

EFFECTS OF ENDOSULFAN ON HUMAN BEINGS

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TO
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CERTIFICATE

This is to certify that the dissertation entitled “ Effects of Endosulfan on human beings ” submitted to NIT Calicut in the partial fulfillment of the requirements for the award of the degree of Bachelor of Technology is a record of the original work done by the aforementioned students during September – November, 2006 under my supervision and guidance.

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ABSTRACT

Our study is about the harmful impacts caused by the insecticide 'Endosulfan' on human beings. Endosulfan is a harmful insecticide. It causes several health hazards in human beings. We have done a case study on a place called Muliyar. Here Endosulfan was aeriually sprayed on the cashew plantations at Muliyar for more than 20 years. The terrain was unsuitable for aerial spraying considering the relatively high rainfall and its geological structure. Unusual diseases and even deaths were observed in and around the region. Our project involves studies about the same and a few remedies have been suggested.

INDEX

| TOPIC | PAGE NO |
|--|----------------|
| 1. INTRODUCTION | 7 |
| 2. IMPACTS OF ENDOSULFAN | 8 |
| 2.1. ENVIRONMENTAL IMPACTS OF ENDOSULFAN | 8 |
| 2.2. DRINKING WATER IMPACT | 8 |
| 2.3. ENVIRONMENTAL FATE | 9 |
| 2.4. AQUATIC FATE | 10 |
| 2.5. TERRESTRIAL FATE | 10 |
| 2.6. ATMOSPHERIC FATE | 10 |
| 2.7. FATE IN HUMANS AND ANIMALS | 11 |
| 3. CASE STUDY:- EFFECTS OF AERIAL SPRAYING OF ENDOSULFAN ON RESIDENTS OF MULIYAR PANCHAYAT | 12 |
| 3.1 LOCATION AND ACCESSIBILITY | 12 |
| 3.2 HEALTH HAZARDS IN AND AROUND CASHEW PLANTATION | 12 |
| 3.3 PROBLEMS IN ENMAKAJE | 13 |
| 3.4 SELECTED VICTIMS OF ENDOSULFAN | 15 |
| 4. HOW IT ALL STARTED | 19 |
| 5. PAPER CLIPPINGS | 25 |
| 6. REMEDIES AS PER PRESENT CONDITION IS CONCERNED | 37 |
| 7. CONCLUSION | 40 |

1. INTRODUCTION

WHAT IS ENDOSULFAN ?

Endosulfan is a chlorinated hydrocarbon insecticide of the cyclodiene subgroup which acts as a contact poison in a wide variety of insects and mites. It can also be used as wood preservative. It is used primarily on food crops like tea, fruits, and vegetables on grains.

Commercial names for the product include Thiodan, Endocide, Beosit, Cyclodan, Malix, Thimul and Thifor. The commercial product is made up of a mixture of two separate parts (isomers): the alpha and beta configurations. Endosulfan will be considered as a single (homogenous) product unless otherwise stated in this profile. Endosulfan is pesticide, which is highly toxic if not properly used.

Its chemical name is 6,7,8,10,10-hexachloro-1,5,6,9,9a-hexahydro-6,9-methano-2,3,4-benzodioxathiepin 3-oxide. Its molecular formula is $C_9H_6Cl_6O_4$. Its melting point is 181 degree Celsius. It has a molecular weight of 422.95. It has a solubility of 0.32 mg/l for alpha isomer and 0.33 mg for beta isomer in water. It has a solubility of 20g/100g in toluene and 2.4 g/100 g in hexane. It is an organo chloride pesticide. It is a neurotoxic pesticide belonging to the group of Cyclodienes.

Some of the related insecticides of the same group viz. chlordane, heptachlor, aldrin, Endrin, dieldrin were banned for use in agriculture because of long persistence of their toxic residues in the environment. Environmental persistence for the insecticide is rated as 3 (ie. Moderately persistent). It was also observed that in tropical climate conditions, the insecticide degrades faster than that in temperate conditions (nearly 4-12 months). It is permitted to be used in India by Directorate of plant protection, Quarantine and storage (DPPQ&S) for use in coffee and tea. It is permitted to be used as spray from helicopter (aerial spray) at 2-3 meters height from crop canopy.

2. IMPACTS OF ENDOSULFAN

2.1 ENVIRONMENTAL IMPACT OF ENDOSULFAN

Endosulfan sulphate will be present in the environment as a result of the use of endosulfan as an insecticide. If endosulfan sulphate is released to water, it is expected to adsorb to the sediment and may bio concentrate in aquatic organisms. Photolysis may not be an important fate process based on the stability of thin films of endosulfan sulphate exposed to light >300nm. Endosulfan standard was not found degraded in standard screening tests using settled domestic waste water as in columns. However, endosulfan sulphate has been reported to bio degrade when exposed to mixed cultures from a sandy loam soil. Hydrolysis in water may be an important fate process based on reported hydrolysis half-lives for endosulfan isomers of 35 to 37 days at pH 7.0 and 150 to 187 days at pH 5.5 . Evaporation from water may be an important transport process based on an estimated half life of 43 hr for evaporation from a river 1m deep, flowing 1m/s with a wind velocity of 3m/s . Evaporation from lakes and deeper streams and rivers will be slower and adsorption to sediments will slow evaporation. If released to atmosphere, it will react with a resulting estimated pour phase half life in the atmosphere of 1.23 hr . Exposure to endosulfan sulphate will result from the ingestion of contaminated food.

2.2 DRINKING WATER IMPACT

Residues found in the Brantas River system, and Madura sea, and the canals and ponds in the Brantas River system for endosulfan sulphate collected during March, where a major portion of the spraying was also carried during this period (ie rainy season, January –April (range) were :Canals <0.01-0.55 ug/l. No endosulfan sulphate residues were detected (method sensitivity 10 ug/l) in well waters located near treaded fields in Wisconsin and Florida 282 and 100 days respectively, after the last endosulfan application.

2.3 ENVIRONMENTAL FATE

Endosulfan does not easily dissolve in water . It does not stick to soil particles readily. Transport of this pesticide is most likely to occur if endosulfan is attached to soil particles in surface runoff. Large amounts of endosulfan can be found in surface water near areas of application. It may also be found in surface water at very low concentrations and can be detected in the air at minute levels.

In raw river water at room temperature and exposed to light ,both isomers disappeared in four weeks during the experiments conducted at California . A breakdown product first appeared within the first week. The breakdown in water is faster (five weeks) under neutral conditions than at more acidic conditions (five months).Under strongly alkaline conditions ,the half-life of the compound is one day.

The two isomers have different degradation times in soil. The half life of the alpha isomer is 35 days and 150 days for beta isomer under neutral conditions. These two isomers will persist longer under more acidic conditions. The compound is broken down in soil by fungi and by bacteria.

