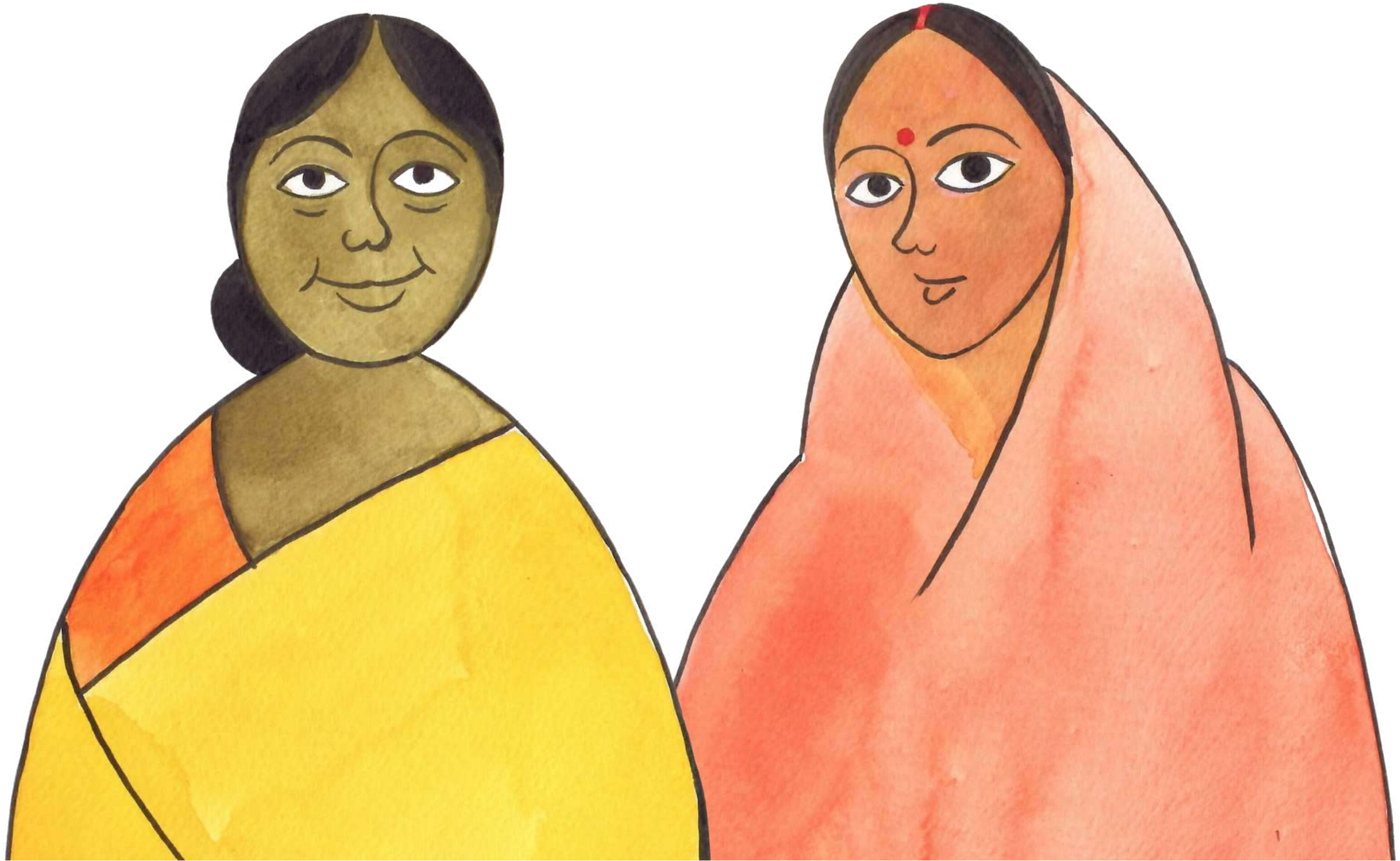




Initially, you can apply fish feed externally at 6% of the total body weight of the fish in the first month after the fish release. In the following months, reduce the rate in descending order—5%, 4%, 3%, and so on—as the fish grow. As fisheries experts explain: older, heavier fish have slower metabolisms and therefore eat less.

Here's my daughter-in-law Minati.
She is the one who assisted me and
actively engaged in the regular
maintenance of this fish pond.

I followed Ma's instructions – as she shared every minute
detail that she learnt from the Sundarban Bari workshops.
But I also knew a few things already, as my paternal house
had a pond where my father and my uncle started
cultivating fish a few years ago.



