Joint Preliminary Tidal Surge Damage Assessment
Yap Outer Islands
January 5 – 14, 2009

A joint Preliminary Damage Assessment (PDA) Team comprising of FSM, USAID and Yap Representatives assessed the recent tidal surge effect (early December 2008) in the outer islands of Yap State from January 5 to 14, 2009. Actual groundwork on 15 islands of the 10 main island groups began on January 8 and ended on January 14, 2009. The PDA Team conducted assessments on agricultural crops, salinity of taro patches, fresh water wells and/or water catchments and conducted coastal/shoreline surveys. The islands covered included the following:

1. Satawal; 2. Lamotrek; 3. Elato; 4. Faraulep; 5. Ifalik; 6. Woleai (a. Falalop, b.Wottegai c. Falalus); 7. a. Eauripik, b. Wew; 8. Fais; 9. Ulithi (a. Falalop, b. Mogmog, c. Fadrai); 10. Ngulu.

Assessment Results.

1. **Satawal**
   a. Population : 468
   b. Date of Assessment: Jan. 8, 2009 (Thurs.)
   c. Agricultural Crops:
      - 1 main taro patch on island; 90% of patch is affected both by salt water intrusion from below and flooding/inundation at the southern part of island during recent tidal surge (see photos: Satawal taro patch).
      - People are subsisting on the remaining 10% of taros in the patch; most taros appeared stunted; leaves of taros display yellowing in color and are wilting away. Pulled sample of corms are rotten and there is smell of brackish water in the taro patch.
      - Breadfruits, bananas and other dry land taros (3 varieties-Alocasia, colocasia, and xanthosoma) appeared ok; not affected as they are situated further inland.
      - Overall, coconuts are ok, though those situated along the shoreline with other coastal strands have either died and/or fallen due to acute erosion.

   d. Salinity Measurements:
      - Salinity tests of taro patch show high salt water content (7.0-9.0). Salinity tests of fresh water wells are along the borderline (3.6).
      - Water catchments tested are ok.

   d. Coastal/Shoreline Survey:
      - Though coastal erosion is obvious around the island, it is severe at the southern part of the island and less severe at the western end of the island. It was reported that the coastline at the southern part of

the island has shifted inland over time (*pls. refer to Attachment: Coastal Erosion Assessment for details*).

e. Other comments

- Breadfruits are not bearing during the time of the assessment; however, it was reported that there is preserved supply and it may last for 1 month.
- People have planted dry land taro varieties and bananas on higher elevation as mitigation measure.
- People are limiting their harvests days of taro from the patch (3 times a week).
- A period of dryness or drought is affecting the island and people have started rationing and limiting use of water resources. It was reported that there has not been rain for a month.

2. **Lamotrek**

a. Population: 339
b. Date of Assessment: January 8, 2009 (Thursday).
c. Agricultural crops:

- Three (3) main taro patches were assessed (north, south and other). Taro patches at the northern and southern part was mainly affected from recent tidal surge with considerable flooding and/or inundation. Salt water intrusion from below during unusual high tides during previous years has had impacted on taro patches; taros are turning yellow and wilting away during the assessment; the last harvest was made within a week of last assessment (only immature ones were harvested before they rot away). About 85-90% of taros are seemed to be affected.
- Several breadfruits are observed and are not bearing during time of assessment; islanders reported that they bear only during summer (April-July)'
- Several bananas were observed and looked ok; some are sprouting and others have fallen (was not affected by recent tidal surge; however, seemed they are not being well maintained; some are sprouting and others have fallen).
- Coconuts appeared ok, except those along the coastline which have been affected, roots exposed and have fallen due to coastal erosion and/or heaving pounding of waves.

d. Salinity measurements

- Salinity tests in the taro patches show high salt water content (0.4-0.6). Two fresh water wells were tested; both were ok for bathing and laundry but are not recommended for drinking and cooking (0.4-0.5).

e. Coastal/Shoreline survey:

- Erosion is obvious around the island. At the southern part of the island roots of coconut trees and other coastal strands are either exposed and some have fallen. Flooding and inundation of coastline is obvious at the northern part of the island.

