

## Umphiem Refugee Camp, Solar & Ram Pump Training

20<sup>th</sup> – 22<sup>nd</sup> June, 2006

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Participants: 16

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BGET had the first ever training on water pumping using Solar pump and Ram pump in Umphiem refugee camp on the 20<sup>th</sup> to 22<sup>nd</sup> of June, 2006. The training was arranged in cooperation with and funded by ZOA Refugee Care.

The participants were comprised of 7 students and 2 teachers from 2<sup>nd</sup> year Agricultural school, 2 people from ZOA Refugee Care, 2 people from the Vocational Training Committee, and 3 people from the American Refugee Committee (ARC). ARC is responsible for the water supply in the camp and could give interesting input on the diesel pumps in the camp's existing water supply system.

For the training BGET purchased two 50 W solar panels from Solartron, one 50 W 12 V DC pump at a local hardware store in Mae Sot, and one 1-inch ram pump from Aid foundation in the Philippines. The equipment was transported to Umphiem, set up and tested on the 19<sup>th</sup>. Unfortunately, it was raining the whole day, so we didn't get a chance to test the solar pump. We didn't get the ram pump to function either because the drive flow was too low (only about 3-4 liters per minute).

The training started on the 20<sup>th</sup> with class training on what we need water for and how much water we need, followed by different ways of getting water and the energy needed for pumping water in different ways. There was also hands-on training on how to measure water flow using a bucket and a stopwatch, as well as on the solar pathfinder and the multimeter.



Fredrik giving classroom training



Yotin demonstrating the solar pathfinder

In the afternoon the topic was solar energy. We installed the DC pump powered by the two 50 W solar panels, and measured the output flow for different heads. Although the pump is rated at 50 W, it didn't work with only one 50 W panel. Using two panels, we could measure 11 V and 4.2 A, giving a power output of 46 W from the panel to the pump. The measured flow for different heads compared with the performance according to the pump specification is given in the table below.

### Solar pump performance

Head (m)	Measured flow (liters/min)	Flow according to spec (liters/min)
1	27	65
2	25	57
3	10	45
4	0	27



Solar pump installation.



12 V DC pump.



Measuring flow with 3 m head.



Measuring current output from solar panel.

The next day was dedicated to the ram pump. The morning session covered theory and the VCD film from AID foundation was shown using power from the computer lab generator next door. After lunch the ram pump was installed. The drive pipe ran 24.5 meters down a 10-degree slope, so we had a decent head of 4.25 meters. After removing some obstructing material in the drive pipe the flow was measured to 64 liters/min.



The catchment tank held 200 liters.



Measuring the drive head.



Measuring the drive flow.



View from the catchment tank of the ram pump (right) and the delivery measurement location (left).

When connecting the ram pump it could only run for a few cycles before stopping and there were many leaks in the drive pipe joints. We realized that the problem was too much air in the drive pipe and after fixing the leaks the ram pump was running fine.

Then we optimized the waste valve opening by measuring the output flow for different settings. Eight turns on the tuning bolt gave the highest delivery flow (8.5 liters/min for 6.3 m delivery head) and was used for the rest of the measurements when we measured the flow for different delivery heads. We had a rather high hill with a slope of almost 20 degrees enabling us to get a head of almost 30 meters. The results of the measurements are given in the table below.

### Ram pump performance

Head (m)	Delivery flow (liters/min)	Efficiency
6.3	8.5	20%
8.9	5.6	18%
15.0	3.3	18%
21.2	1.7	13%
27.7	no flow	0%

We had quite a lot of leaks in the delivery pipe, which is probably the reason that the efficiency was decreasing with the increasing head, and that we didn't get any flow for the last measurement.

In the last day of the training we calculated the results for the ram pump installation from the previous day's measurements. Then we discussed and compared different alternatives for pumping water, namely solar, ram and diesel pumps. The training ended by handing out certificates to the students, who had shown great interest and knowledge during the training.



Hans from ZOA giving out certificates.



Class picture