The breakdown product ,endosulfan sulfate ,has been observed in several field studies involving plants. The sulphate is more persistent than the parent compound, accounting for 90% of the residue in 11 weeks. Sulphate formation increases as temperatures increase. However, sunlight may play a role in the reaction, perhaps in starting the process. On most fruits and vegetables, 50% of the parent residue is lost within three to seven days.

Endosulfan and endosulfan residues have been found in numerous food products at very low concentrations. They have been detected in vegetables (0.0005-0.013 ppm) ,in tobacco ,in various sea foods (0.2ppt-1.7ppb)and in milk.

2.4 AQUATIC FATE

Terminal residues found in aquatic ecosystems include endosulfan sulphate. Endosulfan sulphate is the major product expected under aerobic conditions in slightly acidic waters. Oxidation is slow under anaerobic conditions. In aquatic environments (water and sediment), endosulfan diol was present along with smaller amounts of sulphate.

2.5 TERRESTRIAL FATE

If endosulfan sulphate is released to the soil, it will be expected to bind the soil, and will not be expected to leach the ground water. No information about hydrolysis in soils was found, however, this may be an important fate process based on reported hydrolysis half-lives for endosulfan isomers of 35 to 37 days at pH 7.0 and 150 to 187 days at pH 5.5. Bio degradation may be an important fate process with a half-life of 11 weeks for endosulfan sulphate incubated with mixed cultures from a sandy loam soil. In a controlled environment, losses from the grass and plant surfaces were in the decreasing order, endosulfan i, endosulfan ether, endosulfan ii, endosulfan diol, endosulfan sulphate.

2.6 ATMOSPHERIC FATE

If released to the atmosphere, endosulfan sulphate will react with hydroxyl radicals with a resulting estimated vapor phase half-life in the atmosphere of 1.23 hr. Photolysis may not be an important fate process based on the stability of thin films of endosulfan sulphate to light > 300 nm

2.7 FATE IN HUMANS AND ANIMALS

Endosulfan is rapidly degraded and eliminated in mammals with very little absorption in the gastro intestinal tract. Cattle feed 0.15 mg/kg for 60 days and no residues in the aft. The metabolite ,endo sulphate , seems to show similar acute toxicity to the parent compound. The beta isomer is cleared from blood plasma more quickly than the alpha isomer . Most of the endosulfan seems to leave the body within a few days to a few weeks. Mice fed endosulfan had both isomers plus two break down products in the faeces. There were only traces of oxidized endosulfan in the kidney and muscle.

3. Case study – Effects of aerial spraying of endosulfan on the residents of Muliya Panchayath.

3.1 LOCATION AND ACCESSIBILITY

The area lies between the latitude N 12° 40' and 12° 35'. The longitude lies between E 75° 51' to E 75° 10'. Swarga, situated in Enmakaje panchayath is well connected by roads from Kasaragod town. From Perla we can reach Swarga and Vaninagar easily. Perla is 35 km from Kasaragod on the State Highway Cherkala –Kallakatta. Number of motor able roads connects the area. Periyar is lying on NH 17 between Kasaragod and Kanhangad. Adhur and Muliya are lying on the State Highway Kasaragod-Jaloor. These two places are also connected by number of motorable roads.

3.2 HEALTH HAZARDS IN AND AROUND CASHEW PLANTATION

Aerial spray of endosulfan, a pesticide is being blamed for all the health problems in the area by the people. In places like Muliya, Periyar, Enmakaje, Cheemeni and Pedre in the cashew plantations aerial spraying of pesticide to wipe off tea mosquitoes was undertaken by Plantation Corporation of Kerala (PCK) back from 1978 onwards.

Aerial spray of endosulfan using helicopter was banned under High Court order in the area recently as per the petition filed by individuals. In these places, lot of children, who have been exposed to aerial spray, are considered to be living martyr. After conducting surveys in this region, it was found that the residents suffered from one or other kind of diseases.

For the last more than 20 years, endosulfan was sprayed continuously over Enmakaje panchayat. There is no doubt that all the unusual disease affected in the residents of these places is due to Endosulfan,

according to the resident Doctors of the area. They have recorded that the symptoms resembles to that of poisonous effects of pesticides. Pesticides create problems and have been reported from various parts of the world.

It was in 1977 the Plantation Corporation of Kerala started growing cashew sapling on 2000 Hct of land in Kasaragod. Ever since that time endosulfan was sprayed in the area aeri ally three times a day. The people who were living near by area have been suffering from various diseases there after. Congenital diseases in children, cancer, physical deformity skin allergy, etc. are some of them. All the above defects are seen in places like padre, Bellur, Bovikanam, Periy e, Cheemeni and Rajapuram. Several householders in Padre Village suffering from disease like liver cancer, blood cancer, cerebral palsy, Epilepsy, Mental retard ness, asthma and infertility.

3.3 PROBLEMS IN ENMAKAJE

During the work it has been realized that the problem exists not only in Enmakaje Grama panchayat, but also in its hinterlands and hence decided to look into the matter in Enmakaje Grama panchayat and adjoining areas. For arriving at conclusion secondary data available and factual representations by aggrieved persons were relied on. The visit to areas of Enmakaje, Muliyar, Adhur and Periy e revealed the pathetic condition of the people in the area. As the area is away from the urban and semi urban area, the environmental problem related to any industries or wastes are of remote possibility. The only anthropogenic activity that needs special mention in the area is the aerial spaying of endosulfan practiced by the Plantation Corporation of Kerala Ltd (PCK Ltd) for more than 25 years. It has been learnt that people suffer from suffocation during the spray time, and many of the inhabitants have breathing problems, irritation in eyes, headache, cough, skin diseases, body becoming weak after aerial spraying. It is also evident that unusual abortion rate among women and animals, birth of handicapped children among human beings and animals, suicidal tendency, drowsiness, etc. are prevailing. Many of the health problems found among the inhabitants are similar to the effects of endosulfan may

cause. Hence, prima facie aerial spraying of endosulfan seems to be the cause factor of unusual diseases among the people of the area. Even though the district administration issue sanction for aerial spraying only under stringent conditions considering the necessity for environmental protection, the PCK Ltd has followed these only for namesake. Considering the potential danger and probable impact of aerial spraying of endosulfan in the human inhabited area, as in the present case, it is recommended that the government may ban endosulfan forever. The role of endosulfan as the exact cause factor is presently neither denied nor proved beyond doubt in this area. Though spraying of endosulfan is practiced in the area for more than 20 years, no environmental impact study is seen conducted by either the proponent or any other interested ones. A detailed Environmental Impact Assessment study on endosulfan incorporating health aspects so as to find out the residues of endosulfan, if any, still persistent in the environment including the biotic components. In the mean time it needs to be accounted that cashew is a major foreign exchange earner and a large number of people including the planters, workers and industrialists are dependent on this. It necessitates the implementation of sustainable agricultural patterns in the midst of allowing a minimum period for the resilience of the environment. The prolonged use of endosulfan may lead to the endosulfan resistant varieties of tea mosquito bugs(TMGS). In case any pesticide other than endosulfan is found suitable for eradicating TMGS the aerial spraying shall be allowed only on certain stringent conditions. Endosulfan is an organochloride insecticide. The various water samples analyzed which was collected from the endosulfan sprayed area, namely Swarga has chlorine as the main constituent and is much higher than permissible amount. The half life of endosulfan is very few days but if the concentration of in taking of pesticide is very high, then the span of accumulation of insecticide in the body increases. The continuing use lead to the unusual death and suffering of Enmakaje Panchayat and adjoining regions.

