

2) Potential breeding places

- Pooling rivers and streams, especially Malala ara, Maha ara, Mahawelikada ara. The Walawe River pooled periodically and it was only the stretch halfway that ran through Sooriyawewa. In general, pooling occurred between June-August.
- In the Northeast of the DSD some breeding areas are created by heavy rains.
- Seepage water of tanks.
- Gem pits (Bedigantota).
- Irrigation canals

3) Vegetation and cultivation pattern:

- scrub forest
- cultivation mostly during the “Maha” season

4) Socio-economic level and economic standards in the Sooriyawewa DSD were very low. In the Malala Ara area people were economically poorer than in the other areas: 90% of the houses were constructed of wattle and daub (mud) and have thatched roofs and are located by the stream. Water scarcity is a major issue. There are dry and wet periods and water sources completely dry out in the dry season and residents leave the area during this season and return to live by the Malala Ara during the wet season. Additionally people dig holes in the riverbed to remove water and these holes develop into breeding places.

Along the Maha Ara there are more breeding sites and this area could be identified as a high risk area. There is a moderate risk in Malala Ara, Mahawelikada Ara and the Walawe areas.

Role of risk mapping in malaria control:

Risk maps could be used for malaria control strategies. With these strategies it would be possible to carry out selective malaria control work. If detailed risk maps were made available for the area they could work in a more organized manner.

Presentation: Ambalantota DSD

By Mr. C. Weerasinghe, PHI AMC

High risk areas:

Ambalantota is not a risk area, 75% of the area is under irrigated paddy cultivation.

Seven "risk" GNs:

Liyangastota (76)

Thaligala (113)

Ridiyagama (73)

Punchiheyagama (74)

Modarapilawala (78)

Mamadala north (107)

Mamadala south (108)

Around Ridiyagama tank due to chena cultivation and gem pits.

Number of cases:

1999: Pv 8; Pf 0

2000: Pv 38; Pf 0

(MOH Ambalantota)

Environmental risk factors:

Possible risk factors:

1. Irrigation channels
2. Abandoned gem pits
3. Walawe River during drought
4. Chena cultivation around the Ridiyagama tank
5. Socio-economic factors: poverty and most houses are constructed with wattle and daub and thatched roofs.
6. Migration of people: they migrate to chena areas in the Maha season

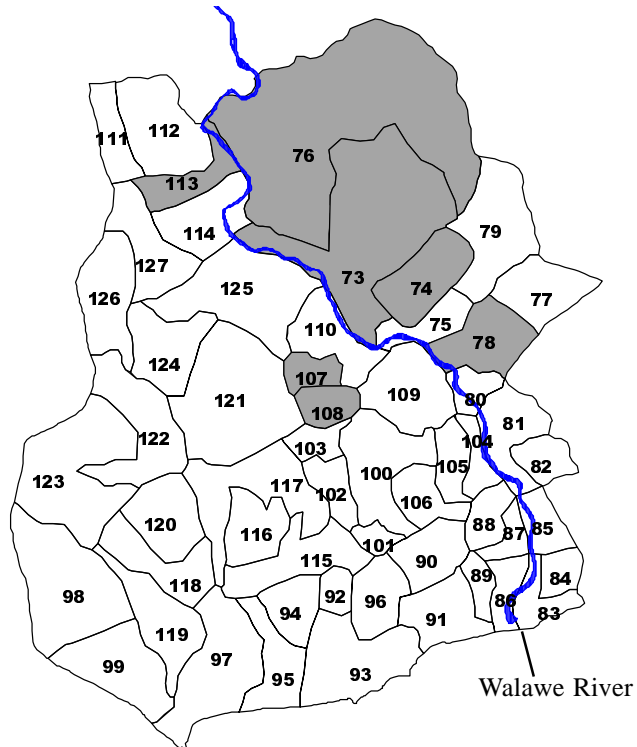
Ad 1) irrigation channels: Mamadala canal, Ridiyagama canal, Katchigal Ara

Ad 2) Abandoned gem pits: Ridiyagama, Baminiyanwila, Liyangasthota

Ad 4) Chena cultivation: Karambagalmulla, Ridiyagama

Role of risk mapping in malaria control:

1. Early planning of control programs
2. To plan and implement mobile clinics and indoor residual spraying
3. To identify the potential breeding places in time



6. OVERVIEW AND DISCUSSION OF PRESENTATIONS

As was clear from the five presentations, the DSDs have distinct differences in risk factors. However there were common factors such as the contribution of rivers and slow flowing streams and especially the pooling in the riverbeds.

