VIET NAM: WAR’S LASTING LEGACY

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Viet Nam is located in southeastern Asia with total area of more than 330,000Km² and more than 3200km of sea coast. Three quarters of the country consists of mountains and hills.

Forest types:
- Mangrove forests,
- Melaleuca forests,
- Evergreen broadleaf forests,
- Forest on limestone,
- Deciduous forests and
- Bamboo forests.

*Forests in south of Vietnam cover of 60 - 70% before 1960 (10,300,000 ha)*
Viet Nam is recognized as one of the biodiversity centers in southeast of Asia with a high proportion of endemic species. Over 10,000 plant species, 1040 bird species, 265 animal species, (1000 species of large timber trees, 40 rare and valuable timber species, 1800 medicinal plants). Sao la (Pseudoryx nghetinhensis), is one of five new large mammals were discovered.
forests constitute an integral component of the land and water resources, Natural forests are a large existing carbon pool
and are vital to the 24 million people in various ethnic groups who are substantially dependent on forest resources for their livelihoods.
But natural forest and biodiversity has been degraded seriously by many reasons:

- Population expansion in forest areas
- Logging and harvesting of wood and non-wood products
- Forest fire
- Other causes: War
Chemical warfare (1961-1971)

Over all ecological zones from the 17th parallel that divided North and South Vietnam to the tip of South Vietnam at the Ca Mau Cape were effected of herbicides and defoliants.

Over 80 million litters herbicides

Three main types of chemicals:

Agent Blue (cacodylic acid),

Agent White (a mixture of 80% tri-isopropanol amine salt of 2,4-dichlorophenoxy acetic acid (2,4-D) and picloram),

Agent Orange (50-50 mixture of the n-butyl esters of 2,4-D and 2,4,5-T. Agent Orange)
HERBICIDE BUTYL ESTERS
50% 2,4-D and 50% 2,4,5-T
FSN 6840-000-0000
TRANSPORTATION OFFICER
GULF OUTPORT
MOBILE, ALABAMA
7426 AF COMUS MACV
ARVIN 20th ORD STORAGE BASE DEPOT
DVSJ01 1/000 BG1
DVSJ01 6206 7091 XX
12/66 LOT NO. KH
DSA-400-67-C-1284-PC409
NET CONTENT 580 LB
GR WT 638 LB CU 10.9
Immediate effect on Natural Resources and Environment

- Over all ecological zones from the 17th parallel that divided North and South Vietnam to the tip of South Vietnam at the Ca Mau Cape were effected of herbicides and defoliants. More than 24% of the land area of South Vietnam was sprayed. 20 to 40 times higher than that used in normal agricultural production.

- Three vegetation categories must be singled out for special attention with herbicides attacks: Dense inland forest, Costal mangrove swamp, Agriculture
Inland forest was heavily affected accounting for 86% of the total spraying mission. The cover of 2 million ha of forests was destroyed.
Hundreds of tree species were defoliated and died. Few species could survived like *Irvingia malayana, Parinari annamensis*. 

Fig. IV B-1. Forest in Tay Ninh Province sprayed three times and not burned. Photo taken by Dr. Michael Newton in March 1972.
Mangrove forest

Rhizophora... species are very sensitive to toxic chemicals, *Ca Mau Peninsula*

*Land sat TM .73*
Loss 112 millions cubic meter timber, also great loss of non-woody forest products. Reductions in overall floral and faunal biodiversity. Loss of nutrients, Loss in freshwater fish...

Defoliation in Quang Tri
Loss of forests led to reductions in overall floral and faunal biodiversity.

