"Current Research on Environmental Risks of Pesticides in Ethiopia"

Paper presented on Baseline Study Startup Workshop in Deberzait, 3-7 October 2011

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Presentation Out line

1. **Introduction**
   - **Environment**
   - **Pesticide**
     - **Risk**
2. **Government Efforts to words sustainable Development**
   - Constitution Rights
   - Establishments of EPA
   - Development of Policy
     - Development of Environmental Legislation
     - Effluent and Emission standard for industries
     - Follow up Implementation of global environment convention
3. **Assessment report on Environmental Risks of pesticides in Ethiopia**
4. Causes for Pesticide Risk in Ethiopia
5. **Approaches to reduce pesticide risk**
6. **The difficult not to have researched data?**
7. **Concluding Remarks**
8. **Recommendation**

1.Introduction

Environment

- **The environment is the basis for achieving prosperity, stability and equity is sustained .**
- Renewable natural resources, i.e. land, water, forests and trees as well as other forms of Biodiversity, have **deteriorated** to a low level of productivity? Why?

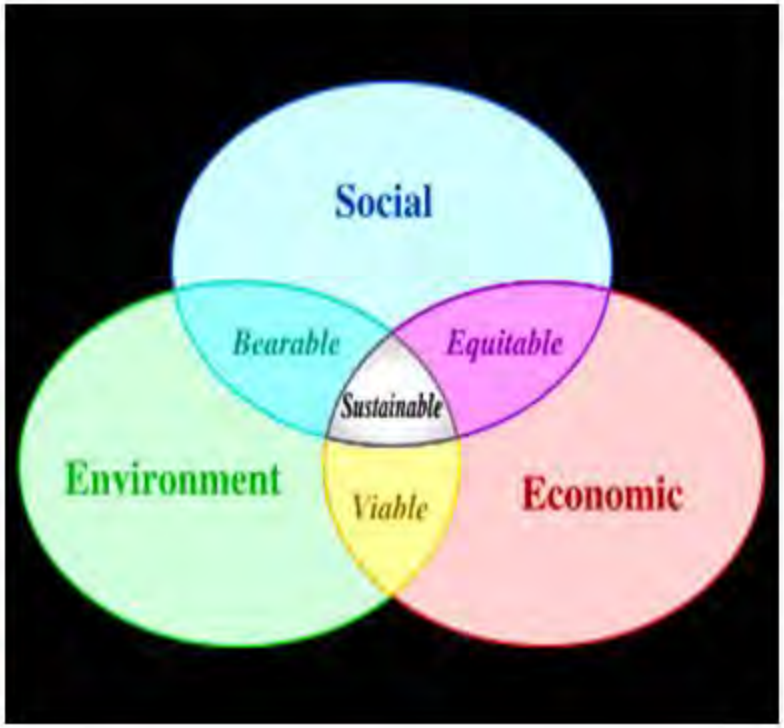
1.Introduction…

Sustainable Development

- It is the development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

"Thinking about the future requires thinking in alternatives"

- The concept is based on the realization that the well-being of human society is closely related to the well-being of natural ecosystems.



- **The definition Integrate :**
  Economic,
  Social and
  Environmental dimensions

***Ecological** sustainability +Social and Economic development =S.D*

1.Introduction...

Play an important role in- Agriculture and Public health sector.

Pesticide-Pesticide is a Hazardous Chemical

Generally the benefits of pesticide use are **overestimated** and the risks (health and environmental costs) of pesticide use are **underestimated.** **Why?**

According to the Environmental Pro. No 300/2002 **Hazardous Waste" means any unwanted material that is believed to be deleterious to Human Safety or Health or the Environment**

Ignitable

Reactive

Toxic

Corrosive

1.Introduction…

Hazardous wastes (specified in Annex I)

- Explosive
- Filmable
- Poisonous
- Infectious
- Corrosive
- Toxic
- Ecotoxic

1.Introduction...

Risk is the likely hood that an adverse health and **environmental effects** will result from an exposure to the inherent toxic effects of a chemical i,e **Pesticide**

Pesticide has risks On -

- **Human health**
- **Agricultural production**
  - ✓ insufficient effect on target organism (effect on production).
  - ✓ Development of resistance
  - ✓ Toxicity to crop plants

1.Introduction...