One major reason for insecticide pollution of Swarga area is the climate and topography. The area under study receives a rainfall more than 300mm per year. So the insecticide may immediately be carried down by rain water and reaches the lower area. The irregular topography makes it unsuitable for aerial spraying. Aerial spraying affects also the

entire biotic community. It affects animals that graze in the sprayed fields. It can enter through air, skin and water to the human body.

3.4 SELECTED VICTIMS OF ENDOSULFAN

Sruthi---age 7. living in vaninagar area of Padre Village. The school is barely 100m from the house. She desperately wants to go there. But the hilly terrain of the Western ghat and her physical handicap wont let her. She was born with three deformed limbs- a congenital anomaly. She hopes around one leg. Her mother died of cancer. Her father is a farmer.

Narayana Naik--- age 22, his mental and physical growth is retarded. At the age of 20, he stands at about three feet. He has skin disorder too. He can make conversation with rudimentary matter. His sister is suffering from epilepsy.

Ashraf--- age 20, lives in Bellur. His height is only 3 feet, his chest and back is bulging in front. This gives him difficulty to travel and also to lay down.

Mlinga Maniyani--- age 34, his finger are bent for the last 15 years.

Sujatha--- she is both mentally and physically handicapped.

Udhaya--- age 11. he cannot crawl or walk and is mentally retarded. When he was at 1, his parents realized him desirably. He is suffering from epilepsy.

Kittana---age 21, has cerebral palsy. Brother Sridhar's mental growth is retarded. The Kodenkeri stream flows next to their house. Across the stream lives S Narayan Bhat, with his two nephews suffering from mental retardness and a 35 year old sister who has epilepsy. Kittana and Sridhar who are handicapped are looked after by their mother. Kittana cant eat or walk without help (Resident of swarga area).

Subramanya Bhat--- he has dangerous skin diseases. This similar to psoriasis. All children are suffering from asthma(Resident of Swarga area).

Sainaba--- 8 month baby of Muladka Lakshman Veedu. She couldn't move her head because of over growth of head. She was always crying due to the pain of her head.

Sujith--- age 14, living in Muliyar panchayat in Bovikkanam. He has skin disease. He cannot continuously study due to this reason.

Mahesh Babu--- Vaninagar resident, studying Vaninagar School. He has special fingers both in hands and legs.

Balasubramanyan--- He was an epilepsy patient by birth. He died recently of his disease. He was a resident of Bovikkanam.



The Cashew Plantation at Vani Nagar.

Photos of some of the victims of the tragedy





Sainaba : The victim whose over-growth of head caused her death.

4. How it all started

Most of them have been putting it down to a supernatural curse. Jatadhari, the guardian spirit (theyyam) of the area, is angry, believe several people of Padre village of Enmakaje Gram Panchayat (village council) in Kasaragod district of Kerala. Family after family has people suffering from diseases that were never noticed in the area in the past. The worst hit is an area of about four sq km in the sixth and seventh wards of the panchayat.

Here, if you walk along the Kodenkiri todru (stream), you'll realize that hardly any family has escaped the curse. Several smaller streams, flowing down the surrounding Western Ghat hills, join the Kodenkiri. The Plantation Corporation of Kerala (pck), run by the state government, has its cashew plantations on the upper reaches of these hills.

Mohana Kumar Y S, a doctor who has practised medicine in the area since 1982, has been perplexed for the past 10 years. "Disorders of the central nervous system are very common among the children of the area — cerebral palsy, retardation of mental and/or physical growth, epilepsy and congenital anomalies like stag horn limbs.

There are too many cases of cancer of the liver and blood; infertility and undescended testis among men; miscarriages and hormonal irregularities among women; skin disorders; and asthma, to name a few. Psychiatric problems and suicidal tendencies have also been rising. Surprisingly, almost all the ailments are restricted to people under 25 years of age," the doctor points out. "There is no source of pollution in the area, no industries. I just couldn't fathom the cause of these diseases. But I was sure about one thing: they are all very difficult to cure," Kumar points out .

In 1996, he wrote to some big names in psychiatry in the region, drawing their attention to the mysterious nature of the problem. There was no response. In December of 1996, he wrote to the Kerala Medical

Journal , soliciting researchers' attention. Again no response. If you check the February 1997 issue of the journal, you'll chance upon the appeal: "I feel the root of the problem lies in the water itself which might contain a mineral or radioactive substance which is harmful to the brain," the letter says, referring to the Kodenkiri stream. Narayan C, teacher at the Government Higher Secondary School in Vaninagar area of Padre, says, "For the past 10 years, teachers have felt that the children coming from the backside of the school, which is adjacent to the Kodenkiri stream, are below the average intelligence level. Of the 40 children who come from that area, nine are mentally retarded. It cannot be malnutrition. Even the poorest of the poor in this village have at least two square meals a day." But let's briefly leave the doctor and the teacher in their bewilderment and go to a somewhat older story.

Around 1963-64, the agriculture department began planting cashew trees on the hills around Padre. The valleys below house villages like Padre. In 1978, pck took over the plantations. Today, the area under pck's Kasaragod Estate stands at 2,209 hectares.

Insecticide sprays were taken up to counter the tea mosquito, a major pest that affects yields. To begin with, it was a pesticide called endrin. Later, pck began spraying endosulfan, an organochlorine pesticide (see box: Endosulfan: a profile). Aerial spraying of endosulfan began sometime around 1976, say Padre residents. Bala Kurup, manager of pck's Kasaragod Estate, says aerial spraying began only 15 years ago (see interview). The Evidence Weekly magazine published a report on cows giving birth to calves with deformed limbs after aerial sprays of endosulfan in Enmakaje Gram Panchayat as far back December 25, 1981. The author was Srikrishna "Shree" Padre, a farmer and journalist who takes keen interest in agriculture, the environment and matters of public interest.