- Primary forest: 100%
- Effect of Spraying
- Secondary forest: 50%
- Degraded: 10%

Loss of forests led to reductions in overall floral and faunal biodiversity.
Long-term effect on Natural Resources and Environment

- The degradation of environment
- and habitats, the irreversible nature of species extinction, the loss of genes and transformation of ecosystems through the devastation of agent orange/dioxin, all these compromise our options for present and future generations
- the soil was unable to hold the released nutrients so that these were lost, a phenomenon referred to as nutrient dumping (Westing, 1984),
- led to accelerated soil erosion particularly in high mountain above 700 meters and in areas of steep slopes also had created negative impact on 28 river catchments areas
Missions of Ranch Hand operation

Distribution of sprayed area by absolute altitude

- < 300 m: 16%
- 300 - 700 m: 42%
- 700 - 1000 m: 30%
- > 1000 m: 12%
The forest has been destroyed, wild grasses (Pennisetum polystachyon, Imperata cylindrica) have invaded indigenous tree species.
sprayed swaths are visible after 30 years

Land sat TM image 1999 Dong nai province
In addition there are an estimated 10-15 million large bomb craters from the war.
The consequences of the Chemical Warfare on the human

- 366 kilograms of dioxin has created a great impact immediate and long-term on 3,181 villages of Vietnam,
- at least 2,1 million people were directly affected by dioxin.
- In addition, contaminated water sources, foodstuff ...indirectly affected many people. It is estimated that 3 million victims of Agent Orange/Dioxin (Jeanne Mager Stellman, 2003).
- The victims affected by Agent Orange/Dioxin are not only Vietnamese people but even American, Australia, Korea...soldiers
Many children are born unable to stand on their own legs (Ke van Bac, 18 Age, A Ngo – A Luoi)
Mrs. Can Di AO/Dioxin victim
Although the war has been over for a long time, the wounds of the war have been gradually healed, however, the mental and physical pain has not yet been eased for millions of Vietnamese families who are victims of Agent Orange / Dioxin.

They are the poorest of the poor and they are the most miserable people of the miserable. Diseases, pains and poverty always weigh upon each family of the victim.

They live in the sprayed areas
Hot spots of dioxin in southern Vietnam.

- To day study have demonstrated that aerially sprayed regions do not retain high levels of TCDD,
- But former military installations was significantly higher than that resulting from aerial applications, and continue to exist as dioxin hot spots or dioxin reservoirs to this day (Dwernychuk, 2005).
- Shown that TCDD contamination has spread from soils to humans via the food chain (Dwernychuk, 2002).

It follows that dioxin levels in soil be used as the principal factor defining a hot spot.
Initial, some areas may be categorized as significant dioxin ‘hot spots’ are:

1. The former US airbases at Da Nang,
   1965 – 1971: 105,000 herbicides barrels
   (24,000 barrels Agent Orange)

2. The former **US** airbases at Phu Cat
   An Nhon district Binh Dinh province

3. The former **US** airbases at and Bien Hoa
   (Dong Nai province)
   The former US airbases at Asho- Aluoi
   (Thua Thien Hue province)
The mission referred to as 'Pacer Ivy' which was launched after decision to halt Operation Ranch Hand. The Pacer Ivy mission were to collect unused herbicides barrels, clean or dump such chemicals, and transport herbicides to Johnston Island. Waste water from cleaning the herbicides barrels was discharged direct to ground; herbicide re-filling.

As a consequence, areas used for Pacer Ivy became highly contaminated with herbicides and dioxin.

The scope and level of contamination by AO/dioxin is still to be determined in some areas known to be polluted with AO/dioxin due to the Pacer Ivy operation at Da Nang, Bien Hoa airports and some other airports.
Remediation

- Given the studies suggest the persistence of hot spot areas highly contaminated with dioxin, which pose a serious threat to surrounding inhabitants, we have been for some time trying to find the means to remediate these sites.

- In the 1990s, the Viet Nam Ministry of Defense built carried out some construction works to control the spreading of dioxin in Danang, Bien Hoa and Phu Cat airports.
Da Nang Airport, with contaminated area indicated by red arrow
Interpolated TCDD values
( pp/g dry weight) in Da nang airbase
The sign of barrel in hot spot
The highly contaminated site is isolated from other lands by a concrete cap.
Also drainage ditches around the highly contaminated sites
Surface water flow on contaminated site is diverted into Sen lake
Sen lake. Đà Nang air base
Bien Hoa Airbase
Isolating & land filling an area heavily contaminated by dioxin in Bien Hoa airport

