BLANG KREUNG SITE VISIT REPORT

Kabupaten Aceh Besar

1. Blang Kreung – site information

Blang Kreung is in Kecamatan Baitissalam which is located on the extreme north coast of Sumatra and lies sandwiched between Darussalam and Banda Aceh. Blang Kreung was one of three locations within the kecamatan subjected to a salinity survey done with the EM38 salinity device. This dataset was compiled by the Soil Research Institute, Bogor 16123, Indonesia from a survey carried out by the institute and funded by the Australian Centre for International Agricultural Research (ACIAR). The site was visited in late October by ETESP accompanied by staff from BPTP and again in early then mid-December 2005.

Table 1 Coordinates of Blang Kreung Site

Site	Deg N	Min N	Sec N	Deg E	Min E	Sec E	Altitude masl	Notes
18 – 1	5	35	12.0	95	22	32.1	28.0	Flooded and abandoned

NB Altitudes from GPS unit and not to be taken as anything like accurate, must be found from topographical map

Site 18 at Blang Kreung is on an almost flat alluvial plain with no obvious high points, mainly flooded, no cropping at all, covered in grasses. Figure 1.

But there was an operational drainage channel. However, local information was that this was, in fact, the previous irrigation system. The water flow in this channel was fairly fast and there was an outlet into a major channel (Figure2 and 3) which was obviously linked to the sea and this drain was flowing but very slowly.

This drainage system was governed by tidal movement and the local estimate was that there is presently between 50-100cm of sludge, sediment and rubbish in this channel.

Figure 1 Site at Blang Kreung

Figure 2 Main Channel Site 18

Figure 3 Drainage Entering Main Channel

Table 2 Soil and Site Features November 2005

Site	PSC 0-25 cm	Soil Textures	Soil ECe 0 -25 cm	PSC 25 – 50 cm	Soil Text 25 – 50 cm	Soil ECe 25 – 50 cm	Soil Depth cm	WT Depth cm	WT EC dS/m
18-1	M	FsL	4.63	H	Cl(h)	ND	0	0	1.56

Soil depth as zero since there is no useable soil as far as plants are concerned.

Table 3 Transect Information Baitissalam Sites

Site	Days flood	Sediment (cm)	No	EM38 Points	Sedmnt Treat	Landuse / Crop	Fertiliser	Noted Problems
Blang Kreung	30	30	18-1	12	None	Sawah – Land not used since tsunami	None	Abandoned, Sediment Salinity, Flooding

2. Problems

The significant conditions noted for this site are the problems of:

- water-logging, obviously indications of very high water-tables plus obvious tidal effects
- no current land use or cultivation
- deep sediments as established during the EM38 survey
- surface water, and presumably groundwater, with salinity of around 5dS/m in November 2005

It is concluded that the above problems place this land in the severely damaged category and the land has, to all intents and purposes, been abandoned and would be difficult and expensive to reclaim, but it could be reclaimed.

3. Soil Salinity

The raw data from the EM38 salinity survey carried out on the site was passed to ETESP for use in soil reclamation studies. The basic findings of what the data reveals are presented as simply as possible in this section without going into the theories or the processes of data-manipulation used

The coloured coded column in Table 4 is the ETESP assessment of the degree of problem that the original depth of sediment presented – the key is shown as Figure 4.3, this coding is also used for salinity in Table 4.5

The salinity data in Table 5 reveals that, based on the average values, the salinity problem is very slight (colour code yellow, with SC2) for the Blang Kreung

The situation at Blang Kreung is that the second layer (30–60cm, colour-coded blue) is more saline than the top 30cm. It would appear as though there has already been some leaching of salts downwards and they are concentrated in the 30–60cm.

Overall, the maximum values for the Blang Kreung site fall into SC2 with values ranging from 4.3 to 6.8dS/m.

