



5th WISDOM PhD Scientific seminar

Investigation on pesticide and antibiotic use and exposure in selected study sites in the Mekong Delta

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Outline

- Main goals of research
- Research process
- Site selection
- Main outcomes from field survey
- Analytical methods
- Monitoring
- Next steps

Main goals of research

Full research: **DEVELOPMENT OF RISK ASSESSMENT (HOT-SPOT) MAPS FOR DRINKING WATER QUALITY (PESTICIDES AND ANTIBIOTICS) IN THE MEKONG DELTA**

Objectives:

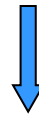
- To identify and assess the influence of the main pollution sources on drinking water quality with regard to pesticide and antibiotic use in the Mekong delta
- To develop GIS risk maps of drinking water

💧 First stage:

Interview at authority and community level (Questionnaire method)

→ collecting maps and data relevant to water sources for preliminary GIS mapping

→ contributing to decide study sites, sample size, sampling frequency and study compounds



💧 Second stage:

Developing analytical methods for selected compounds, sampling, sample extraction and analysis (follow results observed from first stage)

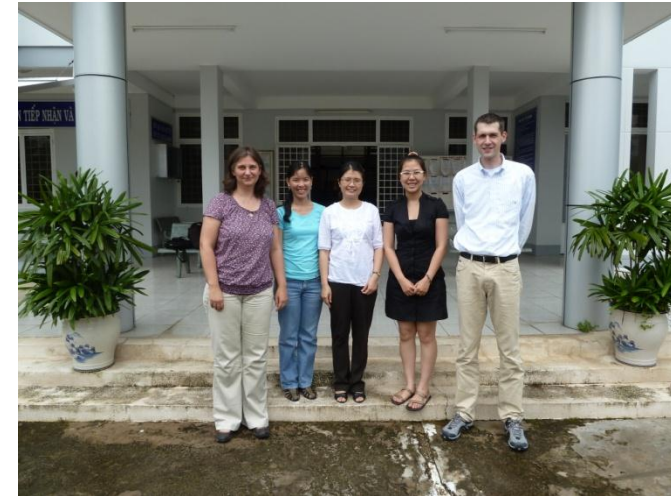


Third stage

Development of GIS risk assessment maps

Meeting and Interview at authority level

- *Center for Environment and Natural Resource Monitoring Can Tho*
- *Center for Environment and Natural Resource Monitoring An Giang*
- *Center for Environment and Natural Resource Monitoring Tra Vinh*



➤ Main criteria for the selection:

- Representative for land use, soil types, cropping systems, irrigation management
- Local people do consume surface water for daily activities

An Giang and Can Tho are
suitable for research purposes



Table 1. Interviewed sites for pesticide use and pollution

Province	Location	No. interviews	Land use	Soil type	Irrigation
Can Tho	O Mon	20	Triple paddy rice crop, fruit tree	Alluvial soil	None closed dyke system
	Co Do	20	Double paddy rice crop	Slight acid sulfate soil	None closed dyke system
	Thoi Lai	19	Triple paddy rice crop	Slight acid sulfate soil	None closed dyke system
An Giang	Thoai Son	20	Triple paddy rice crop	Slight acid sulfate soil	Closed dyke system

Table 2. Interviewed sites for antibiotic use and pollution

Province	Location	No. interviews	Land use	Soil type	Irrigation
Can Tho	Co Do	10	Hatchery fish, pig farm	Slight acid sulfate soil	None closed dyke system
An Giang	Chau Phu	7	Mature catfish (Pangasius)	Alluvial soil	Closed dyke system

