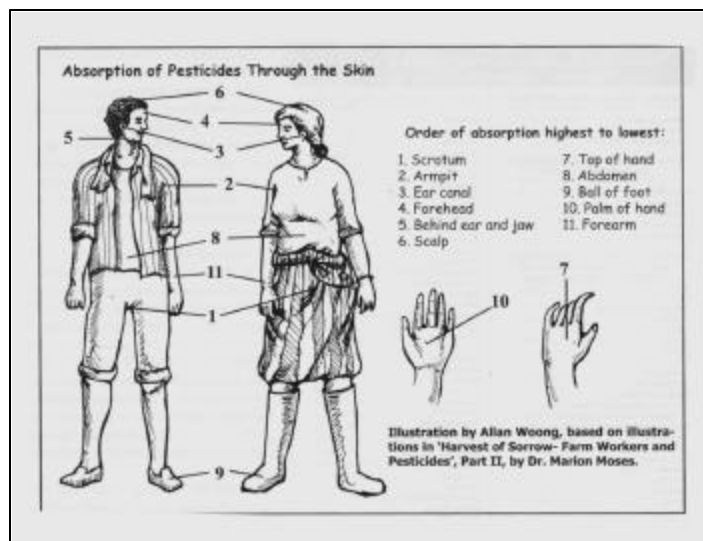


Documentation of Pesticide Poisoning in Kerala and its Implications on Health and Agriculture Planning and Policy



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September 2004

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Acknowledgement

My heart felt thanks are to the following people and institutions who made this study possible.

Kerala Research Programme for Local Level Development(KRPLLD) , Centre for Development Studies , Thiruvananthapuram,

Dr. K.Narayanan Nair, Programme Coordinator and other staff members of KRPLLD,

President and other members of Venganoor Panchayath,

Krishi Bhavan, Venganoor Panchayath,

Cashew Export Promotion Council,

Doctors working in various hospitals who attended the victims of pesticide poisoning with the limited facilities they have at hand,

Pesticide victims and their families and also their neighbours,

Management of cashew factories,

Teachers of Upper primary School, Kottathara, Wayanad,

Reporters of media, mainly Madhyamam daily,

Farmers of Venganoor panchayath,

Harikrishnan, Nigitha and Sujatha,

And all my dear friends inside and outside Kerala and those who are living and working in other countries who give all guidance and meaning to my life and my work.

S.Usha

Summary

This report contains two parts. One part is about developing a sustainable agriculture plan for Venganoor Panchayath, Thiruvananthapuram District and the second part is about pesticide poisoning in Kerala .

The first part of the pesticide poisoning mainly focus on the pesticide accidents which happened over the last 2-3 years in Kerala, mainly those reported in the media and later on field investigations and documentation done by the researcher. It also looks into the intentional poisonings, suicides, during the period between 2003 March to 2004 February and analyses the situation. This is based on media reports only. The study also looked in to the statistics of Government of Kerala, to get an overall picture of the suicides in Kerala.

The study has not looked into the accidents at pesticide manufacturing and formulating facilities and also those workers in the Public Health Department who do regular spraying of pesticides and fogging, due to time constraints. It is understood that State Pollution Control Board and public health department do not have a system to record cases of pesticide poisoning and this is really a barrier in formulating health policies which can help in preventing pesticide accidents . The official records generally do not tell anything about pesticide accidents although the main government hospitals like medical colleges, taluk and district hospitals cater to the needs of the people who are affected by pesticides.

Every Panchayath has a hospital either in the public sector or private sector. So if there is a policy of keeping the pesticide accident records, the health department can develop a system of reporting which will help in the planning process at the local level as well as developing policy at the state level to prevent further poisonings.

The second part is about planning for a sustainable ecologically based agriculture in Venganoor Panchayath, Thiruvananthapuram district. In this study main idea was to look into the existing agricultural situation in the panchayath, through secondary data, survey of selected farmers and also field study of water sources, biodiversity and agricultural diversity. Although some more in depth studies are needed based on the present assessment, a recommendation is made in the end which can be used as a guideline for the planning in the panchayath. For planning for specific input, a detailed assessment is essential.

Introduction

Objectives of the Study

1. To find out the pesticide poisoning cases in the last few years in Kerala with special focus on commercial cultivation of crops.
2. Documentation of selected cases with focus on pesticide exposure history, factors leading to the exposure, how these poisoning cases were handled and what followed later to mitigate the same.
3. To study the sustainability of present agriculture practice in Venganoor panchayath, Thiruvananthapuram district and to suggest measures to improve the situation and help in future planning process.