Minati's pond maintenance activities

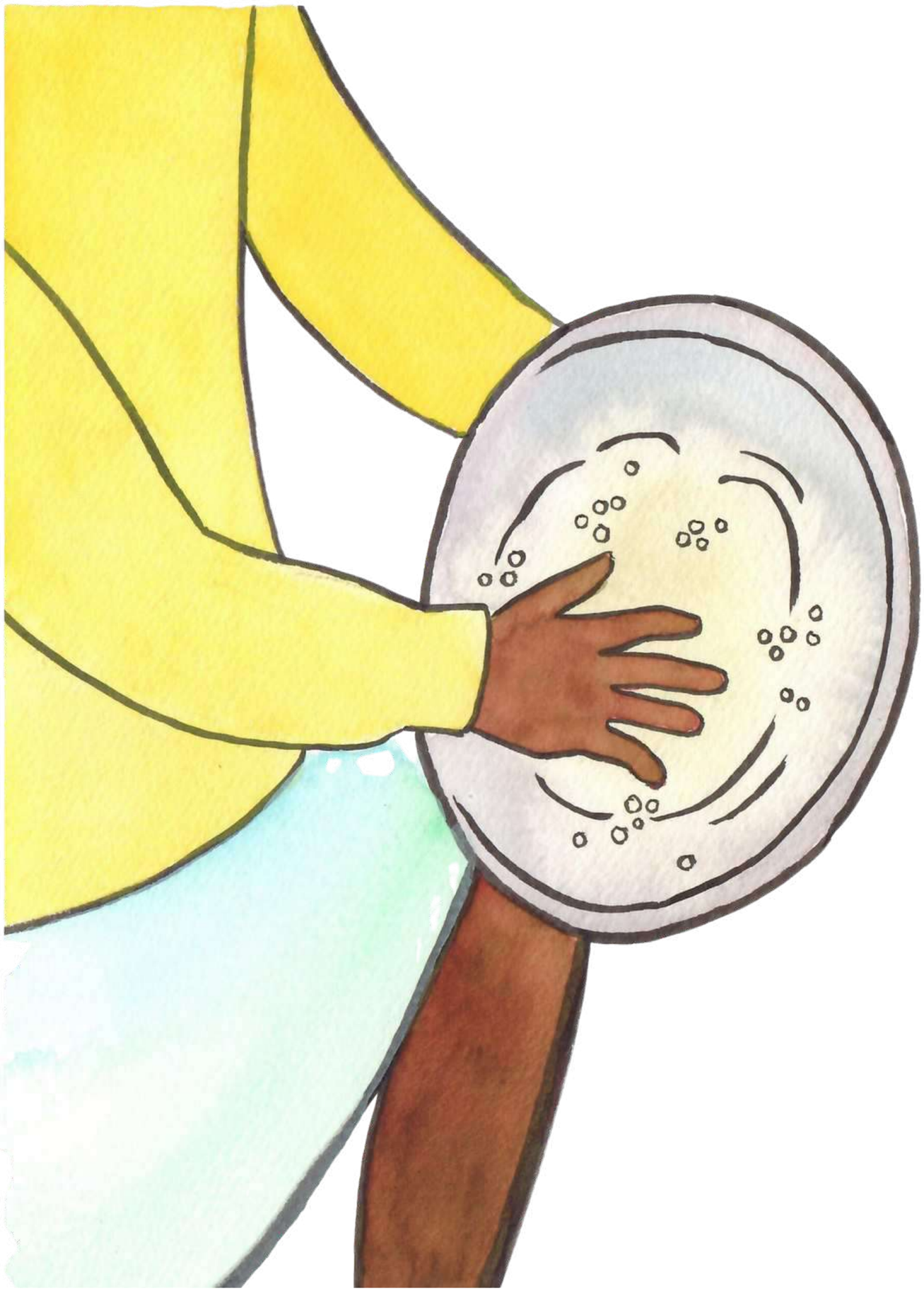
- *Application of two split doses of common non-iodized salt @ 0.075kg/decimal between 12 noon and 1 pm on the 1st and the 15th days of every month once the fishlings are released, until the harvest is done*

- *Two split doses of soaked lime @ 0.075kg/decimal at dawn on the 4th and the 18th days of every month after fish release to harvest*

- *Two split doses of Di-ammonium Phosphate (DAP) @ 0.045kg/decimal on the 8th and 22nd days of every month from fish release to harvest*