Main outcomes from field survey

Water consumption

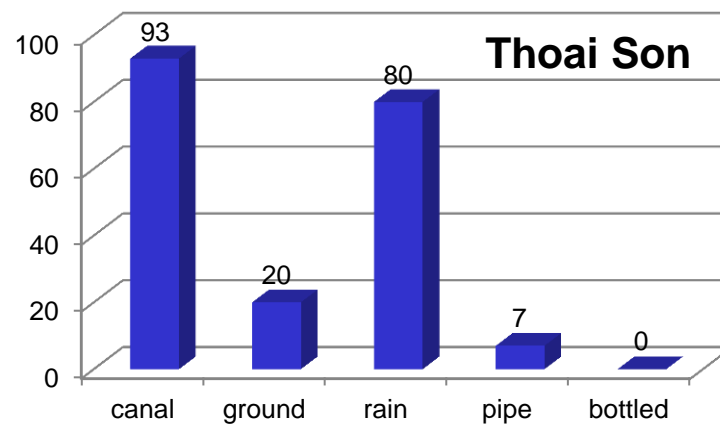
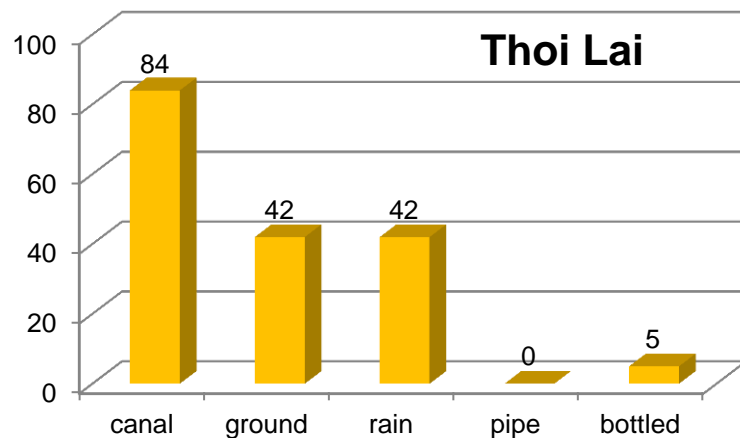
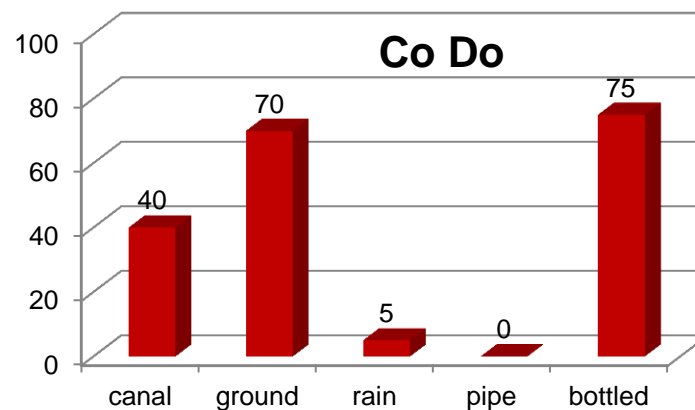
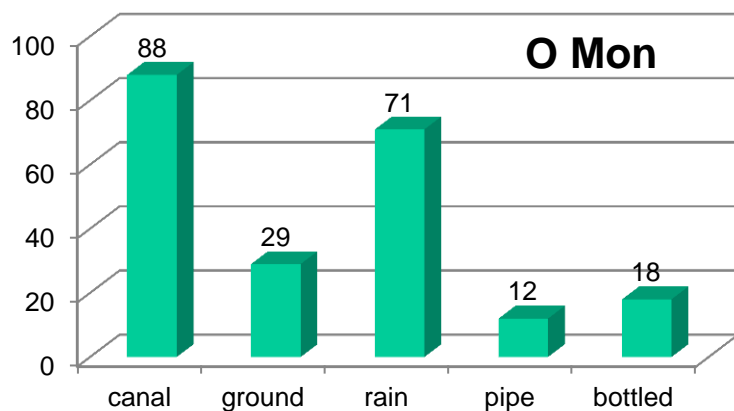
	Co Do	O Mon	Thoi Lai	Thoai Son
#. household interviews	20	20	19	20
Daily activities	Ground-	Surface-	Surface-	Surface-
Do use surface water	40%	88%	84%	93%
Surface water using for drinking	25%	47%	63%	67%
Average daily water intake (L)	2	2	1,8	2,2
Common tank size (L) ⁽¹⁾	Small	Small	Medium	Large