3.Environment

- Contamination of water resources (ground and surface water affecting aquatic and soil ecology)
- Adverse effects/risks on biodiversity, natural pest control mechanisms, pollinators, etc.) and wildlife

➢ Trade

- Market access constraints related to maximum residue levels (MRLs)

2.Government Efforts to words Sustainable Development

The Federal Constitution

- The Federal Constitution of 1995 sets out important articles related to **Development and Environmental** rights;
- Article 43 discusses the right to ***Development***, while
- Article 44 highlights about ***Environmental*** rights as follows:
  - ✓ All persons have the right to live a clean healthy environment .(article 44.1)

2Government Efforts to words Sustainable Development cont'

- The Environmental Protection Authority was established proclamation No 9/1995.
- Re-established with the proclamation No 295/2002
- **The objective** of the authority is :-to formulate policies, strategies, laws and standards , which foster social and economic development in a manner that enhance ***the welfare of humans and safety of the environment sustainable***, and spearhead in ensuring the effectiveness of the process of their implementation.

ENVIRONMENTAL POLICY OF ETHIOPIA

SECTORAL ENVIRONMENTAL POLICIES

- Soil Husbandry and Sustainable Agriculture
- Forest, Woodland and Tree Resources
- Genetic, Species and Ecosystem Biodiversity
- Water Resources
- Energy Resource
- Mineral Resources
- Human Settlement, Urban Environment and Environmental Health
- Control of Hazardous Materials and Pollution From Industrial Waste
- Atmospheric Pollution and Climate Change
- Cultural and Natural Heritage

CROSS-SECTORAL ENVIRONMENT POLICIES

- Population and the Environment
- Community Participation and the Environment
- Tenure and Access Rights to Land and Natural Resources
- Land Use Plan
- Social and Gender Issues
- Environmental Economics
- Environmental Information System
- Environmental Research
- Environmental Impact Assessment (EIA)
- Environmental Education and Awareness

2.Government Efforts to words sustainable Development ...

1. Issued Lows and Regulations

1. Issued effluent and emission standard for industries
   - ✓ **Issued pesticide manufacturing Limit Values for Discharges to Water and Limit Values for Emissions to Air**
   - ✓ **Pesticide formulation Limit Values for Discharges to Water and Limit Values for Emissions to Air**
2. Fallow up the implementation of signed and ratified International convention

Lows / Regulations

3. EIA proclamation No 299/2002

1) Without authorization from the Authority or from the relevant regional environmental agency, **no person shall commence implementation of any project that requires environmental impact assessment**

Considerations to Determine Impact

4) **The impact of a project shall be assessed on the basis** of the **size, location, nature, cumulative effect with other concurrent impacts or phenomena, trans regional effect, duration, reversibility or irreversibility or other related effects of the project**

Lows and Regulations…

Part two Environmental Pollution Control Proclamation NO. 300/2002- It sets rules on :

- ✓ **Control of pollution-** article 3.1 No person shall pollute or cause any other person to pollute the environment by violating the relevant environmental standard.
- ✓ ***Management of hazardous waste ,chemical*** and radioactive substances, (article 4),
- ✓ ***Environmental standards (***article 6 .1)Sectors that require environmental standard

Not to pollute the environment

Lows and Regulations…

Management of hazardous waste ,chemical and radioactive substances, (article 4),

1) **The generation,** keeping, storage, transportation, treatment or disposal of any hazardous waste without **a permit** from the Authority or the relevant regional environmental agency is prohibited.
2) **Any person engaged in the collection, recycling, transportation, treatment or disposal of any hazardous waste shall take appropriate precaution to prevent any damage to the environment or to human health or well-being.**
4) **Importation,** preparation, keeping, distribution, storage, transportation or use of a chemical categorized as hazardous or of restricted use, shall be subject to a **permit** from the Authority or the relevant regional environmental agency or from any other competent agency.
5) Any person engaged in the preparation, production, manufacturing or transportation or in trading in any hazardous or restricted chemical may ensure that the chemical is registered, packed and labeled as per the applicable standards.