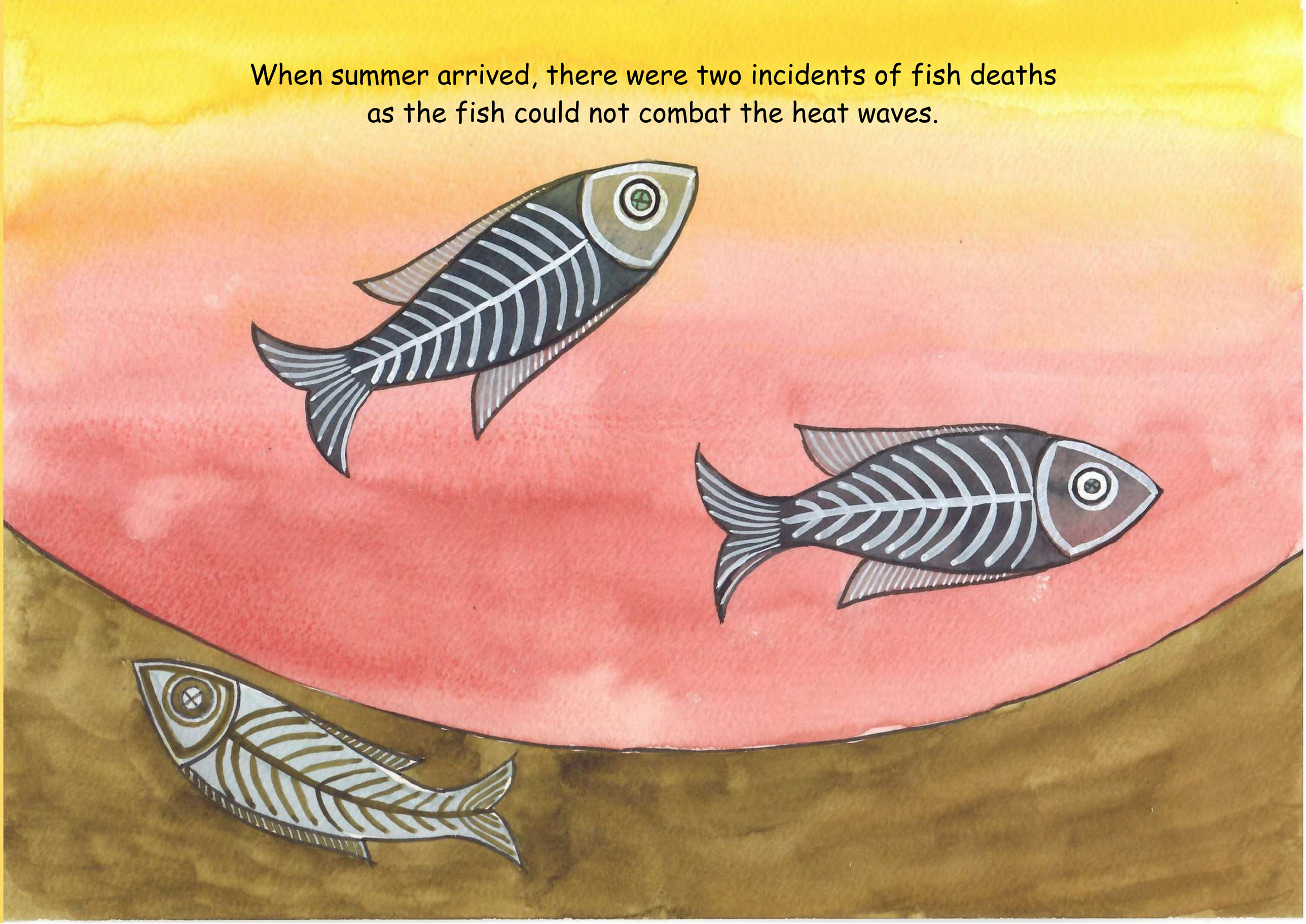
- *Application of 45 kgs of cow dung fermented for 3 days – once every month in the four corners of the pond from releasing fishlings to the fish harvest*

- *Minati's husband engaged in netting once every month since the fish are released, and it continued until all the catches are harvested*




DAP

When summer arrived, there were two incidents of fish deaths
as the fish could not combat the heat waves.



Then all of us engaged in stirring the pond water at regular intervals to enhance the oxygen supply in the water.





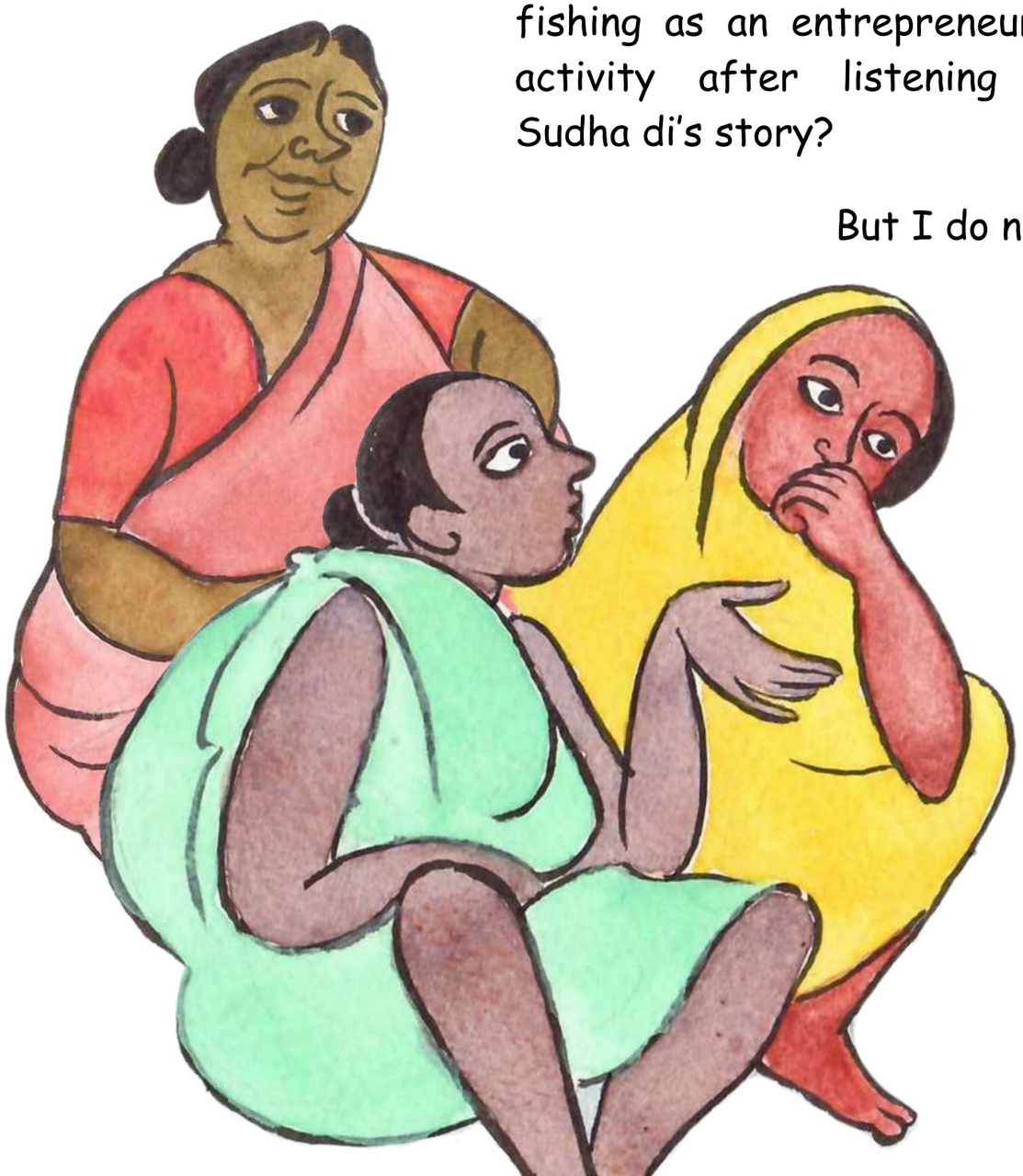
Along with stirring the pond water, please add Hydrogen Peroxide tablets – half a tablet per decimal area of the pond on alternate days to enhance the oxygen level.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$