(1): Tank size: small: < 300 L, medium: < 1000 L; Large: > 2000 L

➤ >40% respondents consider the surface water quality **unsafe for drinking purpose**

➤ Common treatment before drinking: deposit by alum then boil

Using percentage of different water resources of interviewed households





Cropping patterns

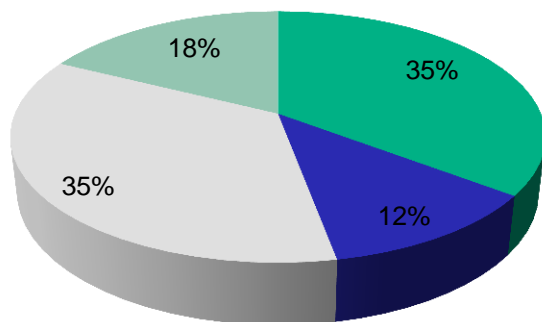
Season	Co Do	O Mon	Thoi Lai	Thoai Son
Winter - Spring	Oct – Jan	Oct – Jan	Oct – Jan	Nov - Feb
Spring - Autumn	Feb – May Mar – Jun	Feb – May	Feb – May Mar – Jun	Mar – Jun Apr – Jul
Autumn - Winter		May – Aug	May – Aug	Jul - Oct
Ave. farm size (ha)	2,38	0,99	0,84	2,55
Irrigation scheme (time per season)	2 - 3	3 – 4	5 - 7	3 - 5

- ❖ Fruit cultivars in O Mon: pomelo, mangosten, durian, etc
- Semi-specializing
- Year round cultivation

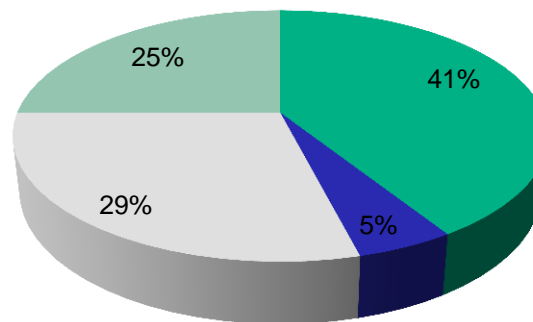
Pesticide application

	O Mon	Co Do	Thoi Lai	Thoi Son
Ave. pesticide spraying frequency per season (times)	4	5	6	8
Ave. number of pesticides using	6	5	7	12
Ave. pesticide dose applying per ha (kg, L)	1,7	1,3	1,6	1,5
Labor protection clothes	Inadequate	Inadequate	Inadequate	Inadequate
Direct expose to pesticides when spraying	100%	100%	100%	100%
Improper pesticide storage	82%	65%	95%	87%
Improper pesticide disposal	90%	100%	100%	100%
Overdose applying	65%	60%	80%	80%

O Mon

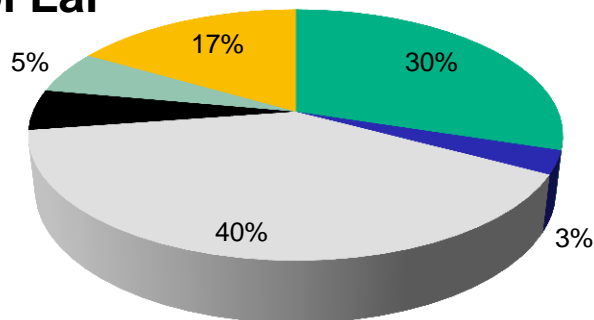


Co Do

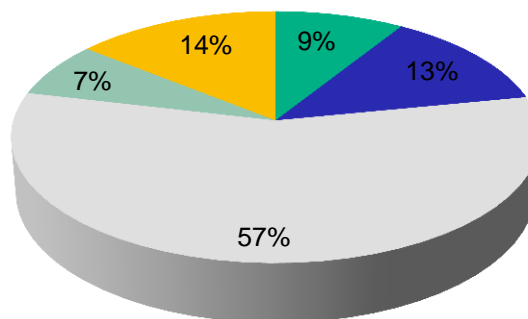


Respondent's
perception
about pesticide
disadvantage

Thoi Lai



Thoai Son



- Skin diseases
- Cancer
- Respiratory diseases
- No idea
- No disadvantage
- Other