Source Pro,No300/2000

Note without a permit from the Authority or the relevant regional environmental agency to, generate ,store ,transport dispose… is prohibited

2.1Ratified convention related to pesticides

NO	Multilateral Environmental Agreements to which Ethiopia is a party	Adoption	Entry into Force	Ethiopia's ratification/accession/ acceptante etc.
	Stockholm Convention on Persistent Organic Substances	Signature period (23 May 2001-22 May 2002)	17 may 2004	Signed - (17 May 2002) Ratified - (2 July 2002)Proc.No.279/2002
	Rotterdam Convention on the Prior Informed Consent	10 Sept.1998		Ratified - 2 July 2002(Proc.No. 278/2002
	Basel convention			
	Bamako			

2.2PESTICIDE MANUFACTURING Limit Values for Discharges to Water

Parameter	Limit Value
Temperature	40 °C
pH	6 – 9
BOD_5 at 20°C	90% removal or 50 mg/l, whichever is less
COD	75% removal or 200 mg/l, whichever is less
Total phosphorus (as P)	90% removal or 5 mg/l, whichever is less
Total nitrogen (as N)	90% removal or 30 mg/l, whichever is less
Suspended solids	20 mg/l
Oils, fats, and greases	15 mg/l
Chromium (as total Cr)	1 mg/l
Chromium (as Cr VI)	0.1 mg/l
Phenols	1 mg/l
Copper (as Cu)	1 mg/l
Mercury (as Hg)	0.01 mg/l
Active ingredient (each)	0.05 mg/l

Limit Values for Emissions to Air

Parameter	Limit value (mg/Nm^3)
Total particulates	10
Volatile organic carbon compounds	50
Hydrogen chloride (as HCl)	20
Chlorine (or chloride)	5

PESTICIDE FORMULATION Limit Values for Discharges to Water

Parameter	Limit Value
Temperature	40 °C
pH	6 – 9
COD	75% removal or 250 mg/l, whichever is less
Total phosphorus (as P)	90% removal or 5 mg/l, whichever is less
Total nitrogen (as N)	90% removal or 30 mg/l, whichever is less
Suspended solids	30 mg/l
Oils, fats, and greases	15 mg/l
AOX	2 mg/l
Organochlorines	0.1 mg/l
Nitroorganics	0.1 mg/l
Pyrethroids	0.1 mg/l
Phenoxy compounds	0.1 mg/l

PESTICIDE FORMULATION Limit Values for Discharges to Water Cont'

Active ingredient	0.05 mg/l
Arsenic (as As)	0.2 mg/l
Chromium (as total Cr)	1 mg/l
Chromium (as Cr VI)	0.1 mg/l
Phenols	1mg/l
Copper (as Cu)	2 mg/l
Mercury (as Hg)	0.01 mg/l

Limit Values for Emissions to Air

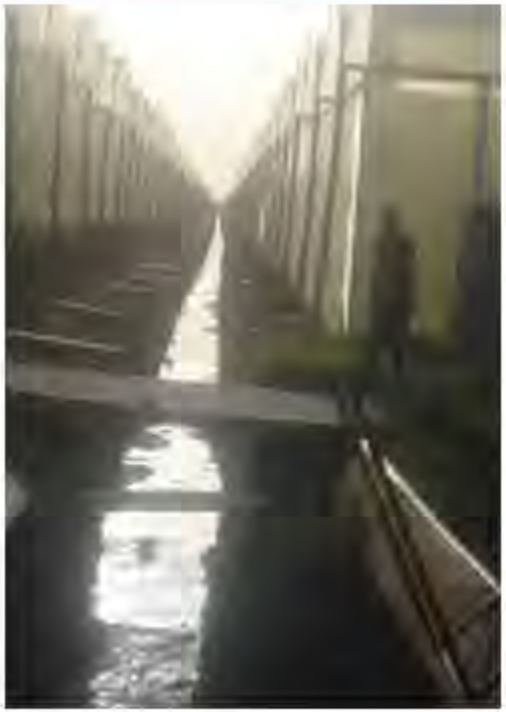
Parameter	Limit value (mg/Nm^3)
Total Particulates	10
Volatile organic carbon compounds	50
Hydrogen chloride (as HCl)	20
Chlorine (or chloride)	5