The following points were raised in the general discussion, which followed the presentations:

1. Ms. Peiris, RMO of Hambantota and Mr. Wimalarathna, Senior PHI of the AMC Hambantota area brought up the fact that at the moment the DSD was experiencing a relatively low risk of malaria except for certain GNs (see presentation DSD Sooriyawewa). But they expected that following the completion of the area coming under construction of the Walawe Extension Project, changes would take place and that there would be an increased risk of malaria in the area. This increased risk would be due to the fact that the canals were under construction for a long time and this would create additional breeding sites during the construction phase.
2. A second important point raised in this discussion was the fact that specific structures, so called “drop structures”, were being built by the Mahaweli. According to Mr. Wimalarathna, these structures formed major breeding sites for mosquitoes and close to 5000 of these structures were to be built in the area. This was clearly a point of major concern for the Sooriyawewa health staff and they specifically made a request from IWMI to liaise with the Mahaweli and advise them to use different types of structures instead of those being currently built.

It was stated that the Mahaweli currently releases water every 14-18 days. According to the health staff it was better if the Mahaweli could release water every seven days in order to prevent mosquito breeding or if they could introduce flushing to wash out the mosquito larvae completely.

Felix Amerasinghe replied that the first step for IWMI would be to liaise with the Mahaweli and find out what these structures were and then confirm that these structures were indeed a major mosquito breeding source. Once this was established IWMI could look into the possibility of meeting with the relevant authorities of the Mahaweli and discuss the change to the structure design.

3. A point raised by Mr. Siripala, PHI-FA of the Thanamalvilla area was that most other DSDs had mentioned that a risk factor in malaria transmission was imported cases from the Thanamalvilla/Moneragala area by people moving to these areas for *chena* cultivation and returning with malaria to their DSDs. He therefore suggested that there should be a focus on control in this area, which would help diminish the risk in other areas and towards this end more resources should be allocated to this area.
4. Mr. Dewasiri, Senior PHI of the AMC in Hambantota area raised the issue of people visiting private hospitals for treatment of malaria. He said that in the Angunukolapelessa DSD up to 70% of the people consulted private doctors. The reason for consulting private doctors was adduced to the reduced waiting time. This statement was followed by a request to the other DSDs to estimate (in percentage) the number of people consulting private facilities in their DSDs.

The figures were as follows:

- a. Thanamalvilla 52% (based on a study by Abeysekara et al 1997, the article indicates 45.5% for the Moneragala and Buttala DSDs in Moneragala)
- b. Embilipitiya 20-25%
- c. Sooriyawewa 20%
- d. Ambalantota 15-20%
- e. Angunukolapelessa 70% (as stated above)

The figures varied widely between the different DSDs, and additional data collection is needed for verification.

It was also stated that there existed a practice, that was never reported, which was the under prescribing of drugs resulting in people having to consult the health facility several times. This was a very serious problem, since apart from not curing the people it could also induce resistance in parasites for malaria drugs. For instance Fansidar was always prescribed too late and not as advised by the AMC.

5. Mr. Shermath, a Senior Entomologist of the AMC Hambantota was of the opinion that it was questionable whether the abandoned tanks were breeding sites for mosquitoes. According to him a lot of malaria mosquitoes breed in the seepage water from the tanks and not in the tanks itself. Dr. Felix Amerasinghe stated that the abandoned tanks may not be a breeding site for the major vector (*An. culicifacies*) but that they could very well contribute to the breeding of possible secondary vectors (*An. vagus*, *An. annularis*). These latter two species were found breeding in the abandoned tanks during the field visit on the March 28 (see chapter 7). Further study would be need into the importance of these secondary vectors in malaria transmission in the area.

Follow Up

Several rivers were mentioned by name and attempts will be made to locate them on the maps and study them in more detail. A method should be found to include the streams as a parameter in the risk analysis. For example, the length of streams and rivers in a GN could be included as a parameter. However possibly even more important are the type of river and the role the underground, sand or rock, could play in pooling as well as the vegetation types growing along the rivers. Therefore it would be necessary to carry out some field research to find out which type of rivers are used for breeding and under what kind of condition by which vectors.