Protests against aerial spraying began about two decades ago. The panchayat complained to the district collector, seeking a thorough probe. Sporadic protests continued. Residents saw bees, frogs and fish disappear from the area. Farmers producing honey to supplement their income have continually opposed aerial spraying. But it took 18 years

for the matter to come to a head. On December 25, 2000, pck announced that it would carry out aerial spraying the next day.

The next day some young men of Padre gathered around the temporary helipad. Two schoolteachers, Aravinda Yedamale and Nagaraj Balike, led the protest. They asked pck officials to desist from aerial spraying. Bala Kurup would have none of it.

When the crowd became agitated, he called in the police. Aerial spraying was carried out. The unrest brought together several residents. The Endosulfan Spray Protest Action Committee was formed with Aravinda Yedamale as the chairperson. Shree Padre was also there. He exchanged notes with Mohana Kumar about the episode

For the first time, the doctor shared his suspicion that endosulfan had something to do with the unusual maladies he has noticed. Shree Padre saw sense in this. He encouraged Kumar to probe further. The doctor went back to his tattered, dog-eared toxicology textbooks. The scribe started searching the internet.

A day later, they were terribly excited. The health effects of endosulfan poisoning were similar to the maladies Kumar had noticed. But saying that a public sector company was indulging in mass homicide was a bit too much. The evidence Kumar and Padre had was too circumstantial. But their sense of moral outrage at the arrogance of pck officials like Bala Kurup made them persist. The doctor began to dig up medical records. Shree Padre, who keeps in touch with the civil society right across the country, began sending emails to anybody who could provide him further information. Both came up with some truly shocking findings. Almost all the symptoms noticed in the area were listed under the health effects of endosulfan. The pieces of the puzzle were coming together.

The doctor began holding public meetings to explain his findings to the villagers. Shree Padre began contacting journalists. In no time, the local press and television picked up the issue. They faced one major limitation: lack of hard scientific evidence. What ensued was a media war. pck began issuing press releases, absolving itself of any blame.

But the local media has been more appreciative of their struggle.

One case that has really caught the attention of the media is that of Kittanna, who has cerebral palsy. “After the popular daily Malayala Manorama carried Kittanna’s picture on page one, Bala Kurup visited his father Shinappa Shetty. He asked Shetty to give a written statement that endosulfan spraying had nothing to do with his son’s illness. Shetty signed a statement saying he couldn’t say whether Kittanna’s disability had anything to do with the pesticide,” points out Shree Padre. Both Shetty and Bala Kurup corroborate this. After obtaining the statement, the pck official went to the doctor to ask for the addresses of other patients in his list. “I refused to give him the addresses of my patients. His motive was obviously not to help them. He probably wanted more signed statements. How can a villager establish the cause of disease?” asks Kumar. The residents saw this move as a sure sign of misconduct. They mobilised themselves under the action committee and sent a complaint to the district administration.

The district collector grants permission for aerial spraying. When Down To Earth met the district collector of Kasaragod, P C John, he refused to comment. He said ministers and elected representatives were discussing the matter and it wasn’t proper for him to say anything. In an interview with the television channel Star News , John had earlier said: “How to stop it [aerial spraying]? Why should I stop it? Those are the questions. Because I am giving consent as per rule. ”

Till the time of this story going to press, no ministers or administrative officials had visited the village, although elections to the legislative assembly are due in three months. Cherkalam Abdullah, the local representative to the assembly, visited three victims’ families on February 3, 2001. The village leaders say the administration’s apathy is hardly surprising as the village is up against a public sector corporation, and hence the whole state machinery. No political party took a stand on the matter initially. The first was the Communist Party of India (cpi), a part of the leftist coalition that is in power in Kerala. The vice-president of the Enmakaje Panchayat is from the cpi , and is busy organising public opinion against the spraying. The Bharatiya Janata Party has also

decided to take up the matter and join the protest. “Everything becomes a political issue given the polarization of Kerala’s polity. We don’t wish to become pawns in a political game. We only want an end to this tragedy. If political parties can sense our misfortune, they are welcome join us.” Having lost their faith in the administrative set-up and the political parties, Padre village has taken recourse to the court. The response has been favorable thus far.

On January 24 some residents of Padre petitioned the Court of the Munsiff of Kasaragod. Mohana Kumar filed an affidavit explaining the reasons for his concern. They obtained an ad interim stay till February 8, restricting pck from spraying of endosulfan by helicopters or any other means. The court order states that the petitioners have established a prima facie case through the documents presented. On February 8, the stay was extended till February 16.

But a woman from Kajampady area of Padre, who works in the pck plantations, informed Down To Earth that spraying was going on through manual pumps in some parts of the plantations. The village is contemplating contempt of court proceedings. But the leaders of the campaign aren’t content with waiting for the court ruling. Every other day, Kumar, Shree Padre and Shripati Kajampady, a doctor who runs a nursing home in the nearby Perla village, as well as other known people hold public meetings. They brief the residents of all the latest information available. If some agitated people want to take up violent measures to put an end to the endosulfan menace, they try to calm them down. They want to ensure that all protest is non-violent and democratic.

They are trying to build support for their cause in the civil society, constantly seeking guidance and support from scientists, social leaders, environmental campaigners and journalists. They are also reaching out to other villages that have complaints similar to theirs. Periya and Pullur, two neighbouring villages 25 km south of the district headquarters of Kasaragod. Some residents here have obtained a stay order from the courts against aerial spraying by pck. Here, several families stay right inside the plantations. They don’t talk readily, living

as they are right under pck's nose. But there are several stories of illnesses here, especially among women and children.

Is it too late?

This is just the first phase of Padre's struggle. "Our gyanodaya (awakening) happened only one month ago. We have get our hands on some scientific information and mobilize some social support based on that. We are yet to understand the magnitude of the problem," says Shree Padre. One walk through the village is enough to send a chill down the spine. Several families live right at the edge of the forest. Their trees, water, crops, land, their very bodies have absorbed endosulfan for more than two decades. The effect is anybody's guess till a thorough scientific probe is conducted. Till then, all that there is to go by are the observations of the residents, particularly the elders who have witnessed the change in local ecology.

"I don't see jackals in this area now," says Kajampady Subramanya Bhat, 75, whose family has lived in Padre since he doesn't know when. "In 1962-63, when the plantation started, they used to put groundnut cakes in the pits. A worker told me they were mixing pesticides in the cakes to prevent jackals from eating them. I don't see any jackals now, nor too many frogs, fish or crows. Rat snake, a farmer's friend as it checks the rodent population, has disappeared. There are no fireflies. I used to have 22 beehives. Now I have none. "

There are several similar tales of ecological destruction. Even if the village manages to stop endosulfan spraying for all times to come, the people here fear a poisoned future. They don't know what other nightmares are in store. If their problems are due to endosulfan then the issue of compensation is bound to come up. But India's record in compensating victims of environmental pollution is abysmal. There can be hardly any hope when the culprit is a government corporation. If the cause of their maladies is not the pesticide, it might be an even longer wait till some scientist somewhere decides otherwise.