Oh my God! So much knowledge and activities. This is so inspiring!

Can we not choose pond fishing as an entrepreneurial activity after listening to Sudha di's story?



But I do not have a pond....

Our pond is jointly used by my husband and his three brothers. They will not give me any access.

Why do we need to do it as an individual enterprise? Let us pursue pond fishing collectively. I can convince my father-in-law and husband to offer us the smaller pond in our house.



Wow! Collective fishing can be
the route to activate our SHG.
What do you think?



So now I hope you all are well prepared to start the first round of activities in Sulekha's pond.



We remember how Bishnu da and many other households incurred huge losses when Cyclone YAAS destroyed ponds and already grown fish varieties incubated in the waterbodies.

Yes! But we are only a little apprehensive about what we should do when there are cyclones and related hazards.



It was a big loss against investments. The damages were heartbreaking.



Do not worry!
We now have solutions to this too.

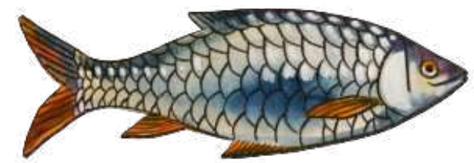
- *Apply soaked lime at 100 grams per 100 decimal area of the pond. Mix it in water the previous night and apply before sunrise—half the pond one day, the rest the next. Do this after dragnetting to ensure even mixing."*

- *Prepare fish bait by mixing 50% wheat flour, 20% fermented rice, 10% jaggery, and 10% of a blend of aromatic ginger, fenugreek, and country liquor. Place the mixture in fine nets and distribute them across the pond before the onset of cyclones. The bait attracts fish, keeping them away from the surface and protecting them from inundation.*

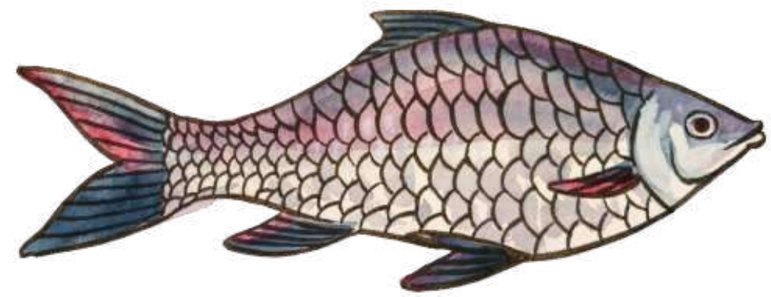
For climate-resilient inland fishing,
you can adopt a multi-stocking and multi-harvesting approach

