

# A Small Farm Water Management Case Study: Fighting Climate Change and Promoting Self Sufficiency

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By: Translated by Patrick Fitzsimons

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"This year the water in the Pa Sak Jolasid Dam was so low you could see the temple ruins, trees, old buildings; all of it. It was a serious water crisis, but if it had gone another half a month without rain, the crisis would have been even worse. Because we don't have any fresh water, we can't build potable water infrastructure; we can't create drinking water. Water is essential, both for consuming and using. We campaigned for nine days about one issue: water. Some places didn't have water for showering or cooking. It was a real crisis. We went to ask for water from other people, but they didn't have any either. That's how bad the crisis was." These are the words of people from the Pa Sak water basin about the state of this year's water crisis. Nevertheless, there are ways to manage our land so that we can survive droughts like this, by means of the "mound, reservoir, and paddy model", an example of micro irrigation which has been implemented in Tambol Nong No, Amphur Muang, Saraburi Province, Central Thailand.

"For this area we've now calculated that we can collect 300% of our water. First, from rain; second, from released irrigation water; and third, water from people who haven't collected it; who don't have reservoirs. This allows us to release and distribute water to the whole of our farm," says Mr. Bunlom Taokaew.

**Farming Only Rice Means Debt; Integrated Farming Means a Sustainable Livelihood**



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Mr. Bunlom Taokaew is the son of rice farmers. He chose a career as a businessman after he finished school. Because he didn't make enough of a living, he went into debt to the order of hundreds of thousands of baht. He borrowed money from his father, a farmer using integrated farming methods, many times to repay his debts, until finally his father told him to return to being a farmer instead. Mr. Bunlom decided to take his advice, but he didn't believe farming would help relieve him of his debts. He started by building a structure to cultivate oyster mushrooms, which didn't require a large investment, and little by little he started to produce enough to sell locally, reducing his living costs, until there was enough money left over to save, and until, finally, he was able to repay his debts. His sustainable life began more than ten years ago. It was a result of following in the footsteps of His Majesty the King, and his own father, who set an example he could follow.

Go back twenty-five years and look at this same twenty rai (3.2 ha), near one of Thailand's many "Centers for Sufficiency Economy Education". This twenty rai had only ever been used to cultivate rice with chemical fertilizers. During years that it rained and there was plenty of water, enough rice could be sold to live off and repay debts. But any year there was drought, debts would pile up. The more they farmed, the more debt they would fall into. Therefore Mr. Bunleu Taokaew, the head of the family, decided to stop renting extra fields and focus on getting the most benefit out of the twenty rai he owned. He did this by listening to talks about new agricultural theories at the Wat Mongkhon Chai Pattana temple, where His Majesty the King had also set aside land to establish an example of these principles. Every time he went to these events, he came home and adjusted his land. Especially important was creating places water could be stored for later use, helping free him from his sole reliance on irrigation, as had been the case in the past, and move him from monocropping to integrated farming.

## Dig a Reservoir Both Deep and Shallow; Let it Wind Around Your Property; Your "Chicken Guts" Canals Will Feed Water Throughout the Area

As water is such an important factor in agriculture, the talks at Wat Mongkhon Chai Pattana made him decide to make his original reservoir wider, and to dig a new reservoir, so that he would only have four rai left over to farm for household consumption. However, when Mr. Bunleu dug the new reservoir for the first time, he still lacked a lot of knowledge and understanding about reservoir-

digging. All he knew was to use a backhoe to dig straight down and 6-7 meters deep, in the shape of a square. It was good enough for storing water, but that was about it (Figure 1).

Later, once he went to study with Ajarn Wewat Salayagamthorn at the Agri-Nature Foundation, he came to understand that a good reservoir should share the characteristics of waterholes found in nature— having varying levels of depth, so that living things, both plants and animals, are able to develop inside, instead of being used solely to store water. When he expanded the reservoir once again, he dug it to conform to the condition of the area around it as much as possible.