Courtesy: Down to Earth magazine

5. Paper clippings

Mathrubhumi (aug 2006)



■ വിസ്മയമായി ശ്രുതി
 വാണിനഗർ സ്കൂളിലെ ആറാം ക്ലാസ്സുകാരി ശ്രുതി. ചെറുപ്പത്തിലേ ശ്രുതിയുടെ അമ്മ അർബുദം ബാധിച്ച് രോഗിയായി. ബന്ധുക്കളും വീണ്ടുപിടിക്കാനാവാതെ കൈകളും കാതലും കട്ടി പാന്നും തിർത്തി. സന്നദ്ധസംഘടനകളുടെ സഹായത്താൽ പൊയ്ക്കാലിൽ ജീവിതം വീണ്ടെടുത്തു ഈ മിടുക്കി. സ്കൂൾ ചുറ്റത്ത് കുട്ടികളോടൊപ്പം കളിക്കുകയാണ് ചിത്രത്തിൽ (ഇടത്ത്). 2001 മാർച്ചിൽ മാതൃഭൂമിയിൽ പ്രസിദ്ധീകരിച്ച, സ്കൂളിൽ പോകാനാകാതെ വീട്ടിൽ കഴിയുന്ന ശ്രുതിയുടെ ചിത്രം. (വലത്ത്) ഫോട്ടോ: മധുരാജ്



ഭാവി എന്ത്?
 ബോവിക്കൊന്നത്തിനടുത്ത് മുതലപ്പുറയിലെ മാട്ടോ ഡ്രൈവർ ഹമീദിന്റെ ചരണശേഷിയില്ലാത്ത പതിനൊന്നുകാരൻ മകൻ സുഹൈൽ. യുവാവുമായിട്ട് ഗ്രാമങ്ങൾ ഇന്ന് ഏറെ അശങ്കപ്പെടുന്നത് വരുമ്പോഴാണ് ഭാവി മാർത്താണ് - ഫോട്ടോ: മധുരാജ്



മാറാത്ത മുഖങ്ങൾ, ഭാവങ്ങൾ..... ശരിവെളിച്ചമുള്ള മുഖമില്ലാത്ത ബാധിച്ച് ഏതുകേൾ പത്തൊമ്പതിലധികം പേർക്കുമുള്ള 27 കാരൻ നാരായണ നായിക്. അഞ്ചുവർഷം മുമ്പ് 2001 മാർച്ച് 23ന് 22ന്റെ 'ബാല്യം' എന്ന തലക്കെട്ടോടെ മാതൃഭൂമിയിൽ പ്രസിദ്ധീകരിച്ച നാരായണ നായികിന്റെ ചിത്രമാണ് വലത്ത് - ഫോട്ടോ: മധുരാജ്



വെളിച്ചം എത്ര അകലെ... ഫോട്ടോ: മധുരാജ്
 ചിരിക്കാനോ കരയാനോ ഒന്ന് 'അമ്മ' എന്നു പോലും വിളിക്കാനോ ആകാതെ വളർച്ച മുടങ്ങിയ ചരണശേഷിയില്ലാത്ത 18 വയസ്സുകാരി രഞ്ജിനി. ബോവിക്കൊന്നത്തിനടുത്ത് മുല്ലപ്പുഴി എടുത്താണ് കുലിപ്പുണിക്കാൻ രമേശൻറെ മകളായിവർ.



ആരോഗ്യവകുപ്പ് മെഡിക്കൽ ക്യാമ്പിലെ പരിശോധന റിപ്പോർട്ട്

| ക്യാമ്പുകൾ നടന്ന സ്ഥലം | കാർഡർ | ആധി കാർഡ് | 60 ശതമാനത്തിൽ കൂടുന്ന രോഗങ്ങൾ | സ്യൂപ്പർമാറ്റ രോഗങ്ങൾ | ഗർഭിണികൾ | മുപ്പ് വയസ്സ് | അന്ത്യമടയാള നൽകാൻ പ്രാപ്തം | പുനരധിഷ്ഠിപ്പണം |
|------------------------|-------|-----------|-------------------------------|-----------------------|----------|---------------|----------------------------|-----------------|
| വെളിമ | - | - | 15 | 16 | 2 | 6 | 3 | 3 |
| മുളിയൻ | - | 4 | 15 | 52 | - | - | 1 | - |
| വെർഗ്ഗ പുഴൻകുരമ്പ | 6 | 6 | 64 | 45 | - | 49 | 7 | - |
| മാണിയാൽ | 3 | - | 30 | 11 | - | 22 | 9 | - |
| തമ്പുരട്ട | 3 | 12 | 19 | 12 | 8 | 26 | 7 | 7 |
| പനത്തലി | 7 | 84 | 20 | 34 | 27 | 47 | 3 | 8 |
| കുന്ദാശ്ശ | 3 | 88 | 74 | 44 | 21 | 49 | 17 | 3 |
| കുളൂർ | 11 | 5 | - | - | 13 | 13 | 2 | 6 |
| മുളിയൻ | 5 | 23 | 29 | 10 | 4 | 1 | 7 | 8 |
| ആകർ | 38 | 166 | 226 | 224 | 102 | 212 | 56 | 37 |

The Hindu (22 / 7 / 2001)

Report

Cashews for human life?

For over 20 years, the villages near the cashew plantations in Kasargod district, Kerala, have been devastated by an unusually large number of cancer deaths, neurological disorders and different kinds of physical and mental impairment. Recent reports in the media and studies done in the area indicate a strong link between the spraying of a pesticide called endosulfan and the deteriorating health of the local people. The State administration appears to



be oblivious to the situation. While the people have now turned to the courts for a solution, the tragedy of slow poisoning in Kasargod underlines the despotism of a certain kind of progress that is at the cost of human health and life, writes NIRMALA LAKSHMAN who travelled there recently.

THE steep hillsides and the leafy gorges of the South Kanara- Kerala border glisten with a muddy beauty in the monsoon. Deep potholes punctuate the rain-washed roads and the uneven terrain is sometimes masked by sudden sheets of water that flow from the culverts onto the open highway. This is a land that is green and beautiful and yet its

undulating topography harbours a deadly peril. In the small hamlets and villages scattered across Kasargod, death lurks in the air and water. For over 20 years, these villages have been devastated by an unusually large number of people dying from various forms of cancer, young adults with congenital neurological disorders, children with cerebral palsy and mental retardation, and lately an increase in the number of suicides in the area.