Other comments:

- There is preserve breadfruit during time of assessment and it may last for 1.5 months. There is possibility of low yield in April (flowering period).
- Three (3) dry land taro varieties were observed and seemed to be ok; not affected by recent tidal surge; however, appeared not healthy. This may be attributable to poor soil and biotic or abiotic factors.

3. **Elato**

a. Population:131
b. Date of Assessment: January 9, 2009 (Friday)
c. Agricultural crops:

- One (1) main taro patch on island; about 90% is affected both by salt water intrusion from below and flooding/inundation at northeastern part of the island; people are subsisting on remaining 10% of taros in patch; most taros appeared stunted and in some areas corms are rotten when harvested; the smell of brackish water is quiet pungent. Wilting and yellowing of leaves was common.
- Islanders reported they have given up planting taros in other sections of the taro patch as taro could not grow due to salt water intrusion within past years and from recent tidal surge which seem to be seeping or making way to other parts of the patch. For the remaining 10% of taros, there is presence of salt water in the middle of patch; samples pulled and observed during the assessment appeared and smell rotten (see photos: Elato taro patch).
- Bananas are ok; several patches are observed and seemed to be ok (not affected by recent tidal surge) as they are situated further inland.
- Coconuts are ok, though those along the shoreline with other coastal strands have either died and/or fallen due to coastal erosion through time.

d. Salinity measurements:

- Salinity tests of water in taro patch show high salt water content (3.7-7.0); salinity tests of wells are not so good (0.5); fresh water

wells are recommended for bathing and laundry and not for drinking.

- Water catchments tests were ok; however, shortage of water will be of concern in the near future as there has not been any rain on the island.

e. Coastal/Shoreline survey:

- Though there is sign of erosion around the island, it is very prominent at the western part of the island (*pls. refer to Attachment: Coastal Erosion Assessment*).

f. Other comments:

- People are having rations in terms of water resources for bathing and laundry.

4. **Faraulep**

a. Population: 121
b. Date of Assessment: January 10, 2009 (Saturday)
c. Agriculture crops:

- The main taro patch was assessed. About 65% of taros were affected by tidal surge as well as salt-water intrusion from unusual high tides during previous years. Samples of taro pulled from the main taro patch were already rotten and there is smell of brackish water. There is presence of concrete taro patches and these were not affected by the tidal surge.
- Coconuts, dry land taros and bananas looked ok and they are in abundance.

d. Salinity measurements:

- A pool (used for bathing in the past), two sections of the taro patch and two wells were tested. The pool is not so fresh with a salinity of 1.0; Sections of the taro patch tested show higher salinity level (2.2-13.2); the wells are ok with salinity levels (0.3-0.9)

e. Coastal/shoreline survey (*Pls. refer to Attachment: Coastal Erosion Assessment*).

5. **Ifalik**

a. Population: 638
b. Date of Assessment: January 10, 2009 (Saturday)
c. Agricultural crops:

- The main taro patch was assessed. About 100% of taros are affected from recent tidal surge as well as salt-water intrusion from below from unusual high tides in previous years. 70-80% of total

agricultural staples are affected. There are several openings on one end of the island (about the middle) whereby direct flow of salt-water continues to make its way into the taro patch.

- Coconuts, bananas and other staples (dry land taros) are ok; not affected by tidal surge as they are located further inland.

d. Salinity measurements:

- Fresh water wells tested are a bit brackish with salinity levels ranging from 0.6-0.8.
- Taro patches show higher level of salinity ranging from 0.7-30.1

e. Coastal/shoreline survey (*pls. refer to Attachment: Coastal Erosion Assessment*).