"Of this twenty rai, in the past I dug out about one rai, which including the ditches around the farm, amounted to about three rai, but not dug in the same place. This year I dug more because we haven't had enough water, because this year we had the drought. Look here, the water we use for the plants and animals, for our household consumption, it was dry. It was a total crisis. The ditches on the farm were all dry, and in the big pond only about a meter left. If it had been another half a month without water, and if they hadn't released the irrigation water to help us, we'd have died. We wouldn't have had any water to use. We had the Lat Krabang's method of calculating how much water we use for consumption; how much water we use to farm rice; how much we use to raise the animals, plant the vegetables—so that one plot, say, needs a reservoir dug how deep, requires just how much water.

"This year we dug at an additional two spots, because we already saw that if there was another drought like the one this year, there wouldn't be enough water with just the big reservoir we had. So we dug more, so that we might have water we could use the whole year, including any seasons the rain doesn't come. Ajarn Yak says that out of 365 days, only 60 will rain. 300 won't. And he says that water will evaporate at a rate of 1 cm per day. So we can see that a reservoir only 3 meters deep won't be enough, because all its water will evaporate. So we added a new reservoir, so that we can match the amount we need to use on our land to our storage capacity.



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Figure 1. The first reservoir dug for water storage, in a square shape.

"Our new reservoir isn't square, like our old one. Once I'd seen Ajarn Yak's, seen the Lat Krabang design—they didn't waste space. We dug a reservoir that took the shape of our area, twisting and turning (Figures 2-5). We planted vegetables and other edible plants all along the sides. By volume, it's as big as our big square reservoir, but we didn't have to waste any single space to dig it. Ours has tight turns, deep turns. We can see that the fish lay eggs—fish like tilapia, silver barb, they don't lay eggs in deep water. They live in shallow water, no deeper than 2 meters. They grow well, and grow fast. It's because they need to rise and breathe at



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Figure 2. The additional reservoir that was dug this year. It twists and turns with the characteristics of the land, and varying levels of depth, which also imitates natural conditions.



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Figure 3. Irrigation ditches bordering the property collect water from surrounding areas, as well as helping to demarcate boundaries.



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Figure 4. Chicken guts canals or irrigation ditches help distribute water throughout the property.



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Figure 5. In irrigation ditches, frogs can be raised for consumption and sale. Plant water hyacinths to improve the water. Rice straw mushrooms can also be cultivated in the baskets.

this level. The water plants, meanwhile ... If the water is really deep we don't get anything to eat—it's only good for storing water. But if we have a shallow level, various water plants can grow, like pandan and vegetable fern. They'll grow in depths of about a meter. This means another food-source in our reservoir. Plus they help prevent it from collapsing. If you go look at the first reservoir we dug, there are no plants growing in it at all. No morning glory. All it does is hold water. But when you come and look at shallower areas, you see food, as well as somewhere to put our water."

The newly expanded reservoir has three depths: a shallow level of 1-1.5 meters; a middle level of 2-3 meters; and a deep level, from 4-5 meters to 8-9 meters. This reservoir feeds the "chicken guts" canals or any smaller canals connected to it. It waters all the plants on the property—everything in the rice fields, vegetable gardens, fruit trees plots, bamboo forest—the entire year.

As well as rainwater, and water from the irrigation canals which can be released into the property, there is another source of water Bunlom can collect and use: water which hasn't been collected on surrounding properties. This is a large amount: twice as much as what he collects.

"For this area, we've now calculated that we can collect 300% of our water. First, the volume of rainfall in Saraburi amounts to 1,200 mm per year. Second, the irrigation water released amounts to the second part. And third, water from people who don't collect it. We get it from here—they don't have a reservoir, so we take all the water that comes onto our property. We've already dug canals all around the outside of our property, so we therefore have canals in all directions. However, the water must first pass through the small canal on our perimeter, and be filtered. We use the Bhumiak principle: let one evil subdue another. We use water hyacinths for filtration. And our reservoirs are earth reservoirs; we use earth as a filtration agent. We also add fermented plant juice liquid and bananashoot microorganisms every one or two months, to adjust the water condition," says Bunlom.

### Raise Earthen Dikes; Store Water; Mold Large Dikes; Plant Edible Vegetables

As well as storing water in reservoirs, rice paddies and mounds can also be used to collect water.