Most of the families who live here are small farmers or farm labourers. There is no large industry fuelling the local economy except the areca plantations. Families also grow other minor forest produce and garden vegetables for their own consumption. The Plantation Corporation of Kerala (PCK) has been cultivating cashew in 4500 hectares spread across this district. Since the early 1980s the PCK has been aerially spraying an organochlorine pesticide called endosulfan that has been banned in many countries including Singapore, Denmark, Germany, Holland and Sweden. Over the last several months, various reports in the media as well as studies done by institutions like the Centre for Science and Environment (CSE), New Delhi have indicated a strong link between the aerial spraying of endosulfan and the number of deaths and illnesses in the area. There has been no response from either the Government of Kerala or the Central Government to the continuing tragedy in this region.

In the small government primary school at Vaninagar, nearly 40 per cent of the children who come from the "plantation side" show definite symptoms of illness ranging from cerebral palsy and physical abnormalities to mental retardation. Udaya, 12-year-old son of a small farmer, Sundara Shetty, has cerebral palsy. He walks with difficulty and the teacher explains that he frequently falls down with convulsions. Mahesh, Satish and Jayakumari are siblings. Mahesh and Satish are mentally retarded and Jayakumari is a slow learner. She has extra toes on her feet and fingers on each hand. We meet eight-year-old Shruti. She is bright and beautiful and loves coming to school. Her legs are twisted and muscular development is very poor. Her mother died of cancer a few years ago. Her stepmother carries her to school whenever

she has time. On other days, it is a long and painful journey to the classroom.

Shree Padre, a progressive farmer, activist and journalist who lives in Padre village, first noticed that something was very wrong in the area in 1981. He wrote a report for a weekly in Andhra Pradesh on the births of mutant and deformed calves in Enmakaje panchayat in the Kasargod taluk within six months of the spraying of endosulfan in the area.

Dr. Y.S. Mohana Kumar, the local physician who has been practising here for about 20 years, wrote to the Kerala Medical Journal in 1997 recording the unusually large number of people suffering from diseases of the central nervous system and soliciting the intervention of medical researchers in the baffling problem. "There was no response at all," he says. Acutely distressed by the situation, Dr. Mohana Kumar has been painstakingly documenting all the cases that have been coming to his notice. In a random survey, he conducted (updated until February 16 this year), he records 202 cases of people from about 400 houses in an area of four square kilometres with psychiatric problems, mental retardation, epilepsy, congenital anomalies, cancer deaths, suicides as well as those currently suffering from cancer. According to Dr. Mohana Kumar, these 202 cases are from 126 houses and 48 families have two or more family members who are ill. In two families, there are five people who are ill and in three families there are four members who have impaired health.

Shree Padre and Dr. Mohana Kumar both feel that they have evidence enough to suggest a strong link between the pesticide usage and the afflictions and also feel angered and saddened by the lack of response from the Kerala Government and from the central government. "We are always being asked to prove the link," says Mr. Padre. "What kind of arrogance is this? We cannot prove it, let them disprove it." The Endosulfan Spray Protest Action Committee which they and other local people have set up with school teacher Aravinda Yedamale as chairman, are receiving more and more information on similar illnesses from other villages in Kasargod district such as Enmakaje, Kumbdaje, Adhoor, Mulleria and Periyee. More than 200 houses come within a few kilometres radius of the spraying area. In the village of Padre alone,

there are 19 cases of mental retardation. Ramana Naik, a resident of the village who joins us for a discussion, points out that in the nearby village of Belur in the Nettanigai panchayat, more and more cases of strange illnesses and early deaths are emerging.

While the Padre panchayat has passed a resolution saying that the spraying has to be immediately stopped, most people we met did not seem to think that things would change. The sense of powerlessness among the village people is palpable. Worse, the knowledge that life has to be lived without hope. Hope for themselves that their days could be trouble free and that the lives and futures of their children would not be blighted. Although some people still do not specifically correlate the spraying with their predicament, almost everyone is aware that during spraying, (three times a year until recently) and in the immediate aftermath there is an alarming increase in allergic reactions for people living close to the plantations. Breathing difficulties, skin allergies, vomiting, giddiness and headaches are common. Allegedly, the PCK workers are also affected. Although no detailed documentation has been made of their health status, cases of workers and family members with the same kind of illnesses are emerging. Mr. Padre speaks of the case of a worker whose 18-year-old son was recently operated upon for a tumour. Forty-year-old Derakka, a PCK worker from Belur village, died of cancer recently.

Leelavathy of Periyee village, who is employed by the PCK as an assistant agricultural officer, has been waging a battle in court against the PCK. Her brother, who moved close to the plantation to supervise the construction of her house, fell ill before the house was finished. He developed a persistent fever, his vision grew blurred and he had joint pain and other troublesome symptoms. After a month of hospitalisation, he died suddenly. When Leelavathy and her family finally moved into the house, they too were not spared. Her son and daughter fell ill with similar symptoms and all the family members experienced breathing difficulties and skin problems that became aggravated during the spraying periods. Apart from costs of medicines and endless visits to hospitals and doctors she has spent close to Rs. 1,00,000 fighting her case. Because of her efforts the munsif court

ordered a stay in aerial spraying in Periyar although ground spraying still continues, says Leelavathy who also feels that health problems have decreased in intensity in the area after aerial spraying was stopped.

Mr. Padre emphasises that these cases of illness are not confined to a small area such as Padre and surroundings alone. In Rajapuram village in Hosdurg taluk, there have been 10 cancer deaths within a two kilometre radius. Those who live closest to the area of spraying as well as those who live close to the Kodenkiri stream flowing through forested tracks seem to be the worst affected. Obviously, the residue of the chemical in the flowing water has caused the maximum damage to those living closest to it.

We meet Narayan Bhatt and his wife Sumathi who take care of Bhatt's two nephews and niece. The boys, 16-and 20- years-old, are mentally and physically handicapped and their 14-year-old sister is epileptic. The Bhatt family has lived here for generations and they say that there has been no history of ill health in their family until now. Narayan Bhatt's sister, who grew up in the area and also spent her pregnancies with her family, left her children behind with her brother as her husband did not want to be burdened with them. While the Bhatt's care for these children like their own, it is obvious that they are very worried about their future. "The cost of medicine for epilepsy is also increasingly expensive as she is slowly getting worse," says Sumathi.