Aquaculture and Antibiotic use

	Co Do	Chau Phu
Ave. farm size (ha)	2,9	1,7
Ave. production (ton/pond)		
- Mature fish		112,5
- Hatchery	4,3	
Density (fishes/pond)	2.922.000	260.000
Apply water treatment before discharge	40%	14%
Water exchange frequency (days)	35 (for hatchery farm)	Everyday
Antibiotic using technique	Instruction on label, Antibiotic retailers	Aquaculture extensionist
Ave. amount of antibiotic using	2	3
Overdose using	40%	n.i



Empty container
on the field



Pesticides
indoor



Direct
feeding



Antibiotic
no label

Selected pesticides and antibiotics

- Cooperating with La Thi Nga's survey, **16 most popular active ingredients of pesticides** have been selected from nearly 100 commercial products using in the studied sites
- Antibiotic analytical conditions play an important role in the selection of studied compounds \longrightarrow **5 common use antibiotics** classified from 4 different classes have been selected



Pesticide list

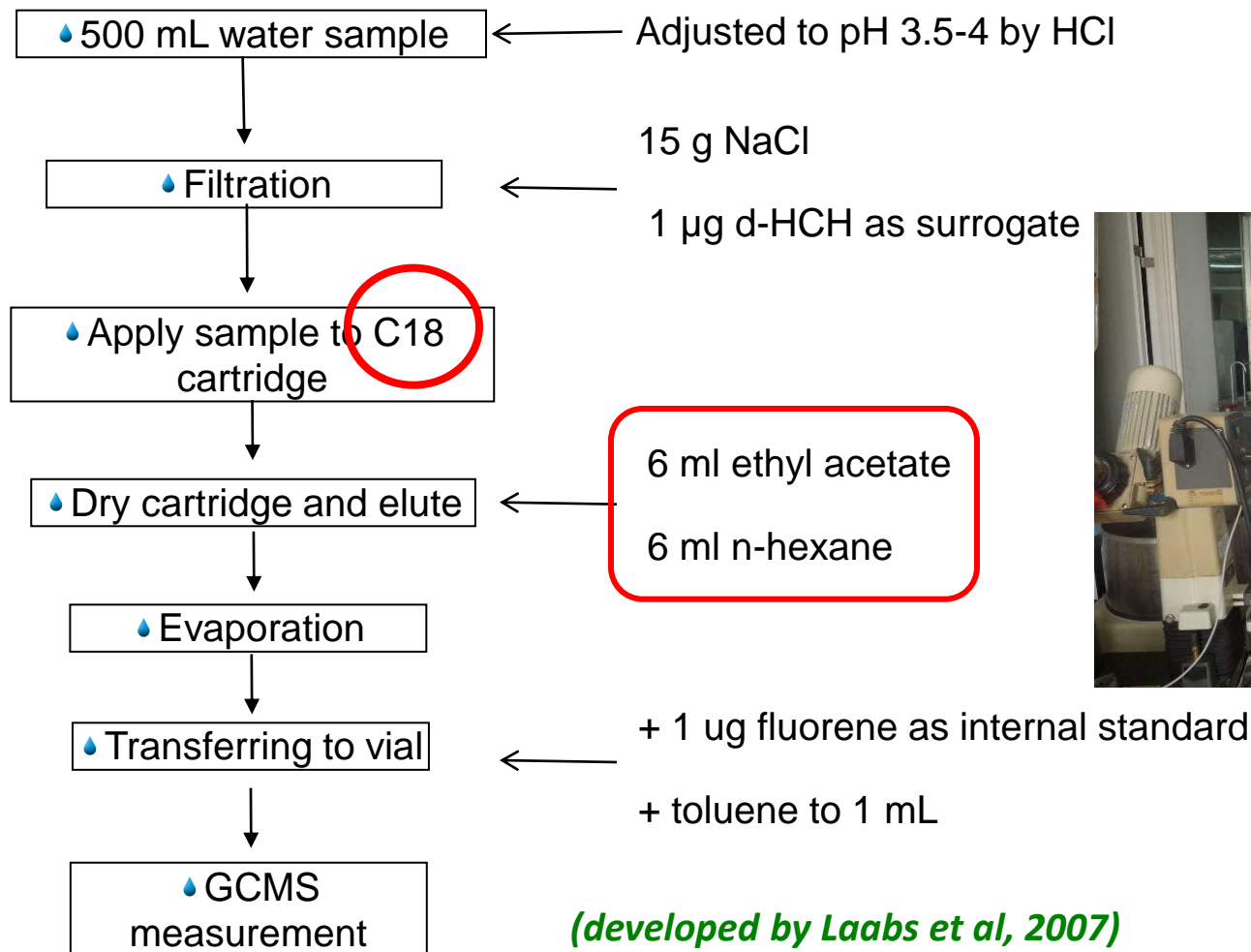
	Classification	Chemical group	WHO toxic classification	Using (%)
Fenoxaprop-P-ethyl	Herbicide	Benzoxazole	III	22,5
Butachlor	Herbicide	Chloroacetanilide	III	16,9
Pretilachlor	Herbicide	Chloroacetanilide	U	60,6
Azoxystrobin	Fungicide	Strobilurin	III	16,9
Trifloxystrobin	Fungicide	Strobin	III	8,5
Hexaconazole	Fungicide	Azole	U	22,5
Isoprothiolane	Fungicide	Dithiolane	III	15,5
Difenoconazole	Fungicide	Azole	II	83,1
Propiconazole	Fungicide	Azole	II	54,9
Thiamethoxam	Fungicide, Insecticide	Neonicotinoid	III	29,6
Quinalphos	Insecticide	Organophosphorus	III	12,7
Cypermethrin	Insecticide	Pyrethroid	II	16,9
Fenobucarb	Insecticide	Carbamate	II	23,9
Fipronil	Insecticide	Pyrazole	II	42,3