"When we first implemented the new ideas, we divided our land: for

digging our reservoir, for farming rice, for growing vegetables, for raising animals, and for living. At first we thought our reservoir would depend on irrigation water releases and rainfall.; that they would both keep it full. But then came the floods of 2011. It flooded, the water overflowed, and we didn't know how to solve the crisis. Now, this year, it doesn't rain, and so there's no water in the dam. Because there's no water in the dam, they can't release any water for us. So now we're facing a drought crisis. three years ago I learned about the Follow in the King's Footsteps Project, which brought up the "mound, reservoir, and paddy model" theory. I was able to go and study there, learn with Ajarn, and saw what this "mound, reservoir, and paddy model" meant.

"Digging a reservoir and making calculations based on your own area was done using the Lat Krabang principles. You could take these and calculate how much land you had, and so how deep and wide you should dig your reservoir, in order to have enough water for your particular area. In the past the top of earth dikes were small and short, and were only to secure the rice paddy. They weren't considered ways of storing water for later use, so we were always pumping water into our rice plots. But then I learned that they needed to be built bigger. They had to be raised up: about one meter wide and one meter tall. At



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first I wondered why they had to be so tall. But then I came to understand the principles. As well as enabling us to collect water inside our rice fields, making the top of our dikes bigger meant we could plant vegetables there, or other edible or useful plants we wanted to grow. Instead of simply being a dike that helped store water, we had this group of plants which brought a host of other benefits. So in one rice paddy, we didn't just have rice, but we had crops on the dikes (Figures 6-9). We had food, and we had income during those 4 months we spent looking after our rice. We turned these crops into income. We came to see rice as just one part of what we did; on the top of our dikes we had a lot more than rice.

"With high dikes, we had a high level of water. Weeds didn't grow in our rice paddies because they were flooded with water. So the rice sprang up, taller and taller, to catch up with the water level. It's therefore a good way to control unwanted weeds, without putting herbicides into our fields. We're farming organically!"

### An Area's Design Must Consider Earth, Water, Wind, Fire, and People

For anyone who has land they want to redesign in order to more efficiently manage and control water and land use, there are some principles that must be considered.

"Important factors in assessing your area are: earth, water, wind, fire, and people. Earth: you must investigate what kind of soil you have. Water: at what points does the water flow onto your property, and from what direction. Wind: this is important for the location of your house. Wind comes from two directions: the southwest wind blows in the rain. The north wind, the cold wind, comes from the northeast. When the north wind blows, we know it's time to harvest our rice—around December, January. It will blow the rice debris into our house. We call it the early rice wind. If we plant our fields, and then build our house in this direction, we're going to be full of rice dust. Or, build our house somewhere that receives the sun on both sides—both east and west—and it'll be hot all the time.

"Fire means sunlight. To the east and the west we should plant trees, wherever they're needed—don't just let your house be hot all the time. In our rice paddies, we can also plant fruit trees on the dikes. If we plant to the east and the west, the shadows of the trees will reach over the paddy, creating shade. If we plant to the north and south, the sunlight will pass right over the dikes, and the shade won't enter the paddy. Therefore you can plant tall trees to the north and south, but to the east and west you should only plant short trees.