3. Assessment on Environmental Risks of pesticides in Ethiopia

3. 1.Discharge of wastes to river

2010 field verification photo

- The use of agro-chemicals has been growing due to the expansion of large scale irrigation projects like Flower Farm.
- According CRVWG report, the study revealed that flower farms at Ziway do not have adequate means of waste management system
- As a result, it has been observed that disposals of both liquid and solid wastes are being discharged in to the mouth of Lake Ziway see picture
- The pesticide residue analysis result for water and soil samples show that the environment is being polluted due to the presence of agrochemicals more than 50% of the detected pesticide are above the permissible limit set by US EPA,WHO(*CRV WG report).*



3.2 Assessment on Environmental Risks of pesticides in Ethiopia cont'

2.Aerial spraying of pesticide

- **For example, It is clear that with the pesticides spraying on cotton, livestock and other crops, the unused pesticide will definitely find its way into the Awash River.**
- **This was evident from the deaths of fish, alligators and hippos due to poisoning.(SEA,2008)**
- **Aerial spraying has caused heavy loss on honey been which are the important sources of income of small farmers .Loss in one wereda in Tigray alone during the 1994 campaign are estimated to be in excess of 160,000birr** (Source EACA)

Aerial sprays with aircraft at MAADE (Source: Girma & Awulachew, 2007)

3.3.Pesticide Poisoning Incidents on Humans, Livestock and Wild Games in the Amibara Wereda

S.N	Location	Incident	Targeted	Number	Remark
1	**Bedulayle**	**Death**	**Livestock**	**20-30/year**	**Spraying by MAADE**
3	MAADE	Poisoning	Spray man	1/year	Transferred to other jobs
4	MAADE	Poisoning	Pilot	1	Spray Aircraft pilot
5	Amibara	Death	Malaria technicians	6	DDT spray
6	Endido	Poisoning	CAHWs	2	Loss of appetite
7	Melkasedi Farm	Poisoning	Spray men	2/season	
8	**Melkaworer**	**Death**	**Fish, alligator, hippos**	**Not known**	**Reason not identified**

Source SEA, 2008

Pesticide Poisoning Incidents on Livestock and Humans at the Former Tendaho cotton

S.N	Location	Incident	Cause	Number	Remark
1	Tendaho cotton	Death	Prolonged exposure to pesticides	2 people	Work in crop protection
2	Tendaho cotton	Poisoning	Welding empty pesticide containers	2 people	
3	Tendaho cotton	Death	Prolonged exposure to fungicide	1 person	Work in seed treatment plant
4	Tendaho cotton	Poisoning	Empty pest container used for cooking	7 people	
5	Tendaho cotton	Death	Livestock kept overnight at air fields	30 goats	
6	Tendaho cotton	Poisoning	Drinking water from canal after sprays	2 people	Women and her kid
7	Tendaho cotton	Poisoning (sever skin lesions)	Collected grasses and washed her body on canals after spray	1 person	Women
8	Tendaho cotton	Death	Canal water used for livestock drinking	20 cattle	Tendaho compensated
9	Tendaho cotton	Death	Canal water used for livestock drinking	300 goats	Tendaho compensated