Figure 4 ETESP Problem Rating Key

ECe dS/m	PROBLEM RANKING	Sediment cm
0 - 1.9	None	0 - 0.9
2 - 3.9	Negligible	1 - 1.9
4 - 5.9	Very Slight	2 - 4.9
6 - 7.9	Slight	5 - 9.9
8 - 11.9	Moderate	10 - 14.9
12 - 15.9	Moderately Big	15 - 19.9
16 - 23 9	Big	20 - 29.9
>24	Very Big	>30

Table 4 Assessment of the EM38 Dataset for the Sites

Aceh Besar - Averages							Samples	Sediment	Flood		
Kabupaten	Kecamatan	Location	Site	EMv	EMh	Average	No	Cm	Days	Status	Check
Aceh Besar	Baitissalam	Blang Kreung	18 - 1	154	149	151	12	30	30	Leached	Reading OK

Table 5 Salinity Measurements for the Aceh Besar Sites from EM38 Survey

						Rhoades	ETESP Lookup			Salinity Class	
Averages			ECe 0 - 30cm	ECe 30 -60cm	ECe 60 -90cm	ECe 0 - 90cm	ECe EMv	ECe EMh	ECe EMav	Rhoades	ETESP
Kecamatan	Location	Site	dS/m	dS/m	dS/m	dS/m	dS/m	dS/m	dS/m		
Baitissalam	Blang Kreung	18 - 1	4.8	6.6	3.1	4.8	3.8	3.7	3.8	SC2	SC1
Maximums											
Baitissalam	Blang Kreung	18 - 1	6.8	-0.1	6.7	6.8	4.4	4.6	4.3	SC2	SC2
Minimums											
Baitissalam	Blang Kreung	18 - 1	4.7	-0.1	4.8	3.1	3.1	3.2	3.4	SC1	SC1

NB Value in red "suspect" and ignored in manipulations

4. Sediment Depth

Table 4.4 notes that the sediment depth is considered a "big to very big" problem. The magnitude of the problem, or problems, being supported by the fact that no cropping has taken place and the above sections indicate that there are serious problems. However, the overriding problem at Sites 18-1 is that the site is still flooded almost one year after

the tsunami, the flood seems to be at a level where it is very strongly influenced by tidal action and soil reclamation. The fact that there are deep sediments becomes almost inconsequential.

5. Conclusions & Recommendations

Although the data collected in November 2005 were limited to a few points it is worthwhile comparing what the situation was at the time of the EM38 survey and the present.

Table 6 Comparison of Salinities EM38 Survey and Nov 05

Location	Site	Overall salinity via EM38 dS/m	Rhoades 0–90cm EM38 dS/m	ETESP average salinity EM38 dS/m	Rhoades 0–30cm EM38 dS/m	Rhoades 30–60cm EM38 dS/m	ETESP average EMh EM38 dS/m	ETESP 0–25cm Salinity Meter Nov 05 dS/m	ETESP 25+cm Salinity Meter Nov 05 dS/m
Blang Kreung	18-1	4.30	4.8	3.8	4.8	6.6	3.7	4.63	ND

The salinity problem at Blang Kreung is insignificant when compared to the flooding and it would be superfluous to say much about salinity apart from the fact that, if anything, salinities are now higher than when the EM38 survey was carried out. If these channels were to be cleared and deepened the site could be reclaimed relatively easily. No active land use at all, apart from grazing buffalo, but the site apparently used to be favoured for wetland rice cultivation and good yields were obtained.

Table 7 Overall Salinity Classes

Location	Site	Rhoades EM38	ETESP EM38	ETESP Nov 05
Blang Kreung	18 - 1	SC2	SC1	SC2

The site at Blang Kreung can be reclaimed and the tsunami damage may have given the pointers for this. The previous irrigation channel is now acting as a drainage channel and water flow is relatively significant in the upper parts of this channel (Figure 3). The main, or lower channel (Figure 2) could be deepened significantly by removal of silt and garbage and, if it was, flow from Site 18 would increase and at least start the reclamation process.

However, the actual padi field would require leveling before reclamation and suitable salt tolerant varieties of rice could be grown here very soon – but perhaps the irrigation supply would need to be restored as well.

It should be noted that this main channel is now tidal and the previous flood gates at the shore line were destroyed by the tsunami

Use of salt tolerant varieties could well give a crop after even the minimum of drainage and reclamation, but a more permanent solution would be to reclaim properly.

