Setting up and measuring erosion

Please note that these instructions are a guide to supplement what we have discussed and done in the field during my visit in June/July 09 with NOMASFI staff. They are not meant to be a stand-alone version of how to measure erosion. There will always be 'bits and pieces' that are not clear or missing. Although we took great care to ensure that we are familiar with the setting up as well as the erosion measurements, there will probably always be loose ends and we will keep on updating these instructions. This requires that we stay in contact all the time and send e-mails if we run into problems. My e-mail is g.kirchhof@uq.edu.au or *skype* g_kirchhof

This is version 1, dated 5 July 2009

Contents

Equipment needed....4
Equipment to set up erosion stations: 4
Equipment to take measurements at the erosion stations: 4
Pluviographs and data logger....5
Setting up the erosion stations 6
Insertion depth for erosion pins on very steep slopes....10
Soil sampling 11
Maintaining the erosion stations....11
Data keeping 12
Measuring erosion....13
Using the Aluminium profile beam 14
Using the sediment flasks 18
Using the paint marker....19
Setting up the logger-PC connection 20
USB to RS232....20
WinCommLog 22
Changing Logger settings 26
Work Plan until the end of the rainy season (Oct 09)....27
Setting up (finished end of July)....27
Measuring (July to middle October)....28
Removing the erosion stations (End of October 2009)....29
Templates for data entry 30
Set-up information 30
Erosion Pins 31
Sediment flasks 32

Figures

Figure 1 Erosion pin in the soil 6
Figure 2. Using a clinometer to measure slope. 7
Figure 3. Using a spirit level to measure slope. 7
Figure 4. The erosion station area 8
Figure 5. Putting a sleeve around the PVC pipe to close the sediment flask 9
Figure 6 Installation of the sediment flasks 9
Figure 7 A completed erosion station 10
Figure 8 An erosion station on steep, uneven ground. 11
Figure 9. The Aluminium profile beam 14
Figure 10. The beam with the DOWN-side facing up to show the locator and where the erosion pin will sit. 15
Figure 11. The beam located on the top erosion pin. NB the locators stops it from moving 15
Figure 12. The beam on the erosion pins for the first measurement from the top left down. 16
Figure 13. One of the four locators for the steel ruler. 17
Figure 14. Taking a distance measurement. NB always at the down side of the locators 17
Figure 15 Water and some soil trapped in the sediment flasks 19
Figure 16 MyComputer: Manage 20
Figure 17 Device manager 21
Figure 18 Port settings 22
Figure 19 WinComLog 23
Figure 20 Status screen 23
Figure 21 Downloaded data 24
Figure 22. Copying the downloaded data 25
Figure 23. Data in the xls-sheet 26

Table 1 Pluviograph locations 28

<u>NOTE:</u> Table one should be filled in!

Equipment needed

Equipment to set up erosion stations:

- Erosion pins
    - Sharpened steel rods (0.5 m long, 12 mm diameter, top 15 cm painted to protect against rusting, we have about 680 of them (Figure 1). Each erosion station requires 4 erosion pins, i.e. we have sufficient erosion pins to set up 170 erosion stations. - They are installed permanently in the field
- Sediment flasks
    - PVC containers about 15-20 cm tall and about 12 cm diameter made from PC pipe (Figure 5). They can collect about 1.5 to 2 litres of runoff and sediment. Each erosion station requires 2 sediment flaks. . - They are installed permanently in the field
- Bamboo identification pegs and small boards
    - These are used to locate the erosion stations. NB unless the erosion stations are clearly marked, you will problems finding them in the field. Unless erosion stations are very close, you need one marker per erosion stations. - They are installed permanently in the field
- Sprit level or clinometer to measure the slope at the erosion station
- GPS to get the coordinates of the erosion station
- Hammer to bang the erosion pins into the ground.

Equipment to take measurements at the erosion stations:

- Aluminium Profile beams (Figure 8)
    - Quarter angle Aluminium beams. 1.6 m long with locators for erosion pin and ruler. We have 8 of them. They will be carried to the erosion stations to take measurements

- Ruler
    - Steel ruler to measure the distance between the soil surface and the profile beams; and to measure the depth of water in the sediment flask. We have 8 of them. They will be carried to the erosion stations to take measurements
- Cloth or mop
    - This is needed to clean out the sediment flasks after each measurement.
- Notebook
    - To record the data.
- Spray paint (highly visible colour) NB: this will only be needed twice during the rainy season

If possible:

- *Camera to take photo of area around erosion station*
- *Ovenproof container*
    - *They are needed to collect a sub-sample of water with sediment from the sediment flasks. You need one for each sediment flask.*

Pluviographs and data logger

- Computer
    - To get the data from the pluviographs you need a PC with a serial interface (RS232) or a USB-RS232 converter cable installed. The PC must have the 'WinComLog' software installed.
    - To download the data from the logger:
        - Either take the PC to the field and do the download in the field

- Or, disconnect the logger from the pluviograph, take it to the office and download in the office – but you need to take the logger back to the field and connect it to the pluviograph to ensure we do not miss and data.

Setting up the erosion stations

Select an area about 1 x 1 m in the field.

Use a hammer and bang on of the erosion pins into the ground. The top 9-11 cm should stick out of the soil (Figure 1). Once the pins are in the ground it is important not to pull them out or push them in any further, in other words, don't stand on them by accident.

Figure 1 Erosion pin in the soil

Estimate the largest slope downwards from the pin. If the slope is quite steep this is easy. If the slope is not so steep you may have to measure which direction down from the pins the steepest slope is. You can either use a clinometer (Figure 2) or a spirit level (Figure 3) to find the largest downhill slope.

Figure 2. Using a clinometer to measure slope.

Figure 3. Using a spirit level to measure slope.

Hammer another 3 erosion pins into the ground; the left and right pins should be 95-100 cm apart, the top and bottom pins should be 65-75 cm apart. This will give a rectangle of about 1 m by 0.7 m (Figure 4). The reason we use a rectangle is because it enables us the potentially use a photographic method (photogrammetry) to measure erosion. This method is under development at UQ. The ~1 x 0.7 m frame has the same relative dimensions as standard photos. The size also corresponds to an area

that can be photographed with a 50 mm lens from a high of 2 m. the other reason for this dimension is also because it is easy to carry an Aluminium beam of about 1.5 m length, anything much longer would be a bit cumbersome.