7. FIELDTRIP REPORT

On the March 28, 2001 a fieldtrip was conducted in the area of Thanamalvilla to investigate whether the so-called abandoned tanks, as indicated on the topographic area maps, could serve as mosquito breeding sources. Participants of the fieldtrip were Dr. Felix Amerasinghe, Dr. Dissanyake Gunawardena, Mr. Lal Muttawatta, Ms. Eveline Klinkenberg and Mr. Nissanke PHI of Thanamalvilla.

Eight tanks were visited in the area (see figure 4) The tanks could roughly be divided in two groups, tanks with vegetation all around (see figure 5a) and more muddy tanks with cattle footprints (see figure 5b). Some tanks were a combination of the two (see figure 5c).

In all tanks larval samples were taken, table 1 shows the mosquito species found in the different tanks.

From Table 1 it can be seen that the main malaria vector for Sri Lanka, *An. culicifacies* was not found breeding in the abandoned tanks but some possible secondary vectors were found: *An. annularis* and *An. vagus*. However, additional larval studies in more tanks are necessary to give decisive conclusions. Additional research should reveal the importance of these species in the transmission of malaria for the area.

A second finding of the fieldtrip was that so-called abandoned tanks were in practice not abandoned and were still being used by farmers for collecting water. Tanks were either privately owned or owned by Farmers Associations, who together took care of the maintenance of the tanks. Additional studies should be undertaken to investigate how many tanks are still being used and fill up with water during the rainy season.

Table 1. Characteristics of the tanks and mosquitoes found.

Tank nr	Name tank	# dips/sample	Mosquitoes found	Ffauna	Vegetation	Bottom	Water	Light	Characteristics
1	Taligala wewa	30	<i>An. vagus</i>	water beetle		mud	turbid	exposed	low water; mosquito breeding in animal footprints
2	Suriya Godana Wewa	30	<i>An. annularis</i>	water beetle	algae, grass	mud	clear	exposed	vegetation till the edges, clear water
3	Uru Horé wewa	30	<i>An. annularis</i> <i>An. vagus</i>		algae	mud	clear	exposed	mixed vegetation, till the edges, algae in the tank, rock pools formed in the bund of the tank
	rock pools in bund tank	3	<i>An. annularis</i> <i>An. vagus</i>			rock	clear	exposed	Rocks were lying in the bund in which pools were formed.
4	little Sigeria"	30						exposed	rock pool, no larvae found
5	Indurugaswewa	30	<i>An. pedicellatus</i> <i>An. barbitrostris</i>		dead leaves	mud	clear	exposed	vegetation till the edges, clear water, some parts sand
6	Paluwatta Karametiya	30	<i>Cx. pseudovishuni</i>		algae, Leersia	mud	clear	exposed	vegetation till the edges, green algae (<i>spirogyra</i>) in tank, muddy place
7	Bimpokunugama	30	no larvae						vegetated tank, lilies, lotus, lots of grass
	road pools near tank	7	<i>An. vagus</i> <i>Cx. pseudovishuni</i>			mud	turbid	exposed	muddy road pools
8	Kukulkatuwa	30	<i>An. annularis</i>		Spirogyra, grass	mud	turbid	exposed	vegetation till edges at part of the tank other part muddy with footprints

Figure 4. Tanks visited and mosquito species found during the fieldtrip in Thanamalvillage area, March 28, 2001.