6 Reclamation

No matter how the salts got into the soil they can be removed (at a cost) provided the reasons for the salt accumulation are understood and the appropriate remedial measures undertaken. The reasons for the salt accumulation have been addressed in Chapter 2. The process of salt removal is termed reclamation.

The general principles for the reclamation of salty soils comprise:

- the removal of salts from the soil by leaching, plus
- the removal of the saline leachate from the site
- the prevention of further accumulation of salt or sodium
- the replacement of exchangeable sodium by exchangeable calcium and

Reclamation is only feasible if leaching water is able to move downwards through the soil profile, carrying the salts below the main root zone and eventually being removed from the site as drainage and disposed of in an environmentally acceptable manner. This leaching water can be required in large quantities and, in association with the continuing percolation of water from irrigated crops, results in the deeper layers becoming waterlogged and a rise in the water-table towards the surface. In most situations natural drainage is insufficient to cope with the water flow and some sort of artificial drainage often becomes necessary at some stage in the reclamation cycle.

Reclamation (in the first instance) involves the desalinisation of a defined depth of soil (root-zone) to a particular salt content. There will be an initial phase of saline water percolating below the root-zone that eventually merges with the subsurface water table, resulting in increased salinity and movement of the water-table towards the surface. Subsequent normal irrigation continues to remove salts from the soil and the quantities of salt carried will decrease over time.

Planning for the reclamation of saline areas requires an estimate of the size of the salinity problem (how saline is the soil? – measured in dS/m) and a reliable estimate of the quantity of water necessary to reduce soil salinity to a level where crops can be economically produced.

7. Water Requirements for Salinity Reduction

Based on the information collected during the EM38 survey and subsequently updated by site visits by ETESP estimates have been compiled for water requirements. The basic data used to get these estimates are given in Table 8 along with other site features. The water requirements are given in Table 9 – where it is considered that the site can be reclaimed.

Table 8 Features of the Sites

Location	Site	Existing Salinity (dS/m)	Soil depth to be recovered (mm)	Depth of watertable (mm)	Drainage System Status	Irrigation System in use	Soil PSC
Baitissalam, Blang Kreung	18 – 1	4.63	300	0	Partial Flood	None	M

NB: The soil PSC is the class for reclamation purposes and is NOT the USDA textural / PSC classification

The available data were then inserted into the tool (Leaching Water Requirement.XLS) for determining the depths and volumes of water required for reclamation – the outputs are seen in Table 9.

Table 9 Water required for reclamation

		Add	Add	Add	Add	Auto	Add	Auto	Add	Auto	Auto	Leaching H_20		Irrigation H_20	
Kabupaten Aceh Besar	Site / Sample Number	**Reclamation Start Month**	Soil PSC, Texture or Type	Depth want to reclaim (mm)	INITIAL Salinity ECo dS/m	INITIAL Salinity class	TARGET / DESIRED EC dS/m	TARGET / DESIRED Salinity class	H20 table depth (mm)	Max soil depth reclaimable (mm)	Reclamation Required	Dlw (mm) DEPTH LEACHING WATER	Dlw m3/ha CUBIC METRES WATER / Ha	Dliw (mm) DEPTH IRRIGATION WATER	Dliw m3/ha CUBIC METRES / ha
Baitissalam, Blang Kreung	18-1	Dec	M/H	300	4.63	SC2	0.5	SC1	0	-150	Yes	-139	-1389	-106	-1061

Source: Leaching water requirement.XLS

The various outputs from Table 9 are discussed below with explanations where required.