6. **Woleai (Falalop, Wottegai and Falalus)**

6.1 Falalop

6.1.a. Population of Falalop: 645

6.1.b. Date of Assessment: January 11, 2009 (Sunday).

6.1.c. Agricultural crops:

- Due to time constraint, the main taro patches (3 were not assessed); however, islanders claimed the main taro patch has had minimum damage from the recent tidal surge (about 45%). The PDA Team assessed three (3) sites nearby the airstrip on the main island whereby ponds are present from recent tidal surge. Taros, bananas and some pandanus trees at the sites appeared brown due to flooding from tidal surge as well as salt-water spray. There was smell of brackish water during the assessment.
- Breadfruits, bananas, coconuts and other dry land taros appeared ok on Falalop (not affected by recent tidal surge).

6.1.d. Salinity measurements:

- Two ponds on the sides of the airstrip (about middle of airstrip) were tested: both show salinity level of 0.0-0.2; this is quite low as it was raining hard prior to assessment time.
- A pond closer to the end of the runway was tested with a higher salinity level of 7.

6.1.e. Coastal/shoreline survey: (*Pls. refer to Attachment: Coastal Erosion Assessment for details*).

6.2. **Wottegai**

6.2.a. Population: ?

6.2.b. Date of Assessment: January 11, 2009 (Sunday)

6.2.c. Agricultural crops:

- About 90% of total crops (agricultural staples) are affected. There is evidence of salt-water intrusion in taro patch from below. Sea wall on island is damaged. Coconuts and other coastal strands are already being inundated or in salt-water during time of assessment. Islanders reported trees lying around the vicinity were already there; result of unusual high tides and coastal erosion.
- Breadfruits were observed to be bearing during time of assessment.

6.2.d. Salinity measurements:

- Three (3) wells were tested showing salinity level of 0.3-0.4
- The taro patch salinity level was at 0.1; may be so as it was low tide and raining hard prior to assessment.

6.3.e. Coastal/shoreline survey:

- There was sign of coastal erosion around island; no proper measurements were taken due to time constraint.

6.3. **Falalus**

6.3.a. Population: 200+
6.3.b. Date of Assessment: January 11, 2009 (Sunday)
6.3.c. Agricultural crops:

- The main taro patch was assessed. About 70-80% of taros were affected from tidal surge and salt-water intrusion from below. A narrow strip of land (about 2 ft. wide, eastern part of island) is left after the tidal surge and salt water continues to surge over it and into a pond, slowing making its way to the main taro patch, though it was low tide at time of assessment. Samples of taro pulled were rotten with foul smell.
- Coconuts, bananas, and dry land taros located inland were mildly affected, but from salt-water spray. Smaller patches of swamp taro adjacent to the main taro patch were not affected as they are on higher elevation and are not in the direction of the recent tidal surge.

6.3.d. Salinity measurements:

- Salinity tests at the main taro patch is 0.2, may be due to heavy rain prior to assessment and the low tide. PDA Team was not able to take sample at further depths due to tester being used.
- Pond created after recent tidal surge at eastern part of island show very high salinity of 27 though it was low tide at time of assessment.

6.4.e. Coastal/shoreline survey:

- Coastal erosion is very obvious around the island. Coconut trees and other coastal trees are observed strewn on the beach especially at the windward side.

7. a. **Eauripik (main island)**

- Main taro patch on the main island was mildly affected from recent tidal surge. Other agricultural staples are ok; Coconuts, breadfruits, bananas and other dry land taros were not affected by surge.

7.1.a. Salinity measurements:

(Please refer to Attachment: Salinity Test: Fresh water wells and catchments).

7.2.b. Coastal/shoreline survey:

(Please refer to Attachment: Coastal Erosion Assessment for details)

7.b. **Wew (uninhabited)**

- Concrete taro patches on Wew island (separate island) were not affected by the tidal surge. The island serves as a reserve for people of Eauripik.