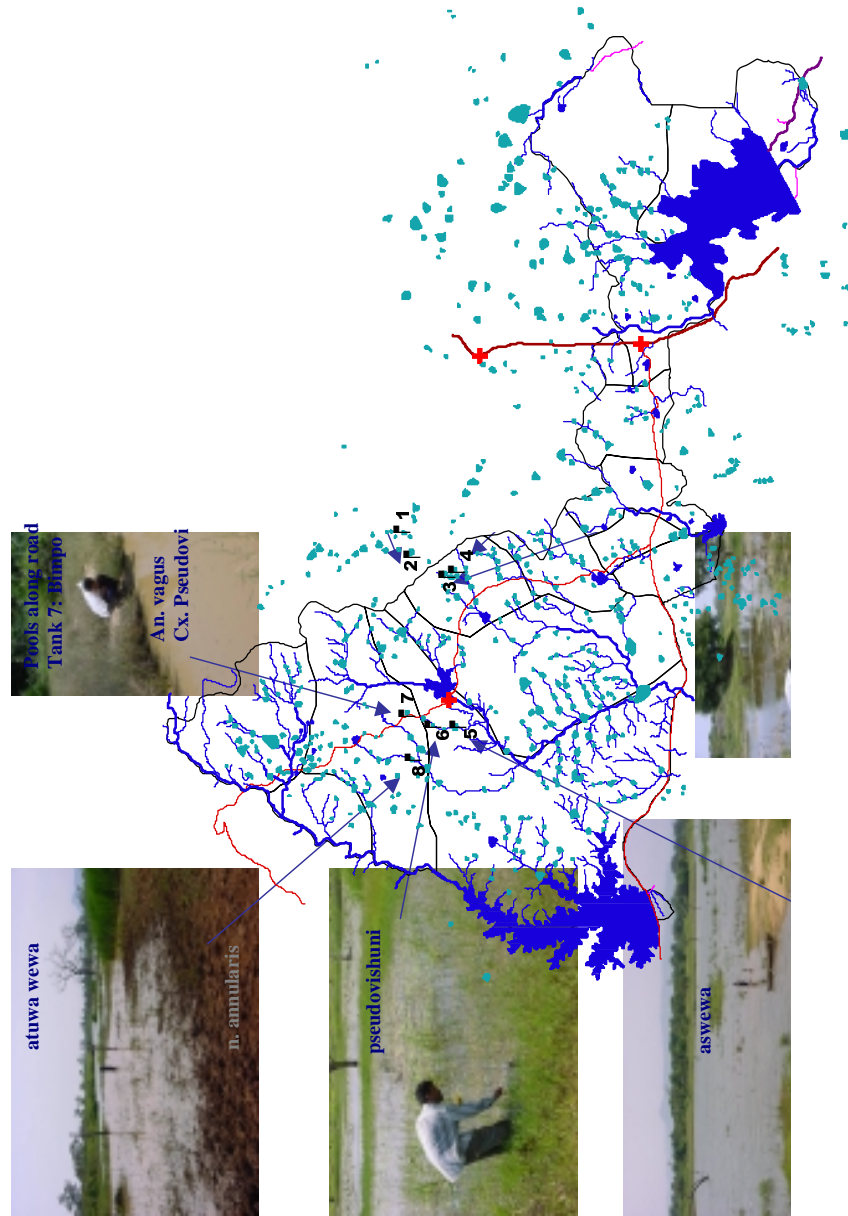


Figure 5. View of several tanks visited in the Thanamalvilla area on the 28th March 2001.



8. REFERENCES

1. Abeysekera, T., Wickremasinghe, A.R., Gunawardena, D.M. and Mendis, K.N., 1997. Optimizing the malaria data recording system through a study of case detection and treatment in Sri Lanka. *Tropical Medicine and International Health* 2: 1057-1067.
2. Konradsen, F., Amerasinghe, F.P., van der Hoek, W. and Amerasinghe, P.H., 2000. Malaria in Sri Lanka. Current knowledge on transmission and control. IWMI.

9. LIST OF ABBREVIATIONS

AMC	=	Anti Malaria Campaign
API	=	Annual Parasite Index
DPDHS	=	Deputy Provincial Director of Health Services
DSD	=	Divisional Secretary Division
EIR	=	Entomological Inoculation Rate
FA	=	Field Assistant
FR	=	Falciparum Ratio
GIS	=	Geographical Information System
GN	=	Grama Niladari area
MOH	=	Medical Officer of Health
Pf	=	Plasmodium falciparum
PHI	=	Public Health Inspector
Pv	=	Plasmodium vivax
RMO	=	Regional Malaria Officer
RS	=	Remote Sensing