Significance of the Study

There is no doubt about the intrinsic toxicity of various pesticides today. Over the years the governments, medical practitioners, scientists and farmers all over the world have understood the capability of these chemicals to harm human health and environment. But only in very few countries governments could take decisions that discouraged the use of these deadly poisons and helped farmers to move out of this vicious cycle of pesticides. Indonesia is one such example. Most of the governments do not take decisions mostly because they are not concerned or interested to bring in charges and also because the reality at the grass root level is still unknown and unreported. The affected people or the panchayaths are unaware of how to bring these issues to the State level or National level so that governments can take necessary actions. The officials who are also in charge of reporting pesticide poisoning cases neither have any control over the plantations nor can they demand any transparency from the management even now. This situation makes them helpless and they fail to report whatever is going on in the plantations. The result is that both the labourers and the people living nearby and the larger environment continue to get poisoned bringing long term irreversible and irreparable changes to both. Hence recording of poisoning cases is very crucial to make the people and the governments understand the problems in its totality and make informed decisions.

Though our state is giving high priority for education and health and very progressive we have not given much emphasis to this issue when compared to many other states. Hence a stock taking of pesticide poisoning cases is urgent to make necessary regulations and changes in the policy and thus help future agriculture and health planning process. In fact, the present Indian

Insecticides Act 1968 was formulated as a follow up to a pesticide tragedy which happened in Kerala in 1958.

Background

Agriculture all over the world is facing great challenges. Loss of fertility of the soil, soil erosion, scarcity of water, outbreak of pests, loss of diversity of cropping plants, loss of agricultural lands have all become a reality through out the developed and developing world, though the intensity may vary. The present globalization process is making the issue more complex, whereby the developing world does not have any control over the trade of agricultural produce nor over the trade of agrochemicals especially pesticides. Fall in prices of the products along with increasing cost of cultivation compel farmers to make drastic changes. Kerala is no exception to this. Suicides among farmers are increasing in Kerala. According to the latest figures of the Crime Records Bureau, 1562 farmers committed suicide last year (Indian Express – 27.01.2002). Large plantations think in terms of reducing cost of cultivation by cutting on labour charges. Very few try for crop diversification.

The survey done in Idukki District – the plantation district of the State has revealed that 50% of the cost incurred in the plantations is for purchase of agrochemicals. This does not include the cost for application of them. But when a crisis arises as of now the management does not think in terms of cutting the cost of these inputs. Instead they cut down the number of labourers or the wages for them. This is because of the fact that they seem convinced about the chemical way of farming and also because there is no clear-cut guidelines from the scientific body or encouragement from the government to try other methods which are sustainable and less costly. Only the big corporates like Tata Tea is trying cutting down on pesticide use because they understand the global trends, are aware of updated scientific practices and can afford to make changes without any external support.

Under these circumstances it is also essential to look into the agricultural policy which subsidizes the chemicals to a great extent. This has made the purchase of pesticides affordable even for the small farmers. This will automatically compel them to depend more and more on pesticides and indirectly discourage them from trying other methods of pest control. Once a farmer starts using chemical pesticides, then he is forced to use more and more of them in each crop and it becomes very difficult for him to turn away from it on his own. This situation – sometimes described as a pesticide treadmill - has led to overuse and misuse of chemicals leading to accidents as well as chronic poisoning, most of which goes unreported or undiagnosed. This is true for India and also true for Kerala. Last year, people of Kerala and the Government heard for the first time about the pesticide tragedy in the cashew plantations in Kasaragod district.

Until then we were really comfortable because we never thought that such a thing could happen in Kerala. Last year four cases of pesticide accidents were reported from Idukki also. Except for some media reports of these cases in the regional newspapers, the follow up action taken by the management or by the panchayath is still unknown and unreported. Since the plantations are going through a great financial crisis these issues get the least attention.

Pesticides are poisonous substances which in the long run can damage the basic systems of survival in human body as well as in the environment. This has been a major point of debate between scientists, industrialists and other people including farmers. Now it is almost evident and for sure that they are hazardous to human beings and the environment. This may be the reason why in the 9th Annual Group meeting of the All India Network Project on Agricultural Ornithology in the year 2000, the Kerala Agricultural University Vice-Chancellor told that there is an urgent need to wean agriculture away from agro-chemicals, on which it depends heavily now. Dr. Awasthi of Indian Institute of Horticultural Research, Bangalore has reported in 1999 that the pesticide residue levels in our food is a reality and almost 100% of our food is contaminated. According to him, maximum exposure of pesticides to consumers has been through vegetables and animal products such as milk and milk products, meat, fish etc.

Dr. A T Dudani, a distinguished scientist and research scholar who has served in various capacities with CSIR, ICAR, ICMR and FAO also has written a lot about the hidden dangers of pesticides as well as about the pesticide policy. His latest work "Alternatives to Pesticides in Tropical Countries" published in 1999 clearly describes how ineffective the chemical way of pest control is.