8. **Fais**

8.a. Population: 300+
8.b. Date of Assessment: January 12, 2009 (Monday)
8.c. Agricultural crops:

- No damage from tidal surge except effect of salt spray, however, minimal effect along coastline.
- All Agricultural crops or staples are ok; not affected by tidal surge as they are located further inland and the island is higher compared to atolls assessed (upraised coral limestone).; however, water resources may be of concern as island is experiencing a prolonged period of dryness or drought.

8.d. Salinity measurements:

- Two fresh water catchments were tested and were found to be ok (0.0 salinity-fresh water).
- A fresh water-well further inland was tested and was found to be ok (0.2 salinity-fresh water).

8.e. Coastal/shoreline survey:

There is no indication of tidal surge affecting the island as it is protected by limestone cliffs.

9. **Ulithi (Falalop, Mogmog, Fadrai)**

9.1. Falalop
9.1.a. Population: 300+
9.1.b. Date of Assessment: January 13, 2009 (Tuesday)
9.1.c. Agricultural crops:

- Minimum damage on agricultural staples. Taro patches appeared to be neglected (not well maintained) and people seemed to depend much on rice and other processed goods being supplied from main island of Yap via aircraft. Coconuts, Bananas, breadfruit and other dry land taros are not affected by tidal surge.

9.1.d. Salinity measurements:
(Please refer to Attachment: Salinity Test: Fresh water wells and catchments).

9.1.e. Shoreline/coastal survey:

Coastal erosion was observed to be acute at the western, northern, eastern and southern part of the island. According to our guide, the coastline has shifted about 80 ft. inland through time.

9.2. **Mogmog**
9.2.a. Population: 240
9.2.b. Date of Assessment: January 13, 2009 (Tuesday)
9.2.c. Agricultural crops:

- Main taro patch was assessed. About 60% of taro patch is affected. Taros appear stunted with yellowing and wilting of leaves due to salt-water intrusion from below. Harvests from patch are spoiled (rotten). Eventually, the percentage of damage will

increase over time as salt-water will continue to intrude from below.

- Coconuts, breadfruit, and other dry land taros appeared to be ok, as they are not directly affected by recent tidal surge.

9.2.d. Salinity measurements:

(Please refer to Attachment: Salinity Test: Fresh water wells and catchments).

9.2.e. Coastal/shoreline survey:

(Please refer to Attachment: Coastal Erosion Assessment for details)

9.3. **Fadrai**

9.3.a. Population: 200+
9.3.b. Date of Assessment: January 13, 2009 (Tuesday)
9.3.c. Agricultural Crops:

- No effect of tidal surge on main agricultural crops. There is presence of concrete taro patches on Fadrai. Hence, these were not affected as they are located further inland. Coconuts, breadfruit, bananas and other dry land taros were not affected by tidal surge.

9.3.d. Salinity measurements:

(Please refer to Attachment: Salinity Test: Fresh water wells and catchments).

9.3.e. Coastal/shoreline survey:

There is minimum sign of coastal erosion. The effect of salt spray is evident on plants along windward side of island.

10. **Ngulu**

10.a. Population: 1 family (5 persons).
10.b. Date of Assessment: January 14, 2009 (Wednesday)
10.c. Agricultural crops:

- Agricultural crops are not affected by tidal surge. Ngulu has concrete taro patches. Coconuts, breadfruit, bananas and other dry land taros were not affected by surge, except coconuts along shoreline. During the assessment, several coconuts, and other coastal trees have either fallen and/or root systems exposed due to

coastal erosion, especially at the northeast and southern part of the island.

10.d. For Salinity measurements, pls. *see Attachment: Salinity Test: Fresh water wells and catchments*.