Before the cyclone arrives, harvest-

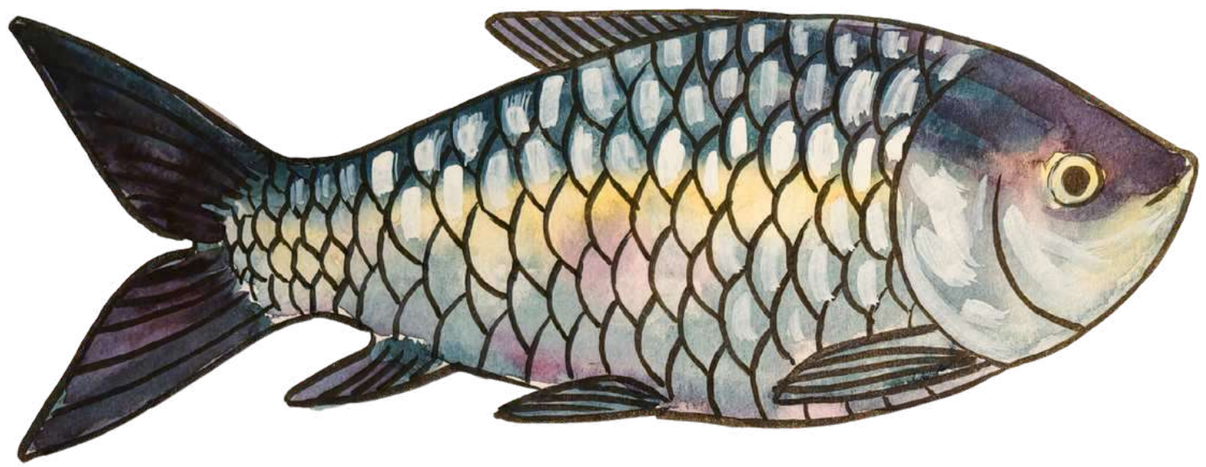
- Mrigal at 75–100 gm,



- Rohu at 200 gm,



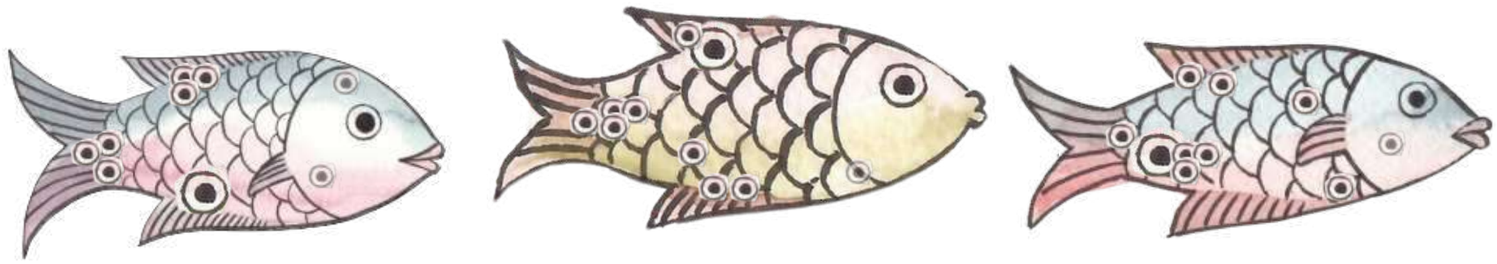
- Catla at 500 gm,



and sell them locally.

After a cyclone, restore and prepare the pond, then restock with the same species and sizes.

Another question: how do we deal with disease outbreaks in fish varieties?



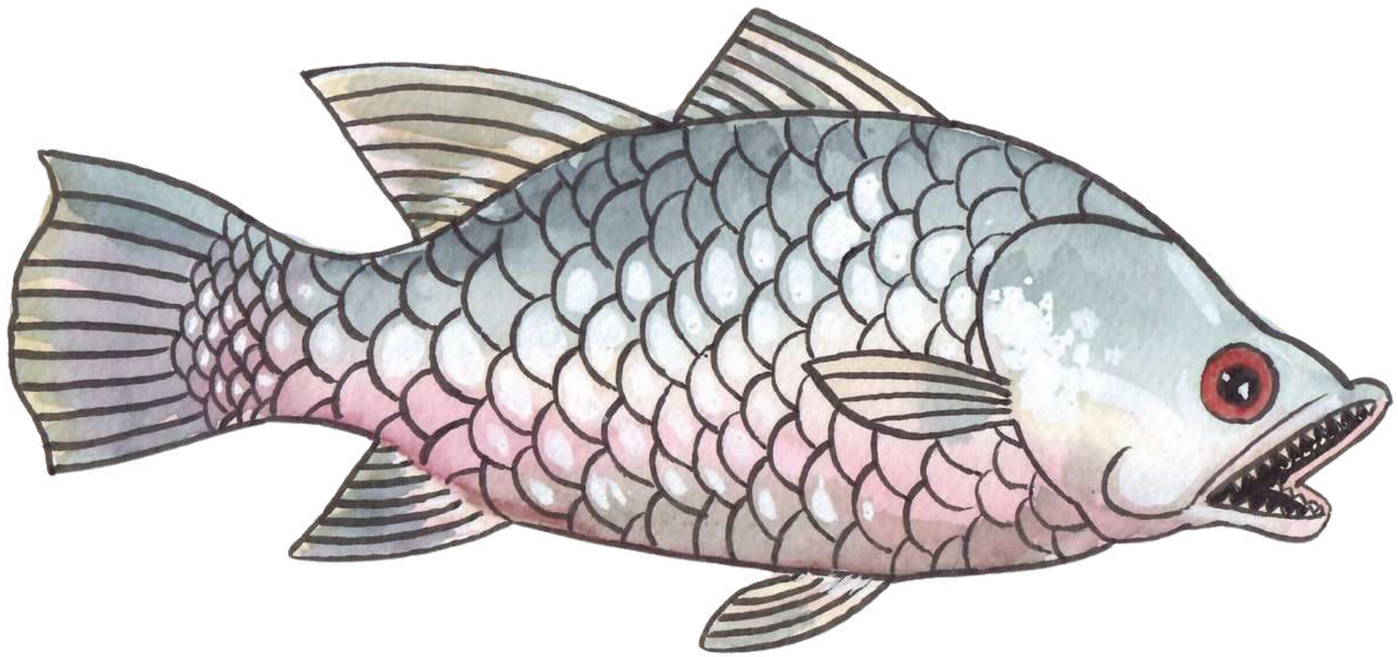
In the workshops, we learnt that regular application of lime and non-iodized salt could automatically offer protection against diseases, including Periphyton infestations.