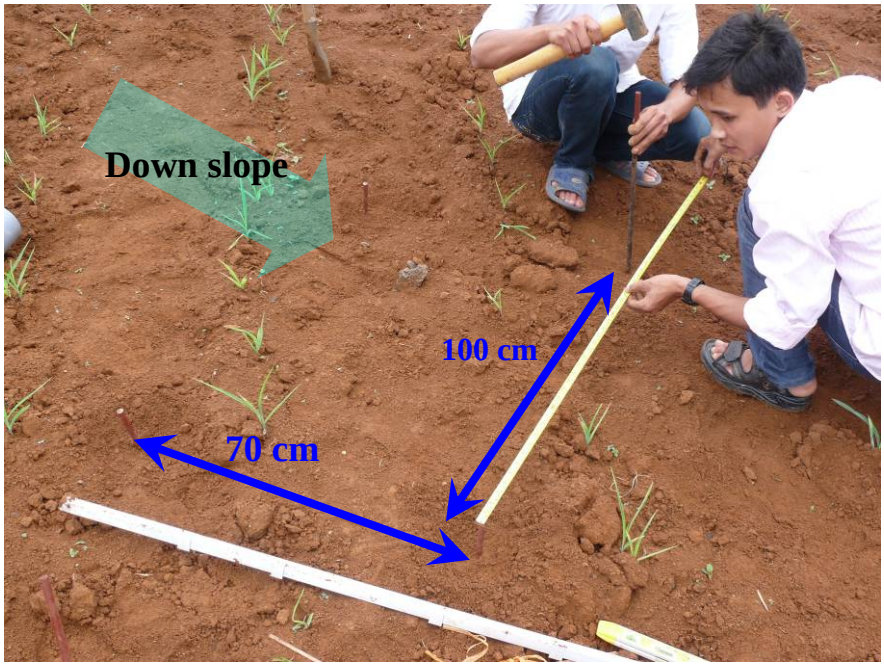

Figure 4. The erosion station area

Measure and record the slope on the left and the right of the erosion station using a clinometer or a sprit level (Figure 3 or Figure 3). If you use a spirit level apply the Pythagorean rule to calculate the angle of the slope.

Use a GPS to get the location of the erosion station. NB using decimal degrees is the easiest unit to use in GIS systems. Also make sure that the map datum of the GPS is set to WGS84. This is usually the default setting, but it is always good to double chk to make sure.

Next install the sediment flasks (Figure 5). Select two locations below the erosion pins, about 30 to 70 cm below the lower two pins. Use a small shovel to make a hole about the size of the sediment flask. Backfill the hole around the flask so that the top of the sediment flask is flush with the soil surface (Figure 6). Make sure that the soil is nice and firm around the sediment flask.

Figure 5. Putting a sleeve around the PVC pipe to close the sediment flask

Figure 6 Installation of the sediment flasks

Finally use some colourful spray paint and spray on side of the erosion pins. Figure 7 shows a completed erosion station. The paint on the soil surface will disappear very quickly after the first few rains.

***IMPORTANT**: Once the stations are installed you will come back regularly to take measurement. Make sure that you put a bamboo stick or similar at each station as a marker otherwise I guarantee that you will have a big problem finding the stations again ☺*

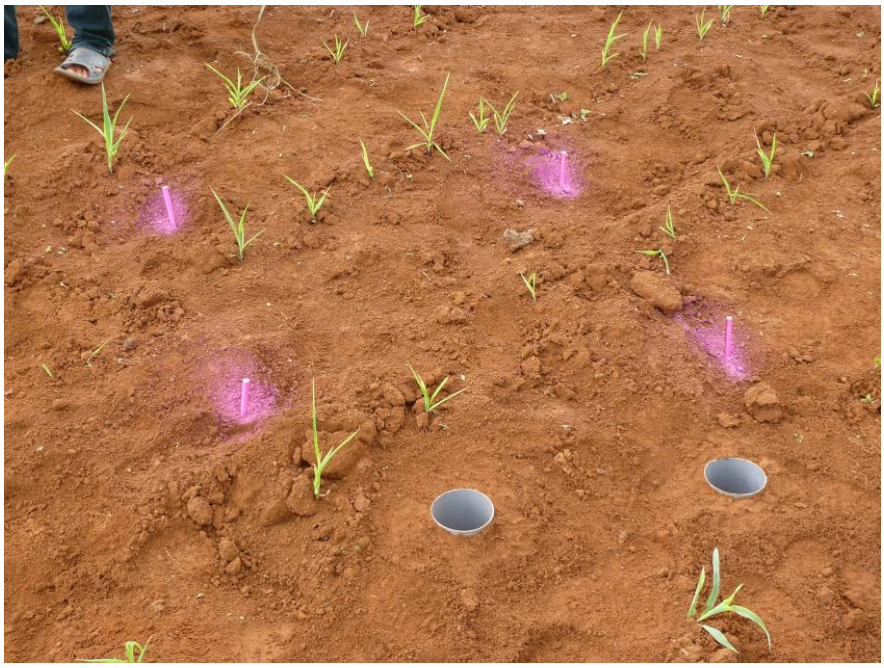

Figure 7 A completed erosion station

Insertion depth for erosion pins on very steep slopes

Some slopes may be so steep or the terrain so uneven that inserting the pins to 8-12 cm may be too deep. The pins must stick out of the ground so that the beam does not tough the soil surface when placed on the pins. If it does, pull the pin out and insert it anew, a few cm away. DO NOT pull it out a bit to give clearance between soil surface and the beam as they will not be firmly in the ground anymore.

Figure 8 shows a cross section of very steep and und uneven ground. The reddish set-up is to close to the soil surface while the bluish set-up is ok even though the pi ns may stick out of the ground more than 12 cm.

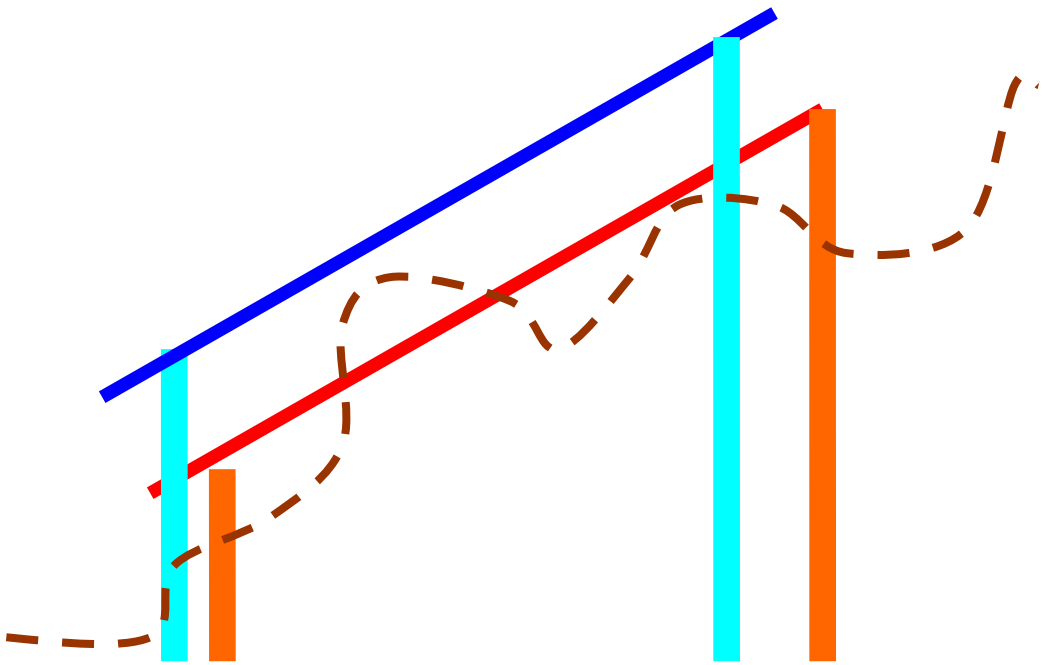

Figure 8 An erosion station on steep, uneven ground.