We visit another house further upstream. Here, Sheenappa Shetty, a farm labourer turned small farmer and his wife Muthakka care for their adult sons, both of whom are physically and mentally disabled. Their young teenage daughter committed suicide in a fit of depression a few years ago. Everyday existence is a huge struggle for this aging couple. They get no assistance from the State and no inputs in the care of their boys either. Muthakka recalls picking cashews from the plantation regularly when she was a young woman and eating them as well. Most children and teenagers have been doing this over the years, particularly as it is a good supplemental income for their families. Sheenappa Shetty speaks to us sorrowfully and yet with an unusual grace. He hesitates to name the culprit but his anguish is obvious; how will he

and his frail and aging wife care for two grown young men who are heavily built and unable to do anything for themselves? As if echoing these questions, Kitanna, the 22-year-old, looks at us wordlessly. One of the most painful aspects of this tragedy is the fact that in many instances it is the younger generation, now in its early twenties, that is ill and dying. The assistance of Rs.100 a month from the state for the handicapped has also not come for the past year and a half, says Sheenappa Shetty. His income from his land is insufficient to meet their family's need, he says.

Medically, there is no solution available for the people who are already affected, says Dr. Sripati Kajampady, a local medical practitioner and another active campaigner against the pesticide spraying. "What is unusual is not the illnesses, but the number of people who have it," says Dr. Sripati. "Despite so many direct interventions and appeals, there has been no response," says Dr. Sripati. "The courts are our best hope." The despair is obvious. The initial shock at the lack of concern of the district administration and the local politicians and those who claim to represent the people's interest in various quarters, including in the Kerala assembly, has given way to a sadness and loss of hope that adds to the poignancy of the situation. Even though the local people have obtained a stay order on aerial spraying they feel that it is likely to get vacated when the case comes up for hearing in late July.

While aerial spraying has been stopped temporarily, there are reports that manual spraying still continues in some parts of the plantation. During the aerial spraying operations which went on until late last year, none of the precautionary measures such as covering water bodies during spraying, notifying the public of the operations well in advance, notification and compensation if domestic cattle died because of spraying, all set out in the Pesticide Act of 1971, were followed.

S. Usha, a research associate with INTACH who conducted a survey along with her colleagues among 250 families in the area, and another survey by the Society for Environmental Education in Keralam (SEEK) found that local people experienced certain acute symptoms after spraying as well as more long-term health problems such as stomach, throat and intestinal cancers, gynaecological problems including

infertility and regular miscarriages, brain damage, hormonal problems and an increased tiredness.

About 50 families live inside the plantation according to the survey and the surrounding area has a population of about 5000. Between 60 and 80 per cent of the people in the area have been affected by the spraying. The workers in the plantation are not given any protective clothing such as masks and gloves and stand for long hours in the cashew groves inhaling the pesticide. According to Usha's survey, there is an increase in the number of dead birds and small wildlife, frogs and fish in the small streams and rivulets after the spraying. Cattle have also been seriously affected.

A Thiruvananthapuram based group, the Thanal Conservation Action and Information Network, which has done extensive investigation on organic pollutants and studied the effects of endosulfan in Kasargod, said that endosulfan has been classified as a Restricted Use Pesticide. "The chemical has been proven to be an endocrine disrupter and genotoxic. The main target organs are the central nervous system, kidneys, skin and reproductive system." They also say that accidental ingestion and breathing of high levels of endosulfan results in convulsions and death. Is the menace of the tea tree mosquito and other fungus found affecting the cashew plantations periodically really reason enough to spray a pesticide that endangers public health, asks the Thanal report. C. Jayakumar, co-ordinator of Thanal also points out that with the acceptance of non-chemical management practices among farmers, and the availability of organic production methods of cashew as opposed to chemically intensive cashew production, there is no reason why the PCK cannot adopt these practices.

Classified by the U.S. Environmental Protection Agency as highly hazardous, endosulfan was at the centre of controversy in the Philippines in the 1990s when Hoechst contested its restriction and the ban of higher formulation by the Fertilizer and Pesticide Authority. Professor Romeo Quijano of the Department of Pharmacology and Toxicology at the College of Medicine, Manila, said in a paper that the claim of Hoechst that "consumer safety was proven is utterly false and grossly dishonest. Several studies ... consistently show that endosulfan

is highly poisonous and easily causes death and severe acute and chronic toxicity to various organ systems including mental impairment, neurologic disturbances, immunotoxicity, reproductive toxicity ..." In India, as C. Jayakumar says, the recommendations of the Banerjee report as early as in 1991 said that endosulfan should not be used near water sources, but strangely the R.B. Singh review report of 1999 does not say anything more about this and other recommendations but only that the "recommendation to continue the use was implemented".

When the PCK came to several villagers to draw blood for their own testing, many of them refused to co-operate. Jayanthi, whose son Harshitha is eight years old and severely brain-damaged, did not allow the PCK to conduct tests on her son. She is in tears as she speaks to us. She knows that for Harshitha the future is bleak and has little doubt that the pesticide is to blame for their blighted lives. She and her husband, Shankara Moolya, who works in a nearby soap factory, actually lived inside the plantation until a few years ago and even now the cashew groves are a stone's throw from their modest house.

There are many other people in small dwellings, in interior forest tracks and in the villages engulfed by the vast acres of cashew trees whose lives have been permanently altered by such unexpected tragedies. Dr. Mohana Kumar introduces us to a young family where both the children have been born blind. The young mother grew up in the plantation and there is no history of blindness in the family. In another house 30-year-old Geeta, who lies in a heap of contorted limbs on the floor, smiles at us in welcome. She is tiny, less than four feet in length, and can barely move; her development has been arrested in early childhood and yet she is not fully mentally disabled and can speak and communicate fairly well. As we leave, we carry with us the memory of her haunting smile. Seventeen-year-old Mamata lives across the hill. She is a victim of epilepsy and is also handicapped physically. Her mental development is not normal.

Mr. Padre points out that her lorry driver father has spent enormous amounts of money on her treatment and yet there is little hope of improvement. According to her mother, her bad spells are increasing and the family is finding itself overwhelmed by her illness.

Although there continues to be a shocking lack of response from official quarters, widespread reports in the media and lobbying from local groups led the Director of the National Research Centre for Cashew (NRCC) to write to Cashew Research Stations all over the country asking them to "refrain from recommending endosulfan forthwith". The reasons he cited in the communication dated March 8 this year included the fact that long term exposure to a single pesticide is an unjustifiable practice and that endosulfan has been in use continuously for more than 25 years in spite of the availability of other equally effective pesticides. Dr. E.V.V. Bhaskara Rao further stated that as endosulfan has already been in use in a number of crops, at least by withdrawing from cashew, to that extent exposure to endosulfan could be limited. However, Dr. Bhaskara Rao clearly qualified the communication by firmly stating, "This decision to withdraw endosulfan neither supports nor contradicts its suspected role in the abnormalities reported from Padre village."