Additionally, applying a non-iodized saltwater mixture (500 g salt per 20-liter bucket) every two weeks, followed by a potassium permanganate solution (half a teaspoon per 20-liter bucket), effectively controls Periphyton and stops Likens and Argulus infestations.

The method is simple: gather the fish into one corner of the pond with a dragnet, sprinkle the mixture over them, and shuffle the fish by hand to ensure even application. For severe protozoal and Argulus infections, Blesson (BKC) is used, based on scientific knowledge and expert guidance.

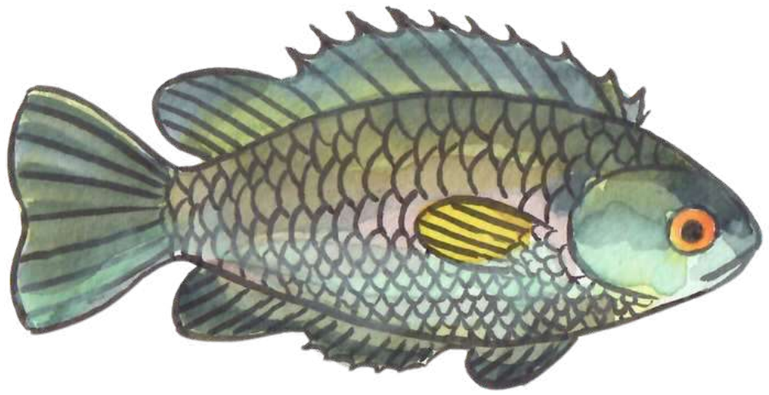


You should also keep some money to buy predatory fish such as Bhetki (*Lates calcarifer*). They consume predatory species of *Tilapia* and their outgrowing numbers. I learnt this trick from my own father when I was small.

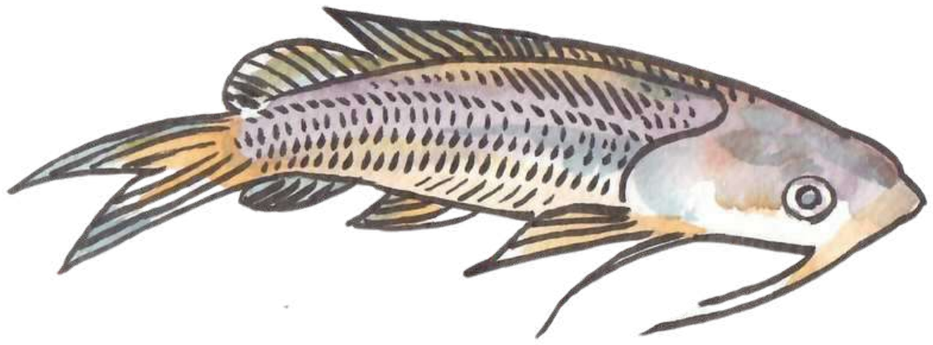




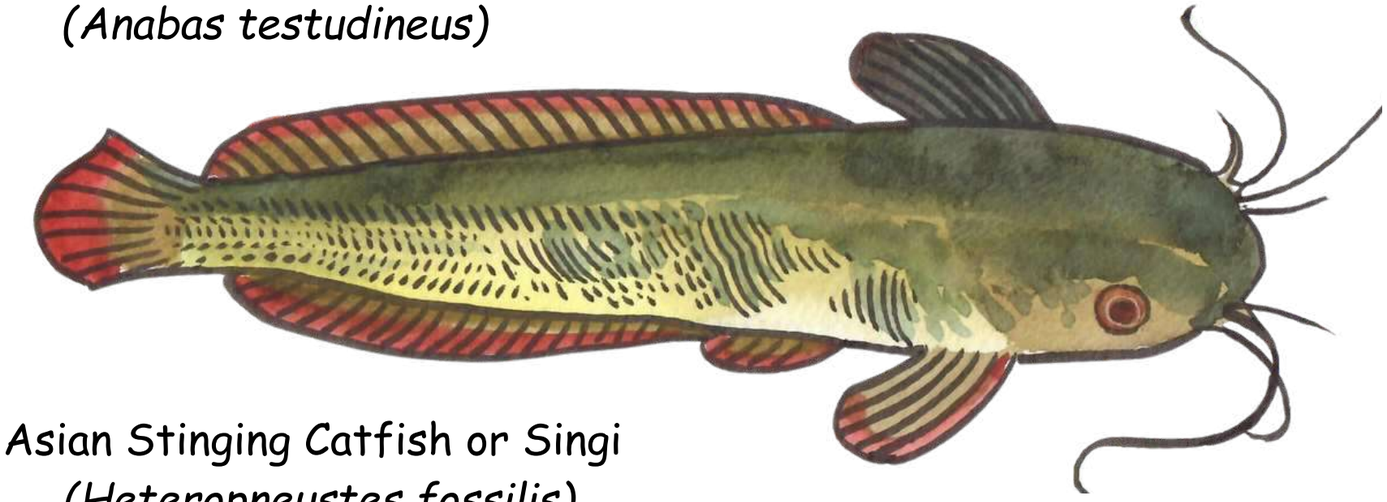
Bhetki (approx. 60 grams in size) at a stocking density of one individual per decimal area of water is an effective biological control measure when the pond is invaded by auto brooders.