Source SEA.2008

3. Assessment on Environmental Risks of POPs pesticides in Ethiopia Cont'

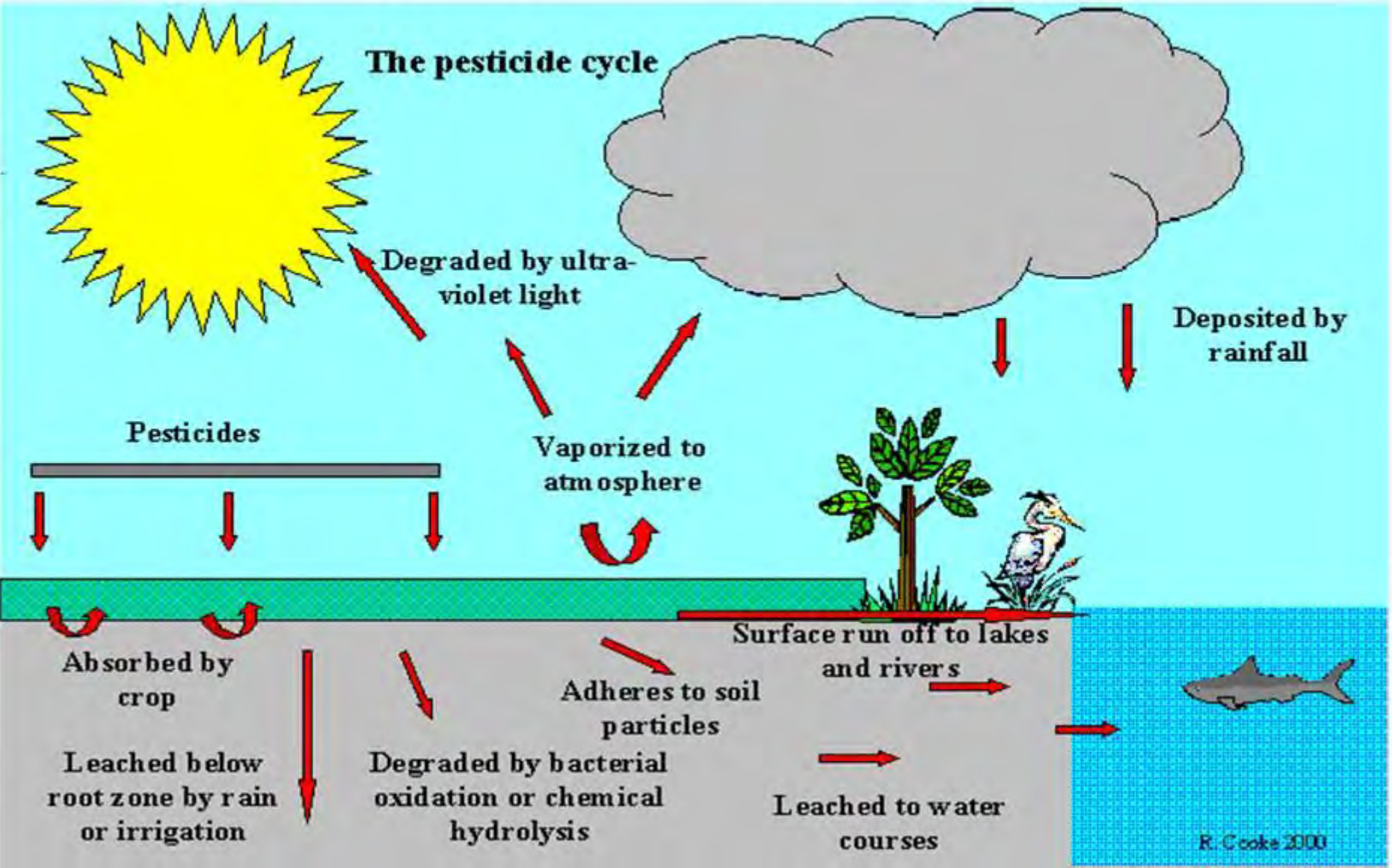
3.3POPs/NIP project, commenced in Feb. 2004,

- **Five task teams were establishing to carry out preliminary inventory and assessment on:-**
  - **POPs chemicals**
  - **Contaminated sites**
  - **Health impacts of POPs**
  - **Legal and institutional infractors including on assessment of gaps in chemical management respectively.**
  - **The work completed in April/May, 2005**

The Stockholm Convention on Persistent Organic Pollutants (POPs)

- POPs have the following common properties:
  - Persist in the environment for decades
  - Bio-accumulate in fatty tissue
  - Bio-magnify through food chain
  - Toxic
  - Long-range transport

Pesticides Lifecycle (POPs)



Criteria to identify contaminated site

e.gOromia, Upper Awash Agro-Industry, Awara Melka Fruit Farm

Contact Person: Ato Tekeste G/Kidan

1.GPS Reading:

1. Zone: 37P
2. X coordinate: 0606271
3. Y coordinate: 100173
4. Elevation: 780

2.Site Information

1. Site Name: Burial site
2. Site Use: None
    a. Now: Open Land
    b. Before: Obsolete pesticide store

3.Observed Site Problems: Burial,

4.Contamination is due to: Disposal Practice

5.Types of POPs involved: Close to 4000 litres of different pesticides was buried amongst it 400 litres of DDT 25% EC.

Criteria to identify contaminated site

6.Distance of contaminated site from

1.Water Points: Irrigation canal runs adjacent [nearly 2 - 3 meters] to the burial site. It's very hard to estimate the burial site depth

2.River/Spring/Creek: No threat to rivers

3.Community: Afar pastoralists frequently visit this area.