Soil sampling

After you have finished setting up the erosion stations also collect soil samples. At each erosion pin, about 10-20 cm outside the erosion station area, take a small soil sample of about 50 g to a depth of about 5cm. Place the 4 soil samples together in a plastic bag, so that you have about 200 g of sample for each erosion station. Take these samples back to NOMAFSI and dry them out in the sun. Once they are air-dry, mix the sample well and take a small sample of about 50 g and place them into the small zip-lock bags I gave you. The lab will need about 10 g to do all the soil chemical analysis we need, i.e. 50 g is plenty. Label each bag with the same number of as the erosion station and date of sampling. Depending how much money we have I will take some of the samples back to UQ for analysis when I come back.

Maintaining the erosion stations

The erosion stations will not interfere with the normal farmers operations. If the farmer needs to do the weeding or other crop management, he/she should do the same inside the erosion station as the rest of the field, i.e. the erosion stations are part of the field and do not require any extra treatment. These operations will change the soil surface which is not caused by erosion. However, taking repeated measurements during the rainy season will compensate for this. If the farmer did weeding or similar,

enter this as a comment in the xls-file. The only thing to take care is NOT to stand on the erosion pins and push them further into the ground; this will create errors!

Data keeping

The xls file I have set up contains all important information for each erosion station. This is:

1. erosion station number (1 to about 80)
2. date of set-up
3. GPS (Latitude, Longitude, Elevation in the WGS84 datum)
4. The slope of the erosion station at the left and right.
5. Name of the province
6. Name of the district
7. Name of the commune
8. Name of the village
9. Name of the farmer
10. Description of the field (i.e. age of maize, how tall, what does the crop look like (good or bad, and deficiency symptoms or occurrence of pests or diseases), type of tillage, weeds, how bare is the soil, ….)
11. Comments (I always include a comments column for anything else you may want to note, but there is no need for comments.

In each field we have at least 2, better 3 erosion stations. These are the replicates within each field. These replicates should be 5 – 10 m apart. This means that the entries 5 to 10 are probably the same. But please repeat each entry for each station (copy and paste). This is important because all data will be transferred into a data base where each row must have a complete set on entries).

Entry 1 (the erosion station number) is the common link for all data e collect. For example the soil samples only need the erosion station number because all the other information is cross referenced in the xls-file. However, it is good practise to also write the date on the soil sample bag.

Measuring erosion

The erosion station allows three different types of measurement:

1. Quantitatively using a profile measuring technique on the erosion pins. This is used to estimate erosion rates or soil loss in t/ha or mm/year
2. Semi-quantitatively using the sediment flasks. Because you do not know where the soil comes from, i.e. areas of soil loss is not known, it is only a relative measurement. However, it is a very good demonstration to show how much soil moved down the hill.
3. Semi-quantitatively by seeing the gap between the painted part of the erosion pins and the soil surface. This is also a good demonstration to show how the soil surface goes down as the soil erodes. However, you will only see that after a few weeks or months because there has to be a lot of erosion to see the gap between the paint and the soil surface.

Using the Aluminium profile beam

The Aluminium profile beam; call it *beam* for short, is 1.6 m long (Figure 8). NB we had to make one more beam for Son La and it is only 1.4 m long.