Betonite, HDPE and concrete.
US embassy visited Da Nang Air base
Rehabilitation

- Rehabilitation of degraded inland forests is a most urgent matter requiring enrichment of ecosystem and sustainable use of sprayed area in south Vietnam,

- *Inland forest rehabilitation is a long process, and difficult*
A Luoi 1993 and Now 2008
Harvesting Acacia forests
Mangrove Reforestation
Rhizophora plantation forest and shrimp pond
Can Gio Biosphere Reserve

- an area of 75,740 ha.
- the mangroves were almost completely destroyed.
- Through the great efforts of the local people, 22,000 ha.
- To date, Can Gio has become one of the most beautiful and extensive sites of rehabilitated mangroves in the world, and was chosen to be included in the world network of Biosphere Reserves by MAB/UNESCO on January 21, 2000.
Planting a green corridor in key dioxin hit A Sho areas of A Luoi district Thua Thien-Hue province
A Luoi is a narrow valley, 40 km long, 3 km wide and surrounded by high mountains,

Natural land area is 117,951 ha, population of 27,146 inhabitants (1986),

Dong Son Commune is located in the “hot spot” of dioxin covering an area of 1,926 ha, with a population of 1,313 people (1996),

A Luoi was a main target affected by chemical warfare with 256 missions. It was home to three former Special Forces bases.
Luoi can be seen as a small picture of the chemical warfare in Vietnam as it houses three former Special Forces bases.
A Luoi - 1974
people mainly are ethnic minority people such as Ta oï (67%), Ca Tu (9%), Pa Hy rely on agricultural and forest production activities for earning their living.
War Legacies Project & WB
Our friends in the US and other countries need to provide more support and assistance to the Victims of Agent Orange/Dioxin in Vietnam.
“Help to reduce the pain left by the past”
Mingpao magazine, December, 2007 (page 48-68) by Shan
A Sho Hot spot The content of dioxin in the soil is 879.85 pg/g
The Green Fence Model

Our project has been researching and planting a green fence around contaminated areas in the hopes that it will isolate “hot spots” from humans and animals and will raise awareness on the harm of the dioxin caused to the people.
Design green corridor in Project site
Catch fish in A Sho
Cow and buffalo in the airbase
Searching for metal
Planting a Green Corridor in A Sho

- However, mechanical caps and ditches are insufficient in more rural, residential areas.
- The main reason causing contamination to the people in A Sho is the chain of contaminated food due to frequent contact with the soil, and animals still walk daily in the affected area.

Dioxin → Food/Animals → Humans
TCDD in A Sho and other villages

(Hatfield Consultants Ltd, 2000)
Soil and water in hot spot
Gleditsia trees
Water locust, Honey locust

Gleditsia australis
- many long thorns around the trunks
- soft wood, not attractive for use as fuelwood or wood
- easy to live in difficult conditions
- strong, healthy, deep roots
- very hardy against diseases and insects
- easy to grow in difficult conditions
- fruits are used to produce soaps, shampoo and medicinal drugs
Seedling of Gleidisia
20.000 *Gleditschia australis* seedlings in the nursery
Training course and practical for farmers to plant trees
Flood and other difficulty appeared
Young trees died
Acacia farnesiana
Acacia farnesiana 2 years
Supported local people to plant

Eagle wood (*Aquilaria crassna*) in farmer garden
Trees for children
Seedlings will be planted in the field on Jan 2009 with organic fertilizer.
CONCLUSION

- The above activities only meet a small part of the very large and long term demand of the AO/dioxin victims as a result of the serious consequences of Operation Ranch Hand on natural resources and the environment.
- The serious consequences have still remained as a heavy burden for the nature and people living in the affected areas.
  - In Vietnam a number of hot spots could be identified
Vietnam as the biggest laboratory in the world for studying the effect of dioxin on human health and environment. Researches and activities for overcoming of the consequences of toxic chemicals/dioxin in Vietnam of organizations and individuals are always welcomed, encouraged and supported by the Vietnam Government.

We hope that all friends will continue to provide more and more support to the Victims of Agent Orange/Dioxin in Vietnam
Thank you

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