7.Observed off-site effects

1.Physical: No obvious smell

2.Socio Economic: Irrigation canals goes close to the demolished store and burial site

3.–Health and Environmental effects: Underground soil and water point may be damaged.

8.Severity and extent of the problem: Highly Severe

9,.Attempts made to contain the problem: None

10. Additional Notes:

1. 20*20 area is suspected as contaminated and within these 4*4 meters with a depth of 4 - 5 meters is the burial site.

2. Previously there was a store on the location [at the edge of the air strip] that served for store to stock pesticides for aerial spray. However, the store is now demolished leaving chemical stains and smell on its floor. And a burial site was bulldozed on the side of the store close to 4000 litres of chemicals [of which 400 is DDT] was buried.

3. Buried chemicals are: DDT 25%EC 400 lts (2 barrels), Ekatin 24% ULV – 1400 lt (7 barrels), Roger 40%ULV – 400 lt (two barrels), Ethion 50% EC – 400 lts (2 barrels), Tetradefor 8% EC – 600 lts (3 barrels), Guthathion – 200 lts (one barrel), Fetrithion Combi – 425 kgs, Tedion - 800 lts (4 barrels), Mancozeb – 25 kgs, Torbidan 20% EC – 200 lts (one barrel

Identified Contamination Sites in each Region

Regional Administrations	No. of Identified Contaminated Sites
Addis Ababa	7
Afar	7
Amhara	36
Benishangul Gumuz	4
Dire Dawa	6
Gambella	3
Harari	2
Oromia	102
SNNPR	41
Tigray	12
Total	220

Source: Contaminated Sites survey 2004

Table 1: Types of Annex A POPs-Pesticides and Quantity by Region (kg/Lt)

Region	Aldrin	Dieldrin	Heptachlor	Chlordane	Total Obsolete Annex A pesticides
Oromia	1057.33	2217	485	172	3,931.33
SNNP	462.75	NA	8	50	520.75
Gambella	NA	NA	NA	NA	NA
Somali	NA	NA	NA	NA	NA
Benishangul Gumuz	NA	NA	NA	NA	NA
DireDawa Administration	NA	NA	NA	NA	NA
Afar	NA	NA	6410	NA	6410
Amhara	589	540	140	2369	3638
Tigray	50	65	NA	NA	115
Total	**2159**	**2822**	**7043**	**2591**	**14,615.08**

Inventory POPs contaminated sites

- **A total of 220 contaminated site were identified in all 9 regional state including Addis Ababa and Diredawa (April 2005).**
  - Of which 23 were burials,
  - 137 were contaminated stores,
    - **41 site/stores are contaminated stores where the contaminants have spilled out and**
    - **19 are open fields/sites that are contaminated due to poor storage and/or handling of chemicals.**
- As far as the types of contaminants is concerned
  - **44 are by both POPs and Non-POP chemicals [mixed],**
  - **79 are by POPs only,**
  - **21 by unknown types of chemicals and**
  - **80 by Non POPs only**

Inventory results Annex A POPs

- According to the four types of Annex A POPs were found, namely, Aldrin, dieldrin, heptachlor, chlordane, total amount **14,615.08 kg/Lt**)
- Not include A.A during of the preliminary inventory A.A focus pesticides general.

Assessment with respect to Annex B chemicals DDT

- According to the inventory conducted on POPs pesticides and other pesticides, both active and obsolute **DDT** were found in **stores/sites160,573 kg/Lt in store, 720 kg/Lt in sites.**

Risk associated with DDT

- Impacts that transmitted along the food chains, and bio-accumulate and bio magnified in food products;
- The death fish and other aquatic life it also have other ecological impacts;
- DDT- thoroughly undermine the productivity of the soil over time by destroying the microorganisms which play an active role in soil formation and transformation processes.(Persist in environment 10-15)