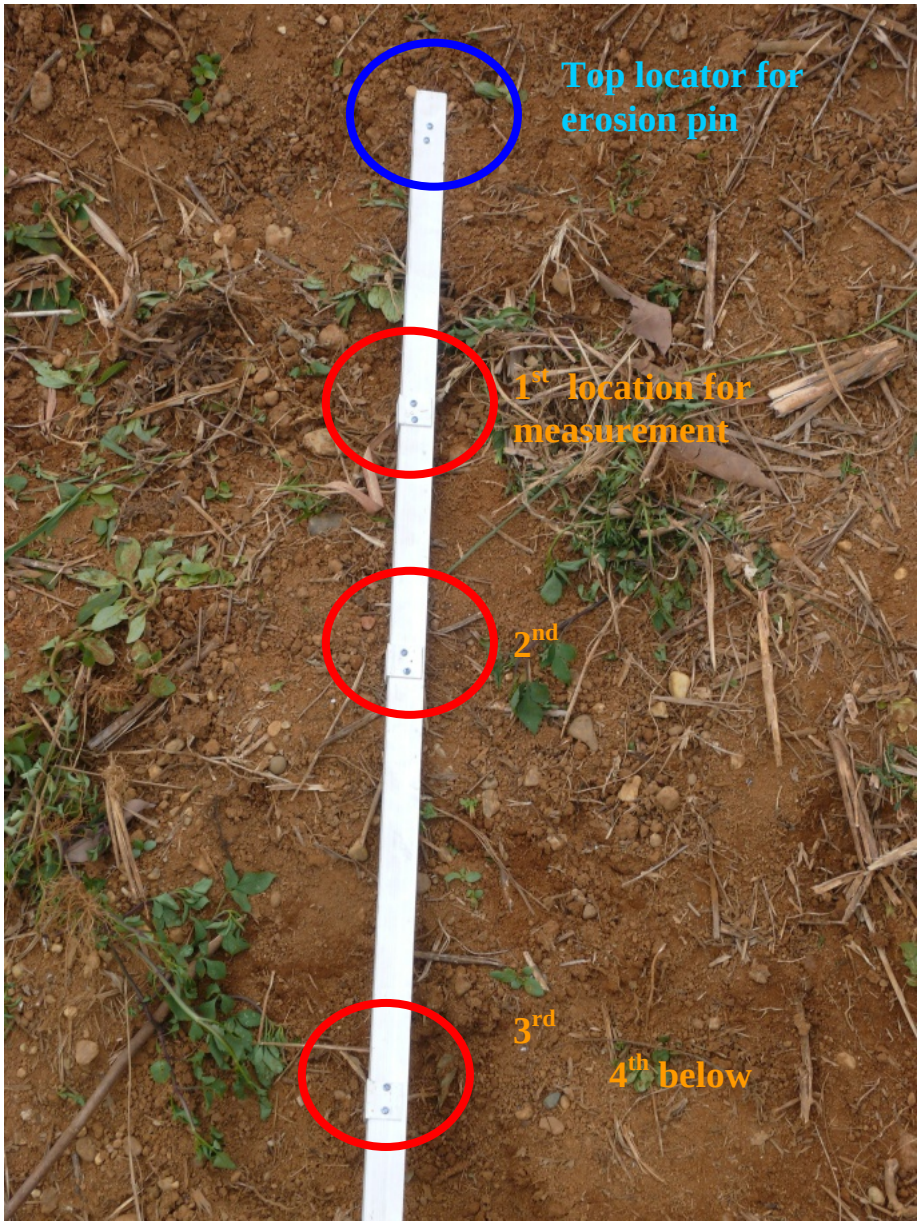

Figure 9. The Aluminium profile beam

The top locator is a short piece of Aluminium INSIDE the beam (Figure 9). It is put on first put on the top left erosion pins so that the mean sits firmly on the erosion pin (Figure 10) and ALWAYS at the same spot each time you take a measurement. The bottom end rests on the bottom right erosion pin (Figure 11).

Figure 10. The beam with the DOWN-side facing up to show the locator and where the erosion pin will sit.

Figure 11. The beam located on the top erosion pin. NB the locators stops it from moving

Figure 12. The beam on the erosion pins for the first measurement from the top left down.

The beam has 4 more locators from where the distance to the soil surface is measured (Figure 12). The steel ruler is placed against each locator (bottom end) and when it touches the soil surface, he distance between the soil surface and the surface of the beam measured. It is best to hold the ruler against the locators (Figure 13), and put you finger nail at the ruler where it touches the top of the beam. Leave your finger nail at that spot and take the ruler away from the beam and read the cm-reading marked by your fingernail.

Figure 13. One of the four locators for the steel ruler.

Figure 14. Taking a distance measurement. NB always at the down side of the locators

The first set of measurements consists of 4 readings at each of the locators, always start at the top. After you have written down the 4 reading when the beam was placed form the top left to the bottom right erosion pins, rotate the beam clockwise, place the

top locator on the top right erosion pin and the bottom left erosion pin. Then take another 4 reading, again starting from the top.

You will have 8 readings for each erosion station. You need to come back after you estimate that rain will have erode some soil. As a guide after about 100 mm or rain. This may mean that you take readings every 2 weeks or so; there is no need to take measurements if it hasn't rain a lot.

When you compare measurements between two times you recorded the 8 distances, you should see that the average distances increase. The amount of decrease is the soil lost in mm. You can convert this to t/ha assuming a bulk density of 1 g/ml; a 1 mm decrease is the same as 10 t/ha. Please do not try to interpret too much into the differences between only 2 times of measurement as the method is not very accurate. You will only get accurate results if you repeat the measurement, say, 10 times during the rainy season. Although distances you measure should decrease, sometime they do the opposite. This happens if eroded soil is being deposited. Remember that soil loss and soil movement always includes erosion (distances get larger) and disposition (distances become smaller). The method relies on repeated measures over time after heavy rain.

Pls enter the data in the xls-file provided.

Using the sediment flasks

Every time the rainfall intensity exceeds the soils ability to take in water, you will get run-off. If the soil surface is loose, the run-off water will transport sediment down the slope. This means that the sediment flasks will collect water and probably also soil (Figure 14). In this figure, there is little soil; sometimes the sediment flasks can be completely full of soil!

Figure 15 Water and some soil trapped in the sediment flasks

How much soil has accumulated in the flasks is a good demonstration how much soil moved down the hill. This is a good way to show farmers soil erosion.

You can take some rudimentary measurements on the sediment flasks. You should take these measurements every time you use the Aluminium profile beam as described above. The easiest is to use the steel ruler and measure and note how deep the water and sediment is inside the flask.

If you have a drying oven, you can stir the suspension inside the flask and take a sub-sample using something like a cup. The sub-sample is dried and the mass of soil measured. Unfortunately this will probably not be possible due to lack of equipment. As an alternative you can use a small container and first bale the water out of the flask; what is left at the bottom of the flask is mud. Then remove the mud. But before you discard the mud somewhere below the erosion station, put it in a container (or cup) and count how many container-fills of mud the sedimentation flask contained. Take note of this as will serve as a relative measure of erosion.

Using the paint marker

When you first put spray paint on the erosion pin, the paint is flush with the soil surface. Over time, as soil erodes, the unpainted part of the erosion pin will be

exposed. You will see that easily if the soil surface has decrease at least, say 5 mm which is 50 t/ha of soil loss. Framers will be able to see this.

There is no need to take any records and it is mainly a qualitative measure (even though you could record is, i.e. semi-quantitative). After the soil surface has been eroded by a substantial amount (i.e. about 5 mm or more) you can paint the other side of the pins with a different colour and start the method again. There is probably only a need to do this one more time after the erosion stations have bee set up.

Setting up the logger-PC connection

USB to RS232

After you have installed the software for the RS232-USB converter, you need to chk what COM-port you computer uses. The WinComLog software must have the same COM-port, otherwise the logger will not 'talk' to the computer.

To check the COM-port, right-click on 'MyComputer', then click on 'Manage' (Figure 16 MyComputer: Manage)

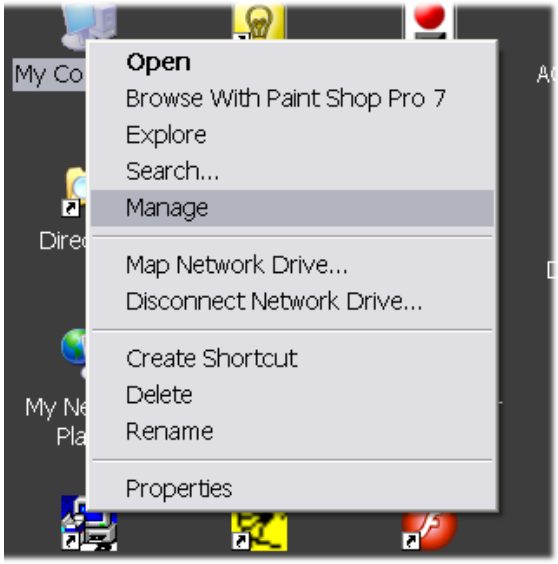

Figure 16 MyComputer: Manage

On the window that opens up (Figure 17 Device manager), click on device manager and you computer will show something similar to Figure 18. You will see an entry called *Ports (COM & LPT)* expand that list by checking the + sign. On the list there will be one entry that says something like *U232 serial on USB port (COM:#.)* The

number behind COM: is the number you need to remember; in this example it is 3. It is the port number your USB-RS232 converter uses. Once you know this number, close all the windows.