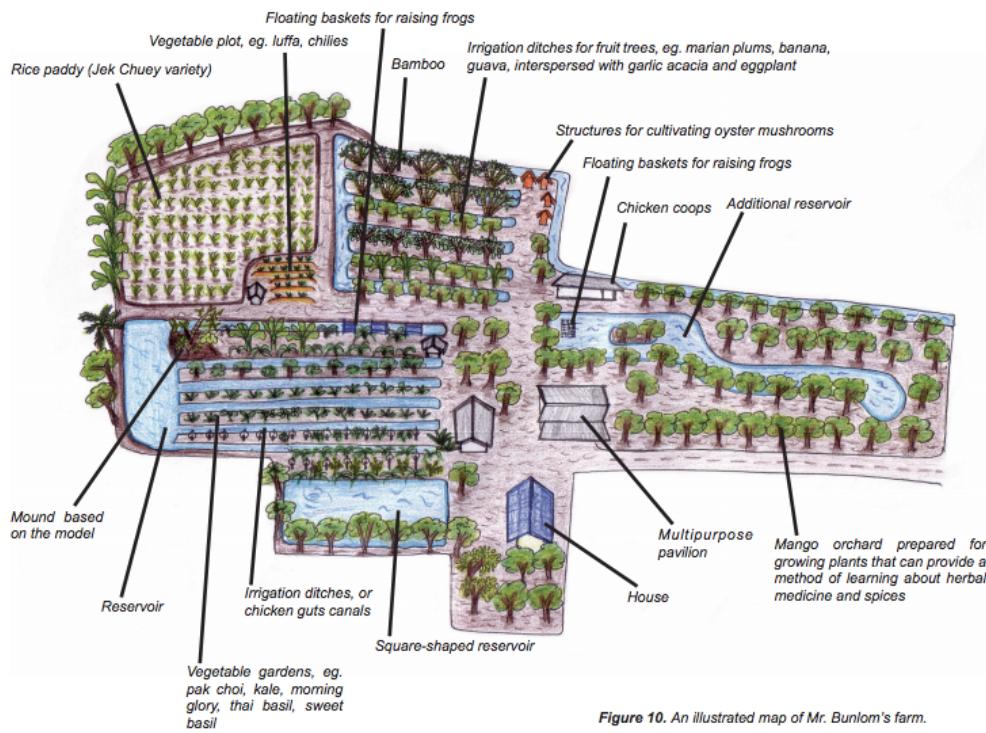
"The most important factor is people. The design must satisfy the people who live there. Take this theory and work out what the people want to do, and how. If we do all the thinking for them, it'll mean they won't like the area we design. So it's obvious that the human factor is the most important of them all," says Mr. Bunlom, about the principles of design.



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(/resources/17ba5e0e-fdb9-47dd-a112-ec9d21cb29b5) **Figure 6.** A model of a mound planted with vegetables and perennial trees. A house can also be erected here for shelter during flooding. **Figure 7.** Raise dikes to a height of one meter. When water floods your paddies it will be collected. **Figures 8 & 9.** When there is abundant water, vegetable crops, and trees, your farm will always be lush.



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Figure 10. An illustrated map of Mr. Bunlom's farm.

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"Every house should have a "coconut dessert well". A hundred thousand would collect as much water as a dam." The benefits of managing water and land according to the principles of the mound, reservoir, and paddy model, aside from producing good results for the owner of the land, will also produce good results at a regional level, and a national level too.

"Creating mounds, reservoirs, and paddies are all forms of water storage. They will help both flooding and drought. If there is flooding, we can draw water in and store it on our land. We have areas to do that, and it won't flow down and find people in Bangkok. If we could collectively implement this model about a hundred thousand times in the Pa Sak water basin, it would be equal to the capacity of the Pa Sak Jolasid Dam. We'd have a dam, without ruining the forest, without appropriating land, without affecting those communities that live on that land, without all the protests—by using just the land we already have. And, what's more, the land we use for it will bring us other benefits. If we can do even more than this, we'll have the equivalent of an even bigger dam; or maybe you can only make a medium-sized reservoir—it will still keep us out of hot water. When it rains, the water can fill our reservoirs.

"Another thing: the theory of the "coconut dessert well tray". When it rains, the water will be stored in each hole, or well in the tray. This is like Ajarn Yak says: if Saraburi were a coconut dessert tray, and each and every hole collected water, some deeper and some shallower, according to each person's land, the water would no longer overflow and flood people down in Bangkok. But at the moment, we fill in all our holes to maximize our land area, so the water is flooding over a flat plain: 100 liters comes, and 100 liters passes on. But if we dug these holes, the water would flow into each hole, it would be spread out, it would be stored in the area of Saraburi. The zone beneath us wouldn't experience flooding. This is done by storing water on our own land for later use, whether that means with canals, on earthen dikes, in rice paddies. Even mounds are able to collect water, by planting various trees on them—like a mountain: when it rains, absorbs water in its soil, which later seeps down bit by bit, turning into drops, each tree releasing drops of water, bit by bit, which turn into a stream, and flow down to find the villagers."

Giving up a field or a piece of farm land for water storage in the form of a reservoir, paddy, or mound, aside from being a way to attain water self-sufficiency, is also a way to improve the efficiency of water management in the bigger picture. It's a worthy investment that farmers should all consider.

If interested, visit this area and ask for more details. Mr. Bunlom Taokaew can be contacted at 84/2 Moo 7, T. Nongno, A. Muang, Saraburi, 18000. Telephone: 08 9050 1812.

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