10. LIST OF INVITEES

Participants in the workshop

Name	Designation	Address
1 Dr. J.B.Senerath	DPDHS-Hambantota	DPDHS Office, Hambantota
2 Mr. H.M. Faizal	RMO	Anti Malaria Campaign, DPDHS Office, Community Hall Road, Moneragala
3 Mr. N.B. Munasingha	RMO	Anti Malaria Campaign, Embilipitiya
4 Mr. W.K. Sirisena	FA, AMC Embilipitiya	Anti Malaria Campaign, Embilipitiya
5 Mr. A.B. Dayasiri	FA, AMC Embilipitiya	Anti Malaria Campaign, Embilipitiya
6 Mrs. B.S.L. Peris	RMO Hambantota	RMO Office, Anti Malaria Campaign,
7 Mr. G.H. Wimalarathna	Senior PHI Hambantota	RMO Office, Anti Malaria Campaign,
8 Mr. A.C.S. Shermath	Senior Entomological Assistant	RMO Office, Anti Malaria Campaign, Hambantota
9 Mr. C. Weerasooriya	Senior PHI	RMO Office, Anti Malaria Campaign, Hambantota
10 Mr. K.H. Weerasena	Divisional Secretary	Divisional Secretariat Ambalantota
11 Mr. R.W.M. Dissanayaka	Divisional Secretary	Divisional Secretariat Angunukolapelessa
12 Mr. P.A. Muthukumara	Divisional Secretary	Divisional Secretariat Embilipitiya
13 Mr. K.A.J. Premalal	Divisional Secretary	Divisional Secretariat, Sevanagala
14 Mr. K.G. Witesinghe	Assistant Divisional Secretary	Divisional Secretariat Sooriyawewa
15 Mr. Ruchira Wickremaratne	DLUPP Officer	Land Use planning Office, District Secretariat, Matara
16 Ms. Chandra Liyanaga	DLUPP Officer	Land use Planning office, new town, Ratnapura
17 Dr. K.A.W. Weerasekara	MOH	MOH Office, Ambalantota
18 Mr. A. Jayasundara	PHI	MOH Office, Ambalantota
19 Mr. G.N. Chandana Kumara	PHI	MOH Office, Ambalantota
20 Mr. P.A.S. Pradeep Rathnasiri	PHI	MOH Office, Ambalantota
21 Mr. A.J.R. Wimal	PHI	MOH Office, Ambalantota
22 Mr. R.M. Chandana Lal	PHI	MOH Office, Ambalantota
23 Mr. S.H. Sugathapala	PHFA	MOH Office, Ambalantota
24 Mr. A.T. Gunapala	PHFA	MOH Office, Ambalantota
25 Mr. K. Somapala	PHFA	MOH Office, Ambalantota
26 Mr. A.H. Shaliyadasa	PHFA	MOH Office, Ambalantota
27 Mr. A. Warnasooriya	PHFA	MOH Office, Ambalantota
28 Dr. H.A.S.S. Ariyaratna	MOH	MOH Office, Angunukolapellessa
29 Mr. D.S.K. Dewasiri	Senior PHI/AMC	MOH Office, Angunukolapalessa
30 Mr. K.L. Gunapala	PHI/AMC	MOH Office, Angunukolapalessa
31 Mr. R.S.P. Priyadasa	PHI/AMC	MOH Office, Angunukolapalessa
32 Mr. Gurunge	PHI/AMC	MOH Office, Angunukolapalessa
33 Mr. G. Pathirana	PHFA	MOH Office, Angunukolapalessa
34 Mr. H.B.Mahipala	PHFA	MOH Office, Angunukolapalessa
35 Mr. I.A. Ariyapala	PHFA	MOH Office, Angunukolapalessa
36 Dr. J.K. Liyanage	MOH	MOH Office, Embilipitiya
37 Mr. H.A. Gunapala	Senior PHI-Embilipitiya	MOH Office, Embilipitiya
38 Mr. K. Subasinghe	PHI-Kolombage-Ara	MOH Office, Embilipitiya