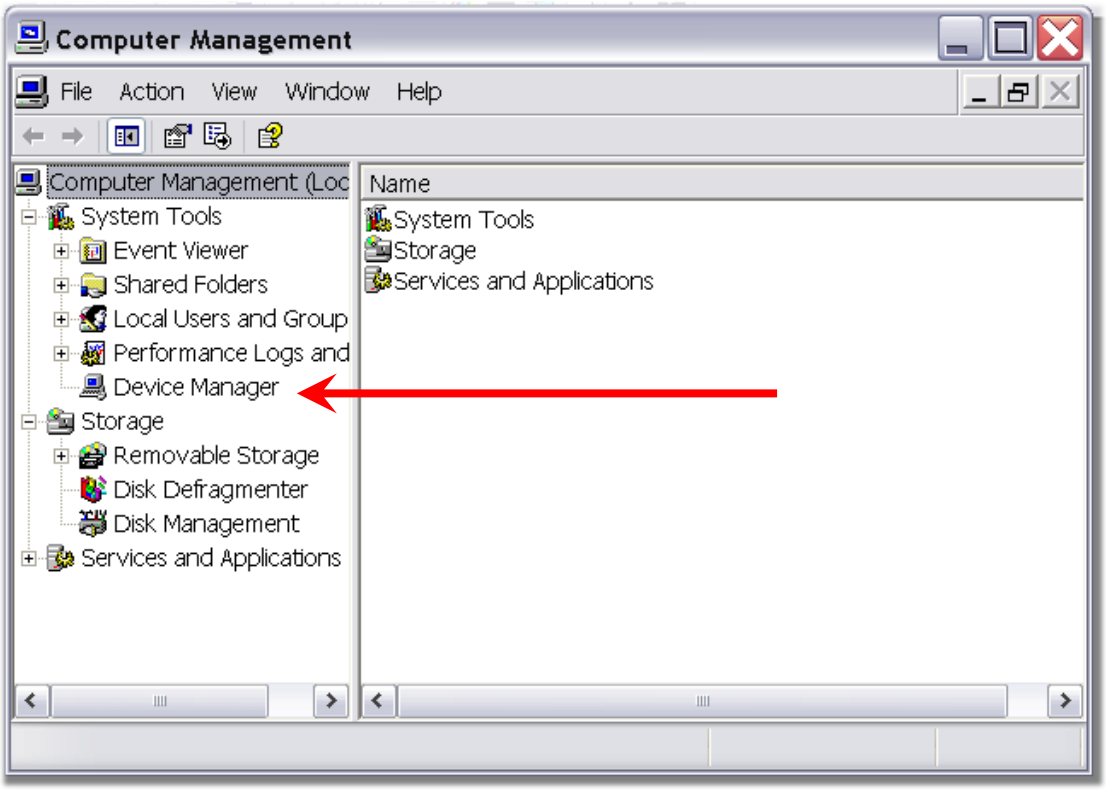

Figure 17 Device manager

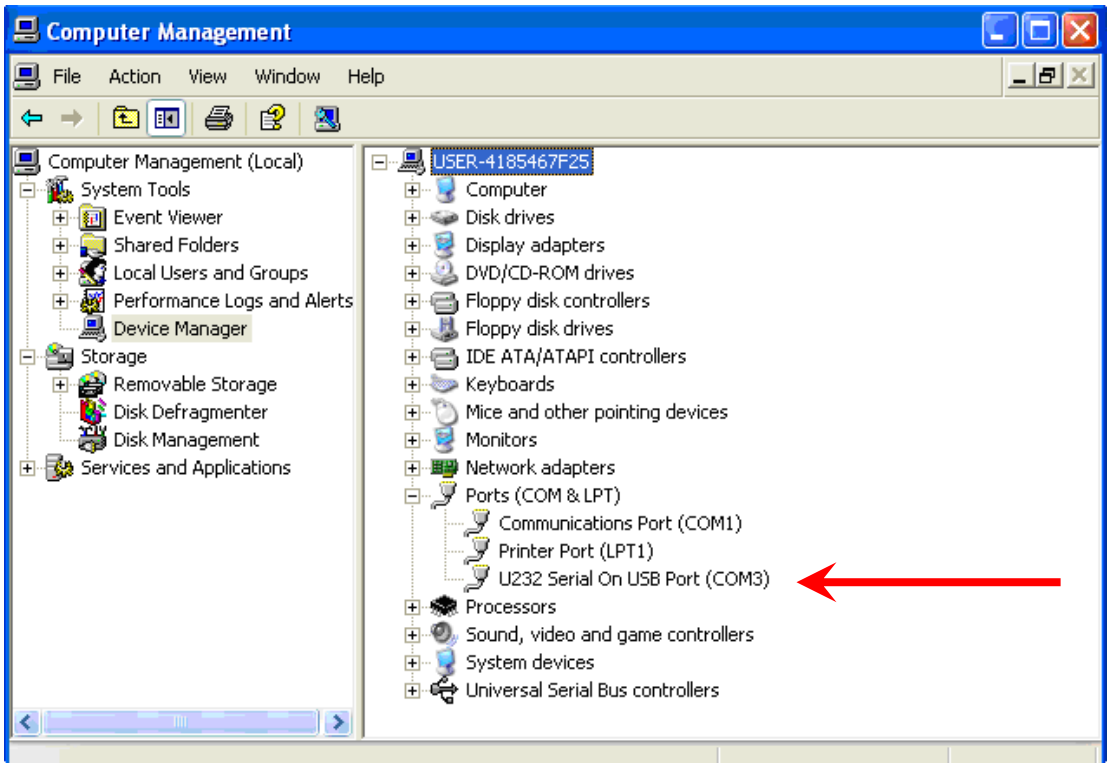

Figure 18 Port settings

WinCommLog

Install the WinComLog software. It will create an icon

on your desktop.

Connect the logger. When you start the WinComLog software the following screen opens (Figure 19). There are three tabs: Communicate, View plot and Firmware upgrade. All you need if the 'Communicate' – this is the one that opens when WinCOmLog starts. The port inside the red circle MUST the same as you identified in Figure 17. To check if the logger 'talks' to the computer, click Status (blue circle). The logger will respond by displaying something similar to Figure 20. All good if it does, if not the COM-port setting is probably not correct. If you get stuck at this point send me an e-mail ☺

Check if the date and time is ok (red rectangle in Figure 20. The time will be a bit incorrect after a few months but as long as it is accurate to the nearest 10 minutes, there is no need to adjust the time.