Maximum soil depths that can be reclaimed:

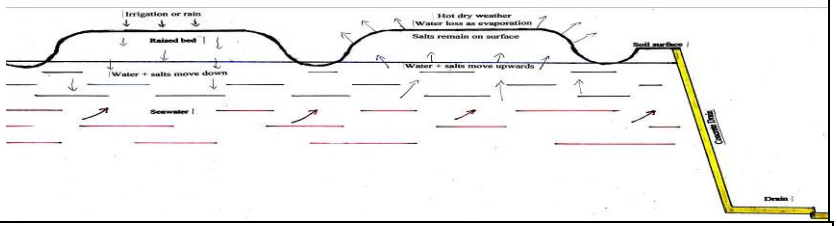
For the "sawah" sites a non-saline depth of 300mm (30cm) would be acceptable. The negative values in the Dlw columns of Table 9 occur because the site is actually flooded and it is just not possible to reclaim a flooded site by any methodology without some engineering works. However, since site 18 had an irrigation system which is now apparently working (almost) as a drainage system there could be ways to recover and reclaim this site. If the existing "drainage" channels were deepened then it could be possible to reclaim the required 30cm of depth. However, even if the soil is reclaimed to some extent only a very salt-tolerant variety of rice could be considered for planting.

8. Recommendations for Soil Reclamation and Improvement

Very little can be recommended or put into operation until a soil drainage system is operational. As and when some soil is exposed it is recommended that raised beds are constructed and used for Palawija during the reclamation process.

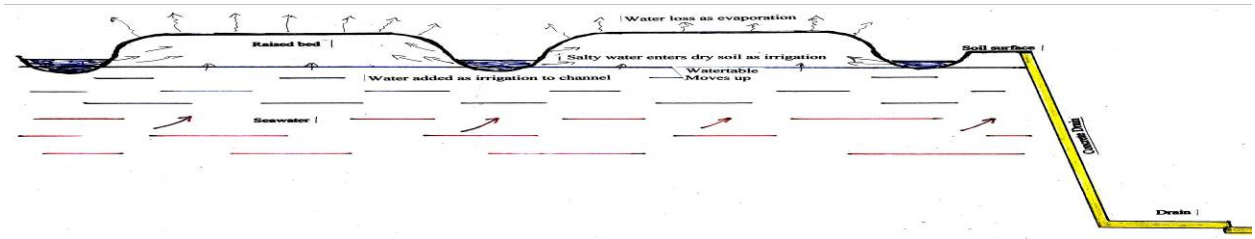
With a raised bed there is an increase in soil depth and there is the possibility of leaching occurring via rainfall and, especially, if the farmer uses watering cans to apply any supplementary irrigation as an overhead system. This is roughly outlined in Figure 5

Figure 5 Overhead Irrigation and Leaching



However, if the farmer uses surface methods of irrigation, such as in furrows, he will not be achieving any leaching and probably making the salinity problem worse. Refer Figure 6

Figure 6 Furrow Irrigation and Re-salinisation



Even after refurbishing and upgrading the drainage systems this site will most likely still be at severe risk from the hazard of very high water tables. If cropping of some type has to be done one, rather expensive option would be to install a dense network of drainage channels and use the excavated soil to build large raised beds. If the beds were wide and long enough with sufficient increase in soil depth above the water then even padi might be possible.

However, an irrigation supply would have to be established from an external source and would probably have to be piped in for overhead or trickle application. This sites are at very low level, are close to the shoreline, must have tidal influence and there is almost certainly intrusion of salty sea sea-water form below

9. Updates of Early and Mid-December 2005

A follow-up visit was made to the site in early December when ETESP Agriculture were accompanied by staff from FAO Bangkok; staff included a soil reclamation specialist and a soil scientist. The visiting specialists agreed with the ETESP assessment and recommendations for this site and added that with some of the newer very salt-tolerant varieties of rice this site could be brought back into production very quickly – based on recent experiences in similar circumstances in Thailand. During this visit the combined team, ETESP and FAO, made efforts to talk to the local people and to advise those local people of what the recommendations were for this site.

A further follow-up visit was made to the site in mid-December when ETESP Agriculture was accompanied by staff from the ETESP Spatial Planners, a civil engineer was a member of the latter team. The civil engineer appreciated and agreed with the recommendations regarding drainage requirement for the site.

The NGO Islamic Relief, UK) working in the area had enabled the clearing of drainage ditches and, by appearances, installed some new field drains – and these drains were flowing well and carrying large volumes of water and discharging into the main drain. In the near future these recently cleared drains will require deepening since much of the water now being carried was from upstream of the site and, as they stand, the drains are not quite deep enough to fully drain site 18-1.