Antibiotic list

	Using (%)	Chemical group
Amoxicillin	17,6	Penicillins
Ampiciline	11,8	Penicillins
Cephalexin Monohydrate	5,9	Penicillins
Chloramphenicol	5,9	Phenicol
Florfenicol	29,4	Phenicol
Kanamycin sulfate	5,9	Aminoglycosides
Spectinomycine	11,8	Aminoglycosides
Sulfadimethoxin	5,9	Sulfonamides
Sulfamethoxazole	41,2	Sulfonamides
Oxytetracycline	41,2	Tetracyclines
Doxycycline	29,4	Tetracyclines
Enrofloxacin	47,1	Fluoroquinolones
Trimethoprim	11,8	

Antibiotic analytical methods would be developed in February 2012

Multi-residue pesticide analytical method



💧 Method validation

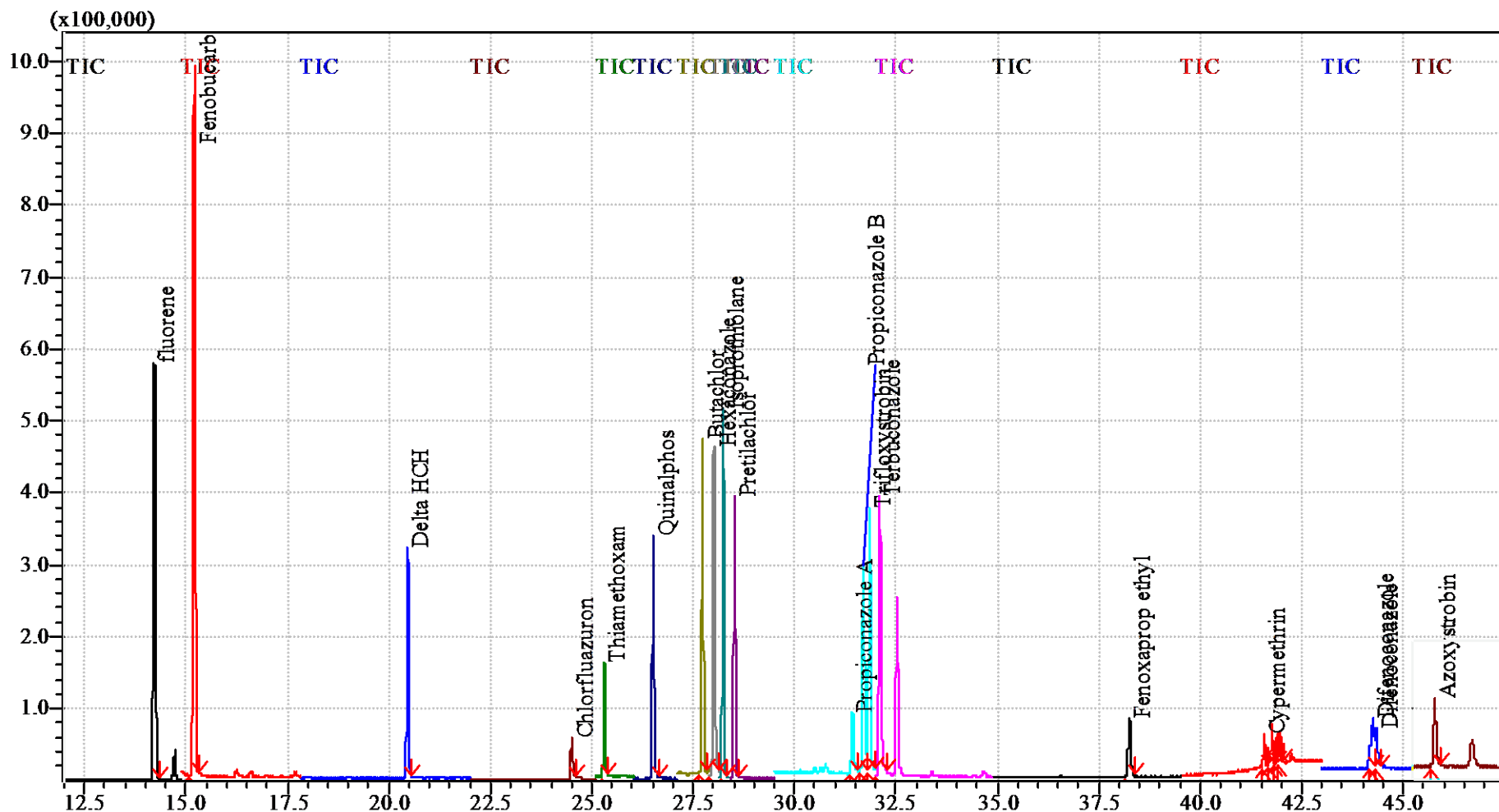
GC temperature program (Shimadzu GCMS QP 2010):

No	Rate	Final temp °C	Hold time
-		80	2.00
1	10.00	150	5.00
2	5.00	230	0.00
3	2.00	250	0.00
4	20.00	280	10.00
Post temp: 300°C			
Post time: 10.00 min			

- Recoveries of analytical pesticide:
 - from 60,1% to 117,0%
 - RSDs from 4,1% to 24,75%

- Limit of detection (LOD): from 3 ($\pm 0,9$) to 30 ($\pm 12,1$) ng/L (n = 7)
- Method detection limit (MDL): from 3 ($\pm 0,5$) to 40 ($\pm 12,9$) ng/L (n = 3)