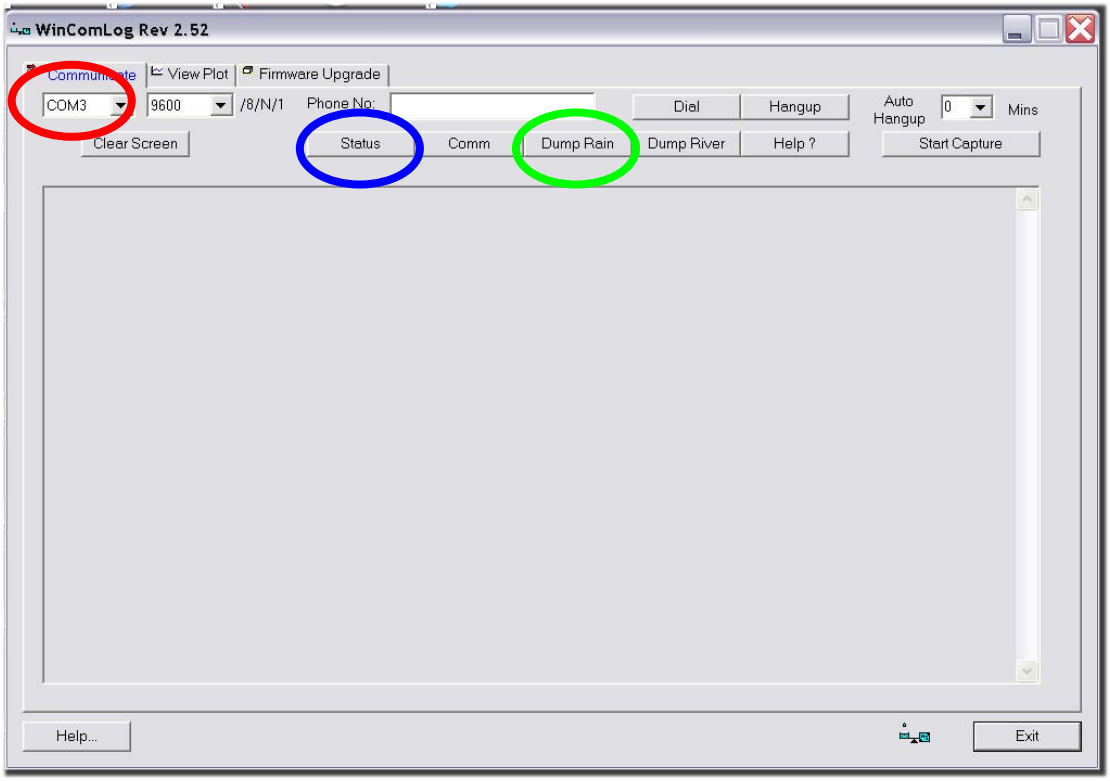

Figure 19 WinComLog

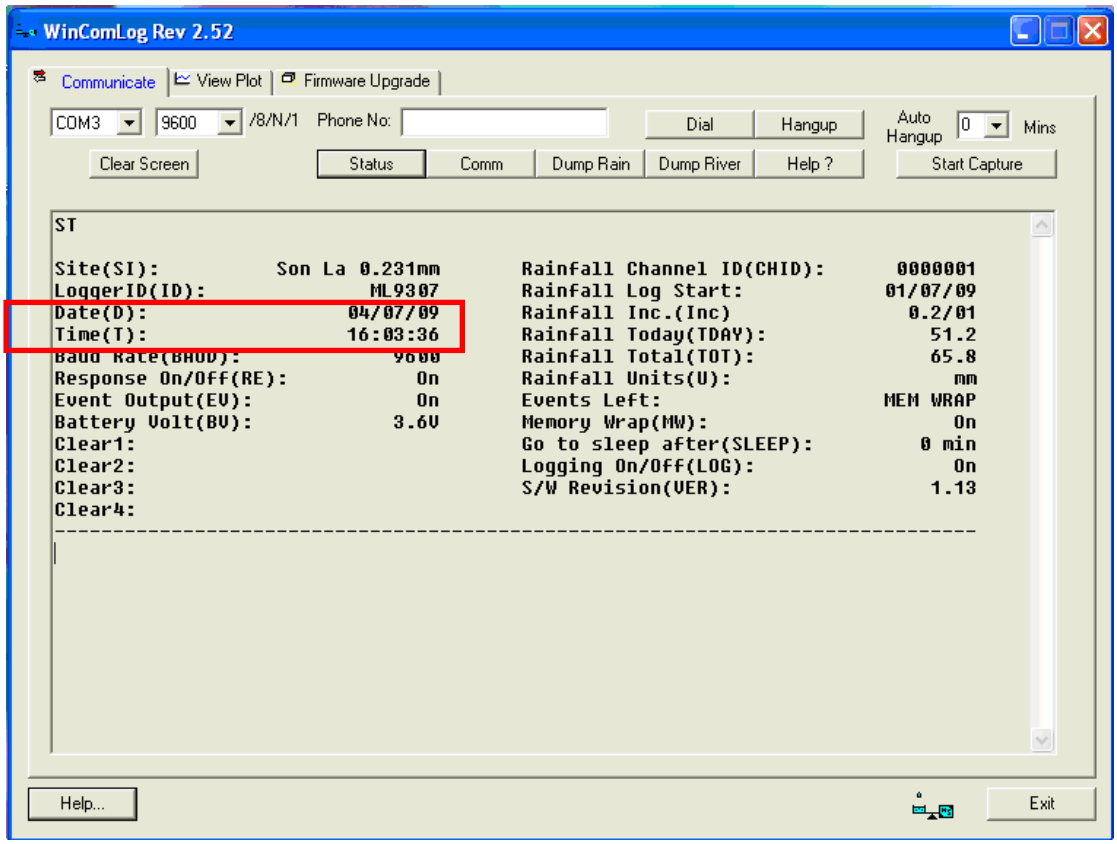

Figure 20 Status screen

To get the data click on Dump Rain (green circle, Figure 19). If a window opens and asks you if you want the plot the data, click 'no' as we will not use WinComLog to create graphs. The logger will then dump all its data and it will display in the main window (Figure 21 Downloaded data). If there is a lot of data, this can take quite a while - several minutes!