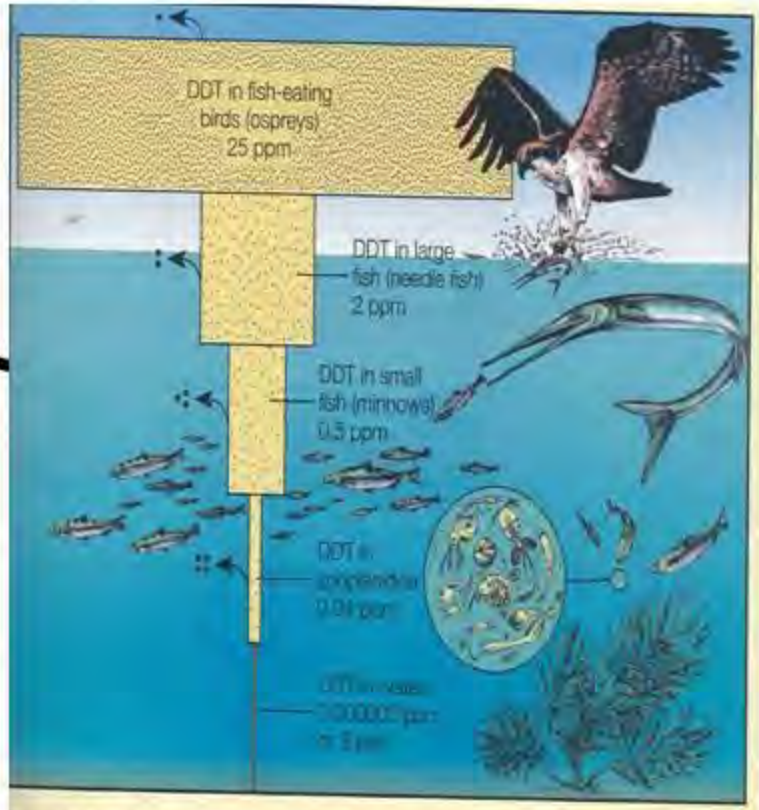


Figure 16-22 DDT concentrations in the fatty tissues of organisms were biologically amplified about 10 million times in this food chain of an estuary near Long Island Sound. Dots represent DDT, and arrows show small losses of DDT through respiration and excretion.

3.4 Location of pesticide formulation

- There is one local pesticide formulation plant in Adami Tulu.. The plant has a capacity to formulate 1500 tons of dust and the same quantity liquid formulations every year.
- Major pesticide formulated include, Malation, (Ethiolation 5% Dust and Ethiolathion50%EC), Endosulfan (Ethiosulfan 25% ULV), Diazinon (Ethiozinone 60% EC), Fenithrothion (Ethiothrothion 50% EC)and DDT. The plant imports active ingredients and solvents from foreign countries, mostly from Italy and Israel.
  - **Built near Environmental sensitive area**
  - **DDT was produced for control of Malaria.**

3.5Facts on DDT use in Ethiopia

See photo: Safe Environment Group

- ***Hadera Gebre Medhin reports on a fact-finding survey in Ethiopia to see whether DDT is being used according to WHO guidelines.***

- **The researcher found DDT on sale in ordinary shops in three areas visited. The unauthorized packaging carried no labels, instruction or warnings. SeePhoto: Safe Environment Group**

3.5Facts on DDT use in Ethiopia …

- Misuse of DDT by peasant farmers, who used it for **treating crops** as well as for **home remedies for household pests**. (SEG,2001)
- The result of the study in Ziway and Arsi Negele, however, showed that 121 (about 29%) of the 422 farmers **use DDT for agricultural pest control.** (source Tadesse & Asferachew oct ,2008)
- In a number of sites, those with access to DDT (spray men, guards and others) had been caught **stealing DDT for private sale**
- Stores in Gambella town had been broken into and looted several times, most recently in 2002 during the spraying period, when **40kg of DDT disappeared.**
- Regional authorities and malaria experts claim to have instituted a system to prevent DDT leakage, and have recovered some stolen DDT.