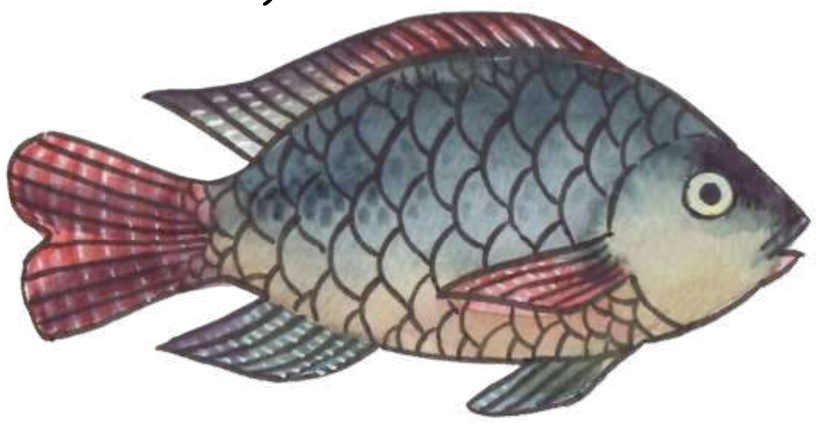
Climbing Perch or Koi
(Anabas testudineus)



Gangetic mystus or Tengara
(Mystus tengara)



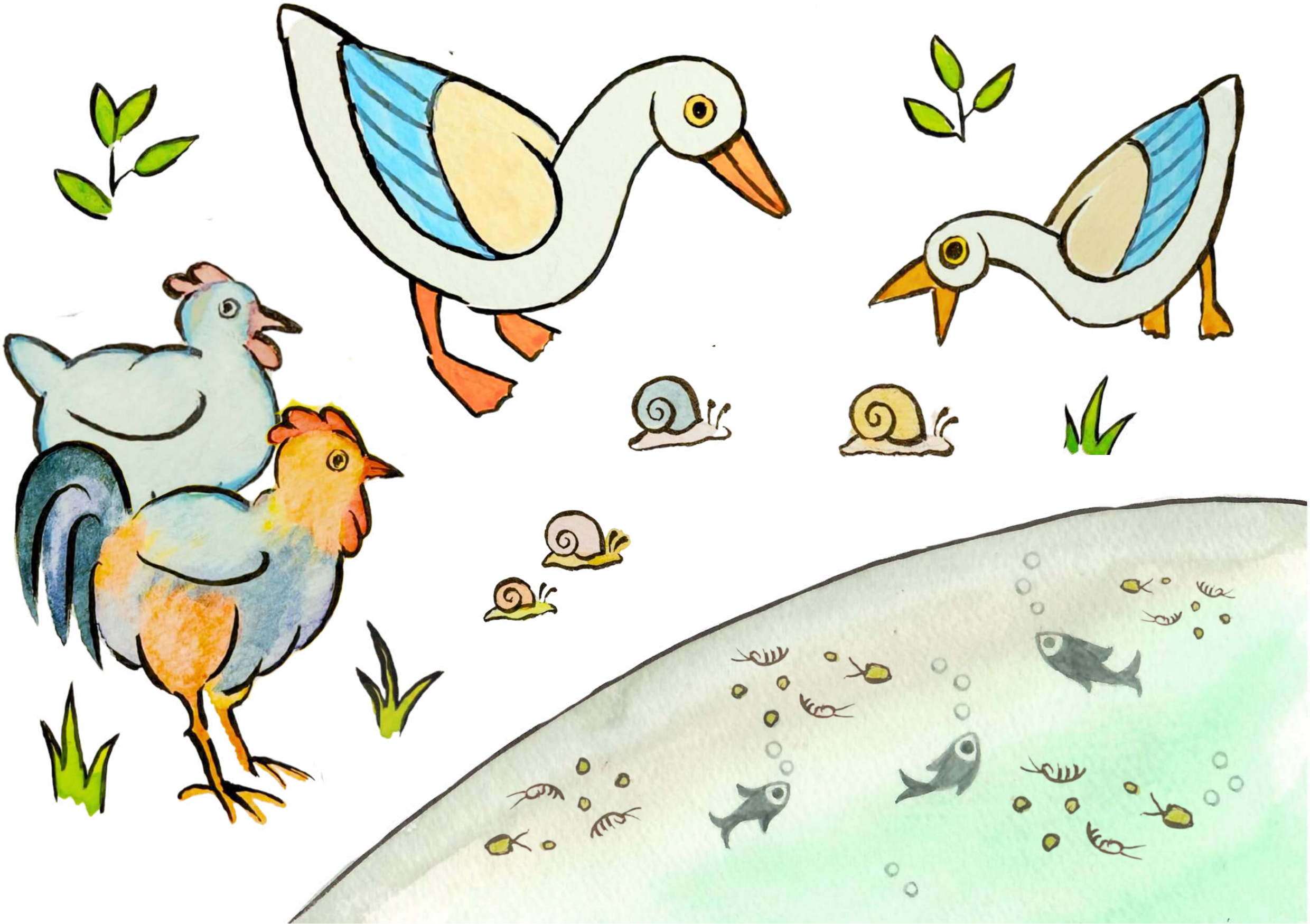
Asian Stinging Catfish or Singi
(Heteropneustes fossilis)



Tilapia
(*Oreochromis niloticus*)

During the monsoons, these species can invade our pond when water from adjoining ponds or paddy fields inundates the pond.





