

**Aquatic Enhancement Trials**  
*(Community Aquatic Resource Enhancement Rings)*  
By Kevin Kamp  
Agrobiodiversity Specialist

**Overview**

The Agriculture Technology Services Association, a NPA in Cambodia, together with the Fisheries Administration, has embarked on a novel pilot programme which attempts to increase aquatic resources in rice field environments in Cambodia. The basis for the pilot is the observation that much of the aquatic life in rice fields are constrained by erratic rainfall (particularly in the early part of the monsoon season), the mid-monsoon season drought<sup>1</sup> and a lack of deep water areas provide refuge for various aquatic organisms. The CARE Rings Pilot has tried to compensate for this lack of water by constructing 80cm deep pits in rice fields using concrete well rings. Approximately 600 pits have been constructed in three provinces. It is reasoned that:

1. early season breeding of frogs will be assisted by these pits by maintaining water between rain showers when rice fields typically dry up;
2. fish and other aquatic organisms such as shrimp can take refuge in these pits during times of low water in rice fields; and
3. deep pits provide a safe environment from predators and extreme heat in rice fields.

If the pits in rice fields are as effective as postulated, this could have a very significant impact on rural communities' access to food resources and nutritional security.



---

<sup>1</sup> The Mid-Monsoon Season drought is the period of time, usually occurring in June/July in which there is a reduction in rainfall. Rains which begin in April/May taper off for a month and then July/August rains increase again in intensity. This is the normal rainfall pattern for Cambodia.

## Early Results

Early observations confirm that the logic for constructing of the pits is sound. Farmers have been collecting information and making observations on these pits since their installation in April/May.<sup>2</sup> They can be summarized as follows:

1. When fields are dry between periods of rain concrete well ring pits continue to maintain enough water for the survival of aquatic animals.
2. Farmers report seeing large numbers of immature frogs in these pits during the early rains in May and June, before the rice is typically planted or during the start of rice planting. Currently there are frogs easily observable in the rice fields near the rings.
3. Aquatic species which begin moving into rice field environments during the early rains quickly inhabit the rings. Farmers report seeing large numbers of shrimp species as well as a number of indigenous fish species early in the season.
4. It appears that some fish species, particularly the “darkena” minnow, start reproducing in the rings based on the large number of immature fish found in the rings.
5. In addition to fish, shrimp and frog species the farmers observe considerable amounts of snails and crabs in the rings, as well as a couple of species of water beetles which are considered important food for local people.
6. Considerable numbers of organisms can be found in the rings. During a brief field visit in 21 July 2008 ATSA found hundreds of fish in some pits of at least six species as well as frogs, snails, crabs and aquatic insects.
7. The quantity of aquatic animals is variable. There was at least one



---

<sup>2</sup> Observations made on July 21 in Mondulkiri only, however, monitoring reports indicate similar impacts.

ring where no aquatic animals were found as a result of the farmers adding freshly cut tree limbs and leaves which began to decompose in the pits.

This may be due to chemicals in the stems/leaves or low oxygen levels.<sup>3</sup>

8. Fish were observed swimming out of rings into the rice fields where there was enough water to do so.
9. Few fields in July had enough water for fish to survive, but substantial quantities of aquatic organisms (particularly) fish were observed in the rings.
10. Farmers contended that on the night of 20 July 2008 (before the observations) that many more fish were in some of the rings but left during the rains to swim into additional rice field habitats.
11. Farmers in the area admit that they have been collecting aquatic animals from the pits (even though they agreed not to in order to increase overall fish populations rather than these pits acting as “collection” traps).
12. The presence of snakehead fish (carnivorous) in the pits suggest they are supporting a food chain of sorts.



### Observations on Constraints

1. Some of the dirt immediately adjacent to the pits (cement rings) has sunken in some cases so that when water levels get low not all organisms can retreat to the pits.
2. In at least one pit the farmers added freshly cut tree limbs and leaves which were decomposing in the pit, reducing oxygen and creating an unfavorable environment for aquatic organisms. No aquatic organisms were observed in the ring.



---

<sup>3</sup> Many of the fish species in the rice field are air important as chemicals from the plant materials.

3. Some of the areas where pits were constructed were relatively close to canal systems which could also contain large numbers of aquatic organisms. As such it would be difficult to measure any increase in overall aquatic organisms as a result of the placement of pits adjacent to this area.
4. Farmers reported that in some cases they were collected fish and other organisms from the pits for immediate consumption, reducing the impact of the pits as generators of resources as opposed to resource traps.

## Recommendations

There is a need to continue monitoring the rings, with one focus on observing which rings had an abundant number of organisms, which had a significant amount and which had few or no organisms and suggestions as to why this is. Also farmers have been collecting organisms, which is probably not a good idea, but the quantities they have collected as well as their observations are important, as well as the area overall. Also, an increase in species which have been decreasing in population in the area should be noted.

There should be some criteria established for installing rings after this first year experience, including how to keep them water-tight, the importance of keeping them low enough to collect all the water in the fields, and other issues which seem to have an impact on overall aquatic animal populations such as ring placement.



The importance of enhancing the habitat by adding dry sticks, avoiding adding materials which decompose in the rings. As part of this recommendation not only fish but other organisms, such as snails, need to be considered.

How many rings are needed? Based on the brief observations made on this trip it would appear that the more the better, but what is a minimum amount which should be done?

## Conclusion

From early monitoring and observations it would appear that the shallow pits in the fields are functioning according to their intended design.

- Frogs and the early users of the rings, followed by the early rice field colonizers and the followed by later colonizers (ie, snakehead fish).
- In addition to snails, fish, shrimp and crabs there are also considerable populations of aquatic beetles which are considered an important food item.
- When rice fields are dry, the rings maintain water levels and, in some cases, extremely high populations of aquatic organisms.
- When rains occur, these organisms readily move out of the pits into the surrounding rice fields.

The most significant problem is being able to determine the overall impact the pits are having on aquatic organisms populations, something which was a concern from the beginning. The rings work in terms of providing the types of functional habitats needed by a number of aquatic organisms to successfully colonize rice fields. How much do they assist? Additional observations by farmers at the end of the rainy season may be able to answer this question. Further to being able to document the level of impact, it should be remembered that the problem is a matter of documenting, not one of impacts. The concern is that there are indeed very significant impacts but that an inability to document the impacts may result in the concept of adding aquatic environments to rice fields is disregarded. From the early observations it would certainly appear that they do work and disregarding them at an early stage in their trials would be tragic. There should be more of these constructed in rice fields for trials, in greater densities and in a larger number of ecological situations.