Mr. Padre points out the paradoxes in the NRCC letter. While Dr. Rao says that "environmental protection and human safety should also receive equal if not more attention over simple economics", he also suggests "equally effective chemicals" like monocrotophos, carbaryl, quinalfos, phosalone and dimethoate. "Have the long term effects of these chemicals on human beings been tested?" asks Mr. Padre. " It took 30 years for us to understand the irreparable hazards believed to have been caused by endosulfan. When some poor men raise an apprehension about the hazards of pesticides, instead of investigating the matter, the government and scientists ask them to prove it. The effects of slow poisoning may be really slow but when they surface, it is too late to do anything," he adds bitterly.

Meanwhile, the CSE sent a team of scientists to Kasargod late in February and took samples from Padre. Dr. Sripati Kajampady assisted them. Soil, water, bovine milk, butter, vegetables, fish and blood samples were extensively drawn and tested at CSE's Pollution Monitoring Laboratory. The test results were shocking. "Alarming" high levels of endosulfan residues were found in the blood, tissues, water, milk, soil and fruit and vegetable samples. The report says, "It is

beyond doubt that the dramatic cases of endosulfan poisoning in Padre village in Kasargod district of Kerala can be directly linked to a decision-making process dominated by a government undertaking which has resorted to aerial spraying of endosulfan thrice a year from 1976 onwards without sufficient back-up from, or debate with, experts in other disciplines, including pesticide experts, social scientists, environmentalists and others."

The CSE's report states that the maximum residue limits for the pesticide in the soil, water and vegetables from Padre had been breached several times over. "But human blood! We could not find any maximum residue limit for that. The tests conducted at the CSE laboratory show that each resident of Padre whose blood sample was tested has endosulfan residues several hundred times the residue limit for water."

Anil Agarwal, Director of the CSE, says he was "stunned" when he first saw pictures of the victims of endosulfan from Padre. In a communication to The Hindu, Mr. Agarwal raises several issues. The first is the role of the medical community, which despite repeated pleas from Dr. Mohana Kumar over many years, did not respond at all. The second is the apathy of local administration, which appears to be oblivious to the distress of the people. The third is the management of pesticides "Everybody knows that the aerial spraying endosulfan is not recommended without major precautions being taken," says Mr. Agarwal. If toxic substances can be used without any controls are we saying that their use and production is more important than public health? he asks. A central issue is also one of economic development, the mode of industrialisation that uses more and more toxic substances and the urgent need for the scientific community to be more interactive with the media and civil society groups so that information is available to challenge interest groups, says Mr. Agarwal.

Lawrence Surendra, economist and development expert, discussing the situation at Padre also stresses that the tragedy is connected to our greed for using agriculture for export crops and spraying poisonous chemicals for production, unmindful of the extreme damage to human beings and natural systems.

He feels that "the tragedy is of the scale of Bhopal, the 'silent Bhopals' everyone spoke about in the aftermath of Bhopal but which we have slowly forgotten". Milan Kundera's words used so often in the context of Bhopal "'the struggle of man against power is the struggle of memory against forgetting' will and should keep ringing in our brains," he says.

In the Enmakaje panchayat, a resolution banning any kind of spraying of endosulfan, both aerial and ground, was passed in January until a survey and investigation of all the problems both physical and psychiatric were carried out. As Mr. Padre and Dr. Mohana Kumar point out however, more and more cases of the effects of poisoning are emerging from neighbouring panchayats and villages. The most recent case is that of six-year-old Balakrishna in Nettinage village who has cancer. His parents are farm labourers who have had to sell what little they had to meet the cost of his treatment. "Who will come forward to help people like them?" asks Mr. Padre in anguish.

The sense of powerlessness and despair is overwhelming. With very little external support in their struggle for justice, these people are currently looking to the courts for some relief. Not that any compensation will ever make up for the lives that have been lost and, in many cases, lives that have been scarred beyond redemption.

The tragedy of slow poisoning in Kasargod underlines not only the despotism of a certain kind of material progress that is at the cost of human health and life, but the fact that a government which claims to represent a people should be the agent of their deaths.

Courtesy : The Hindu and Mathrubhumi

6. Remedies as per the present condition is concerned..

1. Full implementation of the ban of Endosulfan in the district

The hon'ble High Court and state Government has banned Endosulfan in the State of Kerala. Nevertheless, Endosulfan happens to be available and illegally used even in Kasargod. The ban of Endosulfan is strictly needed for effective implementation of the relief measures

2. Phase out Chemical Pesticides in the district in five years

The continuing use of chemical pesticides in Kasargod would make the remediation plan ineffectual, as these chemicals could further contaminate the already affected people, and it is known that such synergic reaction can cause health problems.

3. Develop and implement Community based Organic certification and Local standards.

Health

1. To conduct a comprehensive Family and Individual data generation by door-to-door survey in each panchayth and establish data base
2. Perform an analysis based on the data generated to identify the diseased and healthy for initiating welfare measures.
3. Identify and categorize diseases and a treatment protocol by consultation, counseling, case study analysis and integrating the different system of treatment.
4. Establish a Continuing medical assistance system.
5. Establish a Disease surveillance system with short and long term screening.
6. Establish a Community based monitoring, Long term and Palliative care and redressal system with support of the Calicut Medical College.
7. Special schools /Special Educators for the mentally challenged shall be established.
8. Special remediation systems in School's should be established to take care of the endosulfan affected children through Kudumbasree health volunteers/neighboring facilities/ICDS.
9. Day care centers shall be established with trained volunteers at the Ward/Cluster levels.

10. Medical Aids for physically challenged affected people –like spectacles, wheelchairs, hearing aids walking aid etc.
11. A special Endosulfan Survivors Medical care credit card or health card to be established to cover the treatment.
12. A special programme for Care givers relief shall be established in the locality.
13. Special assistance to be given to mothers with seriously affected children.
14. Special measures for rehabilitation of orphaned survivors to be established.
15. Financial Compensation shall be paid for all death and serious illness.
16. Special assessments of ailments and problems affecting woman to be sensitively carried out remedial measures to be established.
17. Conduct health assessments and establish relief measures to PCK workers.
18. Supplementing nutritional deficiencies through time bound relief measure locally made food with involvement of SHG's
19. Assessment of training needs local and district level.

7. Conclusion

Development and environmental protection should go hand in hand. We believe in humanity, in a peaceful world of mutual helpfulness, and in the high mission of science.

This project is intended as a plea for this belief at a time which compels every one of us to overhaul our mental attitude and our ideas.

With a good conscience our only sure reward, with history the final judge of our deeds, let us go forth to lead the land we love, asking His blessing and His help, but knowing that here on earth God's work must truly be our own.

“Only individuals have a sense of responsibility “-- Nietzsche