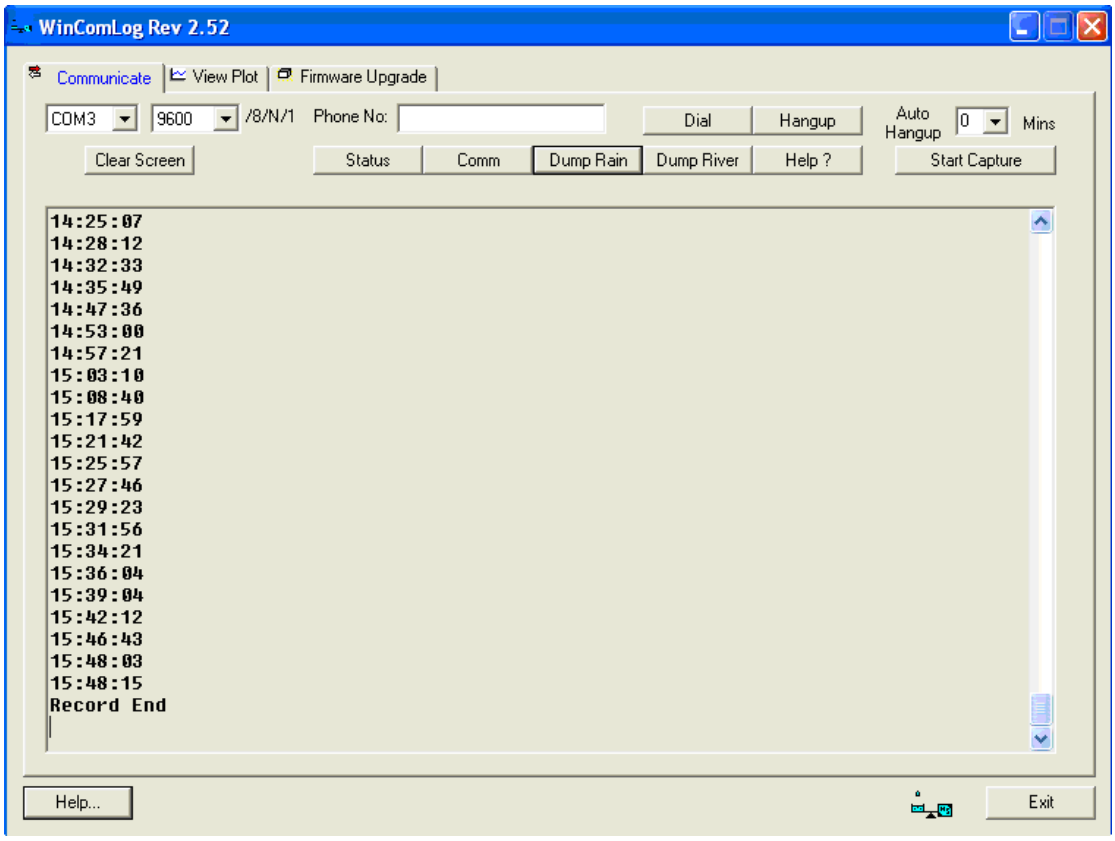

Figure 21 Downloaded data

To get the data into your xls-sheet use the scroll bar at the right of the data-window and go to the date and time you did the last down load. Put the cursor at the start of the line where the first new data starts. Use the scroll bar and go to the end of the data. Hold the *shift*-key down and place the cursor at the end of the data. All data will now be highlighted (Figure 22). You can now let go of the *shift'* key. Right-click on the highlighted data and click *'copy'* (Figure 22, NB pressing ^*C* to copy won't work!). Move to your xls-sheet and activate the cell where you want the data set pasted. Use ^*V* or right-click and *paste* to put the data into xls (Figure 23). --- all done, close WinComLog and disconnect the logger!

The logger records the time each time the tipping bucket tips, this equates to a rainfall of about 0.2 mm. We have calibrated each pluviograph in Pho Tho because they are all a bit different. Each pluviograph has the calibration stored as part of the Site (SI)

information (see first entry above the red rectangle in Figure 20, in this case it is 0.231 mm per tip). The logger also records the date, but only once at midnight (red arrow Figure 23). Any time records below that date are rainfall events according to the calibration (here: 0.231 mm). In this example you see that there was no rain on the 3/07/09. From this dataset it is easy to calculate rainfall intensity for any time interval you like (e.g. every minute, per 10 minutes, per hour, …). You can also calculate rainfall totals by adding up the rainfall event in any time period you like.

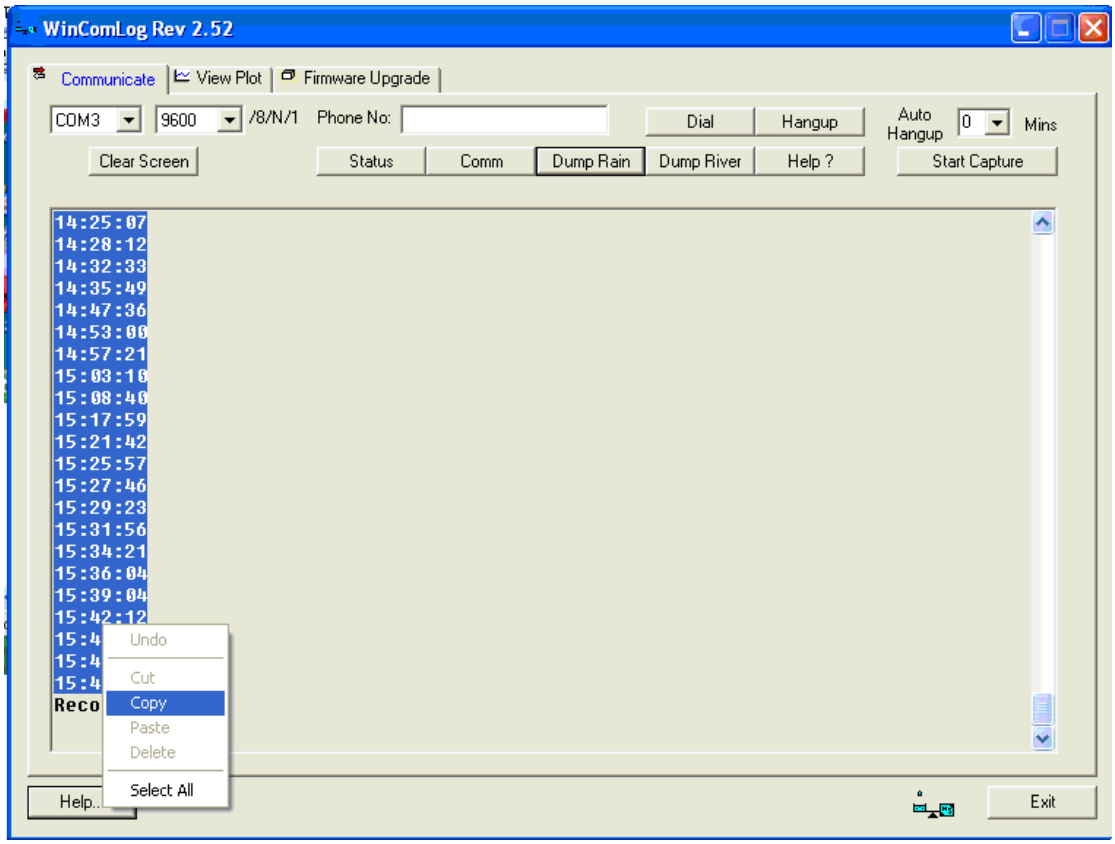

Figure 22. Copying the downloaded data

E82

	A	B	C	D	E	F	G
58	15:22:30						
59	15:23:06						
60	15:23:58						
61	15:24:20						
62	15:24:41						
63	15:24:58						
64	15:25:16						
65	15:25:37						
66	15:25:57						
67	15:26:20						
68	15:27:00						
69	15:30:03						
70	15:31:01						
71	00:00:00 02/07/09 68						
72	14:41:20						
73	14:42:51						
74	16:04:59						
75	16:05:21						
76	16:06:39						
77	00:00:00 03/07/09 5						
78	00:00:00 04/07/09 0						
79	0:07:54						
80	0:39:14						
81	0:57:42						
82	1:00:46						
83	1:05:54						
84	1:18:56						
85	1:25:55						
86	1:33:23						
87	1:41:45						

Figure 23. Data in the xls-sheet

Changing Logger settings

NOTE: the following is only needed if you want to change any of the logger settings. It is very likely that this will not be needed at all, except if the time is wrong by more then 10 minutes.