I wish you luck towards a successful collective venture!



We will need you by our side as our mentor.

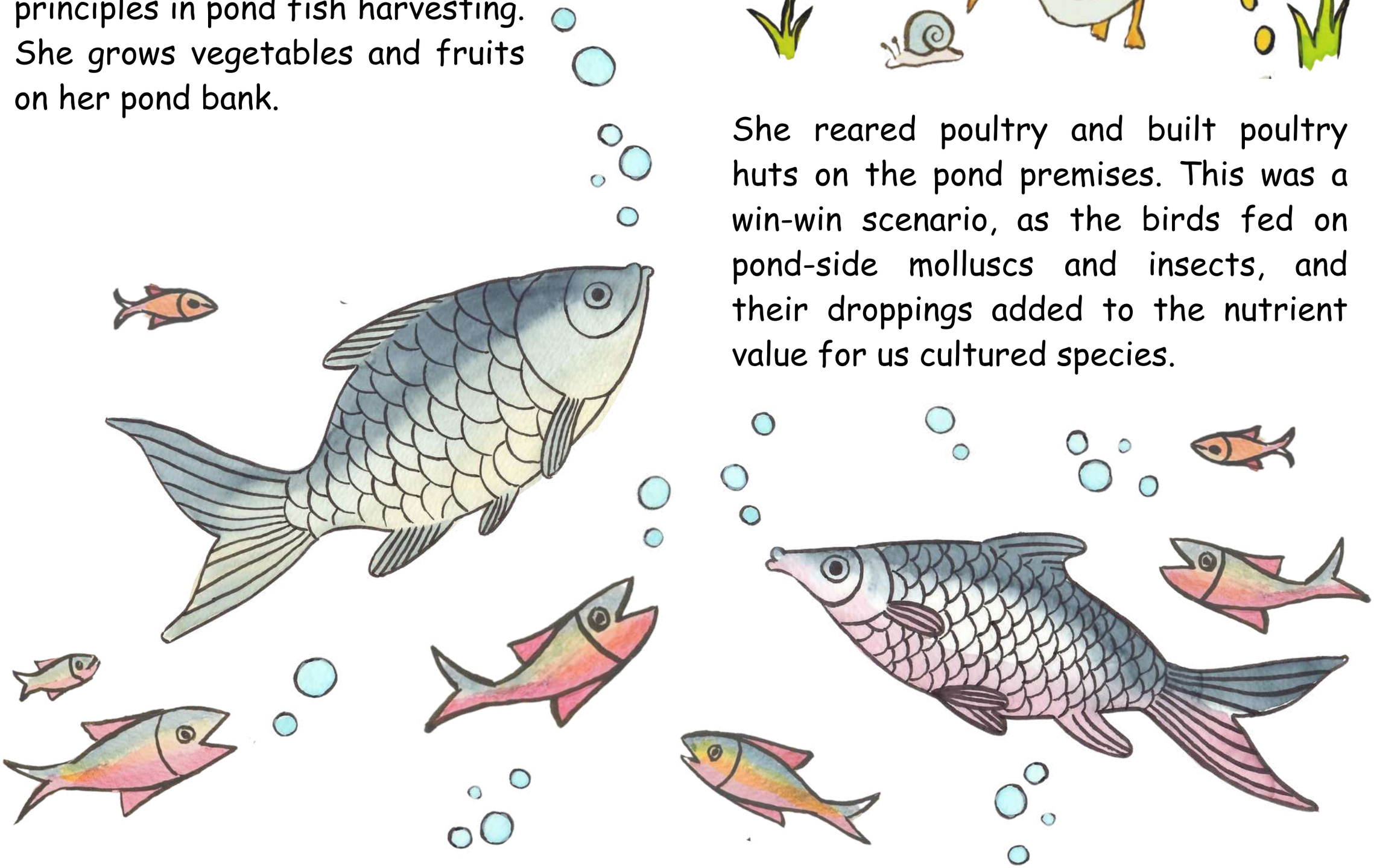


Sure! I will also share some more tips with you which I experimented with, apart from what I learnt from the workshops.

Sudha di applies circular ecology principles in pond fish harvesting. She grows vegetables and fruits on her pond bank.



She reared poultry and built poultry huts on the pond premises. This was a win-win scenario, as the birds fed on pond-side molluscs and insects, and their droppings added to the nutrient value for us cultured species.





This is so helpful! This will mitigate risks of our SHG by letting us diversify our incomes through these complemented sets of activities. Let's do this together!

Let's do this together!!!



In the lower deltaic Bengal, people worship the folk deity Makal Thakur, who is considered as the protector of fish-rearing waterbodies. He is worshipped in the form of mud mounds or stupas near the ponds. Bananas, Puffed Rice, and Sugar Candies/Moringues (Batasha) are generally offered to Makal Thakur.