Chromatogram at concentration 500 ng/mL

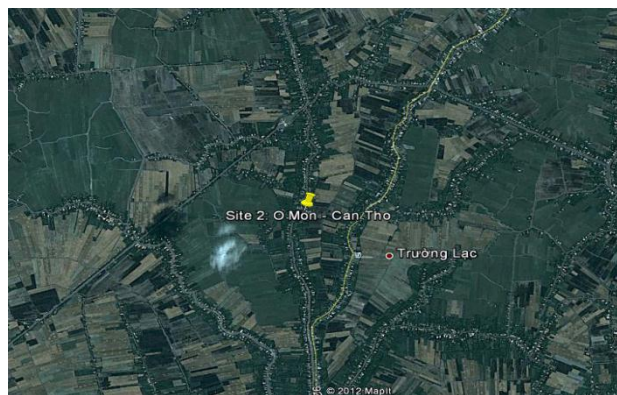


Monitoring sites

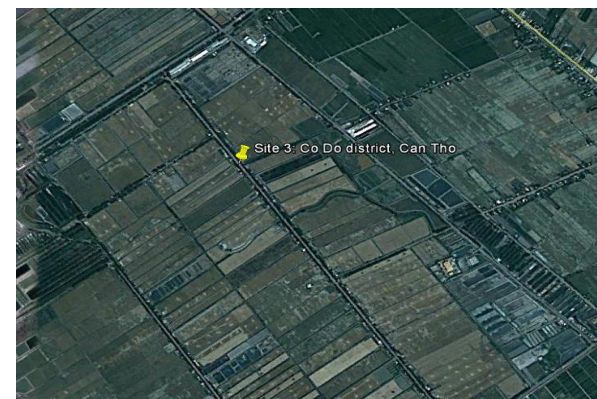
Thoi Lai district, Can Tho



O Mon district, Can Tho

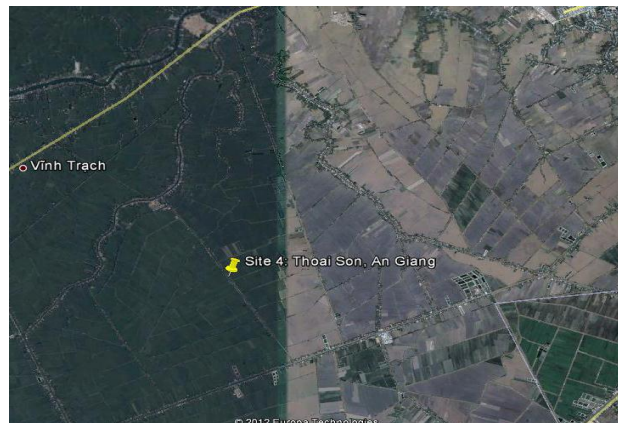


Co Do district, Can Tho

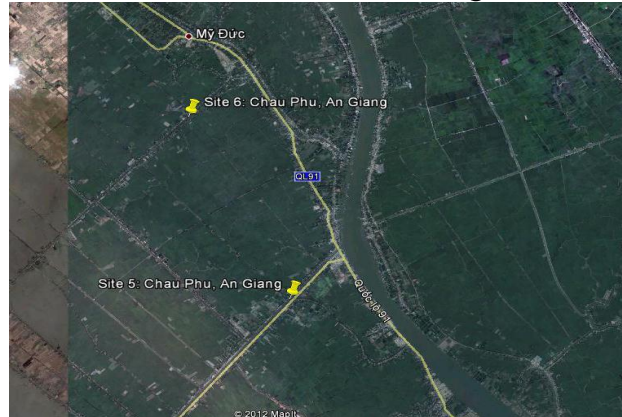


- Sample collection and measurement of general environmental parameters

Thoai Son district, An Giang



Chau Phu district, An Giang



💧 Monitoring campaign

• Samples would be collected from beginning of February 2012 to December 2012

	Target	Frequency	Sample quantity			
			Surface -	Ground-	Pipe -	Bottled -
O Mon	Pesticides	Every month	3			
		Every 3 months		2	1	1
Thoi Lai	Pesticides	Every month	3			
		Every 3 months		2	1	1
Co Do	Pesticides	& Every month	3x3			
	Antibiotics	Every 3 months		2x3	1x3	1x3
Thoai Son	Pesticides	Every month	3			
		Every 3 months		2	1	1
Chau Phu	Antibiotics	Every month	3x2			
		Every 3 months		4	2	2
Industrial zone	Pesticides antibiotics	& Every month	1x3			
4 water supply stations	Pesticide antibiotics	& Every month	1x4x3			

• Next steps to reach the 3rd stage

1. Carry out more interviews at studied sites
2. Collect the GIS maps, integrate analyzed data associate with up-scaling data
3. Set up experiment for antibiotic fate study

💧 Thank you!