The logger is password protected to prevent accidental changes. To allow making changes enter the password by typing:

PASSWD=BOMM ↵

Now you can change the time by entering, for example:

T=14:07:35 ↵

You can also change any other settings as described in the logger manual section 4.1 Command / Syntax (page 9 ff). But you will not really need that at all.

Once you finished making changes to the logger you MUST exit the mode to make changes. This is done by typing the command

BYE ↵

Work Plan until the end of the rainy season (Oct 09)

Setting up (finished end of July)

The objective of these set of measurements is to obtain benchmark data on soil erosion in farmers fields for upland sloping lands maize production systems in relation to rainfall and rainfall intensity. At the same time we will collect soil samples for soil chemical characterisation to supplement the erosion measurements.

We should aim to set up 80 erosion stations to obtain benchmark data on soil erosion. There is no precise plan on where the erosion stations are set up except they must meet our objective to cover a range of slopes over a range of soil types.

The project targets two provinces, Son La and Lai Chau and as a guide we should have about equal number of erosion station in each of the 2 provinces (~40 each = ~80 total). In each province the project has identified two districts; again you should aim to have about equal number of erosion stations in each district (about 20). The project team has also identified about 3 communes where the project will have its sites. On average, this means you should aim to have about 7 stations in each commune; but there is no need to have stations in each commune: if you only go to 2 communes then ~10 stations per commune, or ~20 if you only install erosion stations in one commune. How many villages you go to depends how many communes you select, and the same for farmers. The important thing is that you need a set of at least 2, better 3 erosion stations in each farmer's field! These stations should be 5 to 10 m apart so that the GPS can resolve the different locations (NB the GPS is accurate to about 3-7 m).

Again remember the objectives: **measure erosion on a range of soils with different slopes.**

To make life easy and the workload manageable, please select fields that are relatively easy to access and of, course, you need the support of the farmers, villages and the communes.

You should aim to have the erosion stations installed as soon as practibly possible so that we capture as much of the rainy season as possible. It would be good if you can that part of the work plan completed before the end of July 2009.

I have only brought some of the erosion equipment (erosion pins and beams) with me. Some are still in Phu Tho and most of the erosion pins are still in Hanoi with SFRI. You should try to get the rest of the erosion equipment brought to the North-Wes centre as soon as possible. We have also set-up 8 erosion stations at NOMASFI in Pu Tho, they can be removed and also brought up to Son La as they were only set up for training purposes. The same applies to the rain gauges (pluviographs). The rain gauges (all 4) should be moved to the districts where we will measure erosion. The one we have set up in Moc Chau is ok and can stay where it is. The other 3 should be moved.

You need to record where the rain gauges are set up. Please fill in the table below, tis will the be included in the next version of this document:

Rain gauge	**Calibration mm/tip**	**Province**	**District**	**Location**	**GPS Latitude**	**GPS Longitude**	**Elevation m**
1		Lai Chau					
2		Lai Chau					
3		Son La					
4		Son La	Moc Chau	Dairy farm			

Table 1 Pluviograph locations

Please make sure that you enter the data in the xls-sheets as soon as come back from the field. Also keep backup copies on a flashdrive.

Measuring (July to middle October)

You should aim to take measurement every time there were about 100 mm of rain. However, given the travel requirement this will be no practicable. Perhaps try to take measurements every 2 to 3 weeks. Given that the time period we can cover is

about 3 months, ~ 12 weeks, this means, say, at least 5 measurements for each erosion station, but the more the better!

The rain gauge has ½ a Mb of memory, this doesn't seem a lot but it should hold 100,000 rainfall events. In theory this is plenty to hold the data for the entire rainy season, but sometimes things do go wrong. To safeguard against possible data loss I suggest that you download the logger once a month, i.e. 3 times.

Please make sure that you enter the data in the xls-sheets as soon as come back from the field. Also keep backup copies on a flash drive.

Removing the erosion stations (End of October 2009)

After the rainy season has finished, please remove all the erosion stations from the field, including the rain gauges, and bring back to the North-West Centre. The erosion pins will probably a bit hard to pull out of the ground because they rust. Pls clean them up a bit.

We will need all the erosion equipment for next year after the project team has identified the details of the sites we will conduct our main experiments including treatment design. This will happen during the course of this year and is not known at this stage. The erosion equipment will be installed again at our experimental sites next year and then stay in the fields until the conclusion of the project.

Templates for data entry

Set-up information

erosion_station			
date of set-up			
GPS (Latitude)			
GPS (Longitude)			
GPS (Elevation)			
slope1			
slope2			
Province			
District			
Commune			
Village			
Farmer			
Field_Description			
Comments			

Erosion Pins

Erosion station:	Beam direction	Distance 1 cm	Distance 2 cm	Distance 3 cm	Distance 4 cm
Date:	TL (top left)				
Nearest rain gauge:	TR (Top Right)				

Comments:

Erosion station:	Beam direction	Distance 1 cm	Distance 2 cm	Distance 3 cm	Distance 4 cm
Date:	TL (top left)				
Nearest rain gauge:	TR (Top Right)				

Comments:

Erosion station:	Beam direction	Distance 1 cm	Distance 2 cm	Distance 3 cm	Distance 4 cm
Date:	TL (top left)				
Nearest rain gauge:	TR (Top Right)				

Comments:

Erosion station:	Beam direction	Distance 1 cm	Distance 2 cm	Distance 3 cm	Distance 4 cm
Date:	TL (top left)				
Nearest rain gauge:	TR (Top Right)				

Comments:

Erosion station:	Beam direction	Distance 1 cm	Distance 2 cm	Distance 3 cm	Distance 4 cm
Date:	TL (top left)				
Nearest rain gauge:	TR (Top Right)				

Sediment flasks

date	station	trap	water depth, cm	subsample container ID	tare weight, g	tare + sediment, g	containers_mud	comments
		Left						
		Right						
		Left						
		Right						
		Left						
		Right						
		Left						
		Right						

end