Name	Designation	Address
39 Mr. R.M.K. Bandara	PHI-Mulendiyawala	MOH Office, Embilipitiya
40 Mr. W.T. Dias	PHI-Panamura	MOH Office, Embilipitiya
41 Mr. K.M. Kumaratna	PHI-Thimbolketiya	MOH Office, Embilipitiya
42 Mr. A.K. Ariyadasa	PHFA- Hagala	MOH Office, Embilipitiya
43 Mr. N.M. Somapala	PHFA-Gangeyaya	MOH Office, Embilipitiya
44 Mr. G. Jinasena	PHFA-Nawinna	MOH Office, Embilipitiya
45 Mr. B.G. Samson	PHFA-Panamura	MOH Office, Embilipitiya
46 Mr. L.A. Jinadasa	PHFA-Uda Walawe	MOH Office, Embilipitiya
47 Dr. M. Weerathna	MOH	MOH Office Sooriyawewa
48 Dr. G.R.K.H. Halpage	MOH	MOH Office Sooriyawewa
49 Mr. K.N. Senaratna	Senior PHI/AMC	MOH Office Sooriyawewa
50 Mr. P. Asarappuli	PHI/AMC	MOH Office Sooriyawewa
51 Mr. E.L.A.S.S. Kumara	PHI/AMC	MOH Office Sooriyawewa
52 Mr. A.G. Lalith Devandra	PHI/AMC	MOH Office Sooriyawewa
53 Mr. R. Karunaratana	PHFA	MOH Office Sooriyawewa
54 Mr. A.A. Nandasiri	PHFA	MOH Office Sooriyawewa
55 Mr. S. Hettiarchchi	PHFA	MOH Office Sooriyawewa
56 N.A.S.B. Nissanka	PHI	MOH Office, Thanamalvilla
57 R.N. Ratnasiri Bandara	PHI	MOH Office, Thanamalvilla
58 W.P. Gunapala	PH FA	MOH Office, Thanamalvilla
59 P. Siripala	PH FA	MOH Office, Thanamalvilla
60 N.K.D. Chandrasekera	PH FA	MOH Office, Thanamalvilla
61 S.P.P. Kulatunga	PHFA	MOH Office, Thanamalvilla
62 Miss T. Malkanthie	MTC Uva Kudaoya	Malaria Treatment Centre, Uva Kudaoya, Thanamalvilla
63 Dr. W. van der Hoek	Theme Leader Water, Health & Environment, IWMI	IWMI PO Box 2075, Colombo, Sri Lanka Tel: 1-867404 Fax: 1-866854
64 Dr. F.A. Amerasinghe	Principal Researcher IWMI	POBox 2075, IWMI Colombo, Sri Lanka Tel: 1-867404 Fax: 1-866854
65 Mr. D. Gunawardena	Research Associate IWMI	IWMI PO Box 2075, Colombo, Sri Lanka Tel: 1-867404 Fax: 1-866854
66 Mr. L. Mutawatta	GIS - Remote Sensing Specialist IWMI	IWMI PO Box 2075, Colombo, Sri Lanka Tel: 1-867404 Fax: 1-866854
67 Ms. E. Klinkenberg	Consultant Malaria, IWMI	IWMI PO Box 2075, Colombo, Sri Lanka Tel: 1-867404 Fax: 1-866854
68 Ms. M. Ranawake	Software & Database Helpdesk Coordinator, IWMI	IWMI PO Box 2075, Colombo, Sri Lanka Tel: 1-867404 Fax: 1-866854
69 R. Karunaratna	IWMI-fieldstaff	IWMI PO Box 2075, Colombo, Sri Lanka Tel: 1-867404 Fax: 1-866854
70 I. Gamage	IWMI-fieldstaff	IWMI PO Box 2075, Colombo, Sri Lanka Tel: 1-867404 Fax: 1-866854
71 M. Dayananda	IWMI-fieldstaff	IWMI PO Box 2075, Colombo, Sri Lanka Tel: 1-867404 Fax: 1-866854
72 S. Lionaratne	IWMI-fieldstaff	IWMI PO Box 2075, Colombo, Sri Lanka Tel: 1-867404 Fax: 1-866854

Invitees unable to attend

Name	Designation	Address
1 Dr. W. P. Fernando	Director AMC	Anti Malaria Campaign, 555/5 Elvitigala Mawatha, Colombo 5
2 Dr. A.R. Wickremasinghe	Senior Lecturer Medical Faculty	Department of Community Medicine & Family Medicine, University of Sri Jayawardenepura, Gangodawila, Nugegoda
3 Dr. D.A.B. Dangalle	DPDHS-Ratnapura	DPDHS Office, 75, Dharmapala Mawatha, Rathnapura
4 Dr. Asela Gunawardena	DPDHS-Moneragala	DPDHS Office, Community Hall Road, Moneragala
5 Dr. R.P.S. Rajapakse	MOH	MOH Office, Thanamalvilla
6 Mr. J.A. Geenthananda	PHI/AMC	MOH Office, Angunukolapalessa
7 Mr. S.C. Withana	Divisional Secretary	Divisional Secretariat Thanamalvilla

Postal Address

P O Box 2075
Colombo
Sri Lanka

Location

127, Sunil Mawatha
Pelawatta
Battaramulla
Sri Lanka

Telephone

94-1-867404, 869080

Fax

94-1-866854

E-mail

iwmi@cgiar.org

Website

www.iwmi.org