10.e. Coastal/shoreline survey (*pls. refer to Attachment: Coastal Erosion Assessment for details).*

Attachment: Salinity Test: Fresh water wells and Catchments

Satwal 1. Well 3.6 sal 2. Taro Patch 7.0 sal 3. Taro Patch 9.0 sal	**Ulithi Falalop** 1. Well 2.3 sal 2. Well Basin 2.1 sal 3. Well 2.2 sal
Lamotrek 1. Taro Patch 0.4 sal 2. Taro Patch 0.6 sal 3. Well 0.5 sal 4. Well 0.4 sal	**Mogmog Ulithi** 1. Well 1.4 sal 2. Taro Patch 2.0 sal 3. Taro Washing 1.1 sal 4. Well 1.4-1.7 sal 5. Well 2.0-3.0 sal 6. Well 5.2-4.6 sal
Elato 1. Taro Patch 7.0 sal 2. Taro Patch 3.7 sal 3. Well 0.5 sal 4. Catchment 0.0 sal	**Fadarai** 1. Catchment 0.1 sal 2. Well 7.3-7.5 sal 3. Well 2.7-2.9 sal
Faraulep 1. Pool 1.0 sal 2.Taro Patch 13.2 sal 3.Taro Patch 2.2 sal 4. Well 0.3 sal 5. Well 0.9 sal	**Ngulu** 1. Catchment 0.1 sal 2. Well 7.1 sal
Ifalik 1. Well 0.8 sal 2. Well 0.6 sal 3. Taro Patch 0.7 sal 4. Taro Patch 30.1 sal	

Wottegai 1. Well 0.4 sal 2. Well 0.3 sal 3. Well 0.3 sal 4. Taro Patch 0.1 sal	
Eauripik 1. Catchment 0.1 sal 2. Well 0.7 sal 3. Well 0.5 sal 4. Taro Patch 0.3 sal 5. Catchment 0.0 sal 6. Well 1.1 sal 7. Taro Patch 0.3 sal 8. Well 0.4 sal	

Please note: Salinity Measurment: 0-0.5=Fresh water; 0.6-3.0=Brackish; 4.0 and above=Salt water.

Attachment: Coastal Erosion Assessment

Satawal

Coastal erosion is not confined to only one particular area but all around the island whereas northwest and southern part have sustained a heavy impact from tidal surge of which 50-100 meter of land lost.

Lamotrek

No coastal erosion survey conducted in Lamotrek due to time constraint.

Elato

Coastal erosion observed all around the island. Southwestern expose shoreline sustained heavy impact with approximately 100 meters shifted inland. 3 rolls of coconut line were up rooted.

Faraulep

Coastal erosion here is very similar to the previous islands we have visited in which it circumnavigates the island. Approximately 100m of the northern part of the island has shifted inland and 50 to 70m along western shoreline. Three (3) rolls of coconut trees at the western shoreline been up rooted and washed into the lagoon.

Ifalik

Coastal shoreline on the western island had shifted inland at approximately 50-100 m. Two (2) rolls of coconut tree are being lost from the surge.

Woleai

Falalop and Paliyaw windward, southern and northern end of these islands have sustained a heavy impact from the tidal surge. More than 100 m of shoreline has shifted inland with about 3 to 4 lines of coconut trees being uprooted and washed into the lagoon.

Eaurpik

Due to the small size and low elevation of the island, a coastal erosion from the tidal surge was obvious all around the island. The tidal surge had shifted the shoreline inland

to approximately 100m from both end of the island. Two (3) line of coconut tree and other coastal stabilizer vegetation have been up rooted and washed into the lagoon. Few coconut trees are still standing in the water along the coastal line.

Fais

Fais is a volcanic origin protected by limestone cliffs with a higher elevation in the Outer Islands therefore, there is no indication of current tidal surge being affecting the island.

Mogmog

Coastline on both end of the island has been affected by the current surge, approximately 25-50m at the eastern and western.

Ngulu

Northeast and southern coastline has been affected by the current surge, approximately 20m shifted inland exposing one line of coconut at the water edge during high tide.