3.5Facts on DDT use in Ethiopia …

- DDT was found repacked in small plastic bags on sale in ordinary shops in three areas. Samples of insecticides identified as DDT were freely bought in an open market and in shops in
  - Awassa, Adua and Bahir Dar.
  - In several areas, farmers confirmed that they often use DDT on their crops.
  - In the Southern region farmers described how they usually prepare a mixture of DDT and malathion to treat maize and sorghum against storage pests and also on the narcotic shrub qat.
  - Dire Dawa farmers recounted how they used to chew qat that had been sprayed with DDT

Note from all reported case and assessment report I concluded that DDT has more risk than other pesticides

4.Causes for Pesticide Risk in Ethiopia

- Improper management –ie poor storage ,transport
- Less awareness on pesticide hazard
- Less focus on alternatives(IPM,IVM strategies)
- No chain of incidence reporting and monitoring system
- Unable to conduct pesticide residue analysis(No accredited laboratory
- No data base
- Smuggling and Selling unknown chemical
- Less **involvement** in research(Why???)

Major causes cont'd…

- **Poor Storage and Handling**
- **Pesticide/chemicals store together with food items**
- ***Accumulation- Obsolete pesticide* 3000 tons Ethiopia (the largest accumulation in Africa)**

Pesticides stores used by the dubti woreda

Causes for Pesticide Risk in Ethiopia …

Survey in Ethiopia (ESA, 2006) showed

- 91% of farmers prepare pesticides near water resources,
- 61% washed their pesticide sprayers and other equipment on the farm field)

Causes for Pesticide Risk in Ethiopia …

Less Awareness

Pesticides (malathion) being stored in a local commodity shop with other household goods

What has been done?

Disposal of Obsolete Pesticide

Completion of nation wide re-inventory identified

- ✓ **2,800 tones obsolete pesticide stock over 940 sites**
- ✓ **100 tones heavily contaminated soil**
- ✓ **350 tones – empty dram, contaminated sprayer**

- ➢ **Ethiopia disposed in the first phase 1500 tones of obsolete pesticide**
- ➢ **Second phase 715 tones obsolete pesticide**
- ➢ **250 tones obsolete pesticide will be shipped with African stockpile project but not ship the contaminated soil.**

What has been done?....

Shell Ethiopia

- ✓ 58 barrel (2000 litter each) POPs Pesticide other chemical
- ✓ 659 sucks of contaminated soil which contains alderin, dieldrin, endrin of POPs pesticides.
- ✓ 37 container ready for export
- ✓ 13 containers already shipped.

Possible Solutions as Way forward

- Give training on basic principles of occupational health and safety to employees
- Media could play a role in disseminating programmes of awareness creation and sensitization of the public at large
- Use IPM and IVM strategy.
- Attitudinal change i.ePesticides are called "Medicines" not "Poisons"
- Attitudinal change Big companies
  - Shiny advertisements
    - Focus only on the sell

Possible Solutions as Way forward...

- To have acierated libratory to conducts research and monitoring
- Establish data base system

What should be done?

- Disclosing the reality at different levels using:
  - Researched evidences
  - Trainings
  - Workshops
  - Panel discussions
- Communication at different levels through
  - Radio
  - TV
  - News letters
  - Scientific journals
  - Leaflets, brochures and posters-using local languages

Networking among stakeholders

- Who are the stakeholders?
  - Governmental organizations
    - **MoARD, MoH, MoTI, MoLSA, QSAE, EPA, Customs**
  - Non-governmental organizations
    - **Working on Environment and Development**
  - Universities & Research Institutes
    - **For research evidences**
  - Private sector
    - **Pesticide companies**
    - **Environmental concerned citizens**
  - Grass roots representatives
    - **CBOs and Cooperatives**
  - International organizations
    - **Donors and development cooperations**

What is the difficult not to have researched data?

Difficulties Encountered not to have researched data

- **No accreted laboratory for residue analysis of pesticide**
- **Dissemination**-*Our experience shows that* most of the time the research results are not reaching all concerned parties
- **Resources**-Allocated research funds are inadequate
- **Sustainability**: lack of long term and sustained attention to specific theme of research,

Conclusion

The negative effects on human and environmental well being due to the chemical residues found in food items and in environment have not been thoroughly investigated/researched in Ethiopia.

From the assessment ,reported cases , as well as from my personal observation; poor chemical management risks human health and environment .

Recommendation

- **Pesticide is a hazardous chemical and has impact on environment if not properly managed.**
- **As the issue is a global, regional and national; it needs the collaboration and commitments of all stakeholders to:**
- **Use pesticide wisely not widely in order to prevent, manage and mitigate the risks and effects by giving due emphasis to specific condition**
- **Undertake the research and publicize findings**

- Thank you