It is reported that every year there are 3 million pesticide poisoning cases all over the world. This is said to be an underestimation. The Global Pesticide Campaigner has reported that about 25 million people are getting poisoned by pesticides every year and out of this 90% is happening in the developing countries. There are many factors which lead to this situation. But no such studies have been undertaken to analyze these factors, especially in our State. Each poisoning case is handled in isolation. This is one reason why the pesticide poisoning issues are not getting the attention it warrants. Many a time these accidents can be linked to a particular pesticide, a pattern of use, ignorance and such other factors.

Recently many such studies have been undertaken by concerned people including doctors, scientists etc and also organizations to high light the issue and bring it to the government level and international bodies like United Nations. This is not only from the developed countries like United States, European Countries, Australia etc but also from developing countries like Columbia, Philippines, Indonesia, Syria etc. Studies on pesticide

poisoning and community health have actually forced the countries to bring in stricter regulations and restrictions and in many cases banning also. Banning of Endosulfan in Columbia and Philippines is such an example.

The Insecticide Act of 1968 in India was a follow up of the pesticide accident that happened in Kerala in 1958. This accident resulted in the death of 102 people and poisoned around 300 people according to official figures. It is ironical that even after four decades since the accident the official figures of the Government of India on pesticide poisoning in the country show the same figures even though many accidents and chronic poisoning issues have happened since then. Though the Insecticide Act is written with concern for people and environment, at the implementation level a lot of failures have happened. Even when pesticides are reviewed by various committees appointed by the Government of India they do not consider such poisoning cases and human health at large while making decisions. The toxicological data they depend on to review a particular pesticide is based on lab studies provided by the industry which in many cases have been reported to be fraudulent and has been challenged.

The Pesticide Residue Studies done by the All India Coordinated Research Project (AICRP) of IARI has made it clear that there is large scale contamination of water bodies, soil, food and milk in our country.. Even the Holy River Ganges is contaminated with DDT and HCH (Dr. Agnihotri, 1999, AICRP). But all these data has not actually brought out any changes in the pesticide policy of our country. The main reason for this lapse is that these studies are done in isolation and does not actually relate to the health of the people and the environment at large. People are also unaware of these studies and their public importance.

There is no systematic monitoring of health of either the workers of plantations or the community at large in India as also in Kerala. For making any change in the pesticide policy, the community health is a crucial element as shown in many countries. This idea is yet to gain acceptance in the government, panchayaths, people and the plantation management. Many rare and unknown diseases are becoming a reality in Kerala Society, particularly among the people living nearby plantations and also among the workers. People are suffering from loss of immunity. Children are born with physical and mental challenges. What they gain economically through farming and laboring in the plantations is spent for medicines and other health care needs. Recording of pesticide exposure history related to poisoning cases can be a beginning to equip the community to monitor their own health. This will in turn help the panchayaths to plan for long term sustainability in the agriculture and health sectors.

Planning for health and agriculture

Through out the planning process in our country each sector was considered separately and plans were made accordingly. This has had some long-term adverse effects which are very difficult to correct now; especially through short-term interventions. People working in different sectors could not come together so far and discuss over the issues which have some underlying thing in common. Even in the new experiments in decentralized planning going on in Kerala this has not become a reality. This is reflected in the agricultural schemes and other schemes in the Panchayath.

Health and Agriculture are actually two sides of the same coin. It cannot be and should not be dealt with separately. This is especially important in this chemical era because all the agrochemicals are capable of causing one or other problems to human beings and the environment. This has to be taken into account while planning is done at the panchayath level. The panchayath and the health department all should know about the farming practices and what it can do to the people and how it can be addressed and also how to handle an emergency situation like a pesticide accident case. Similarly while planning for agriculture sector, people's health should be given priority along with the concern for productivity. This reorientation will take sometime to materialize. Understanding pesticides, recording poisoning cases, initiating community health monitoring etc can help make this happen. This process will empower both panchayath and people in the long run to take responsible decisions.

What are the problems in modern farming which leads to un sustainability

“Land is life”- peasant women from Philippines

Overuse of natural resources is the basic character of modern farming and the ultimate objective of it is making profit. So in modern farming agriculture is considered as an activity which is capital intensive and the produce is treated as a commodity. The spread of this idea totally changed the basic approach to farming itself, from sustenance and one of sharing to, maximising productivity and fetching good price in the market. In the 70's itself a lot of people predicted the impact of this sort of approach in farming with a total external dependence “the

side-effects of the modern agricultural chemicals and machines raise serious questions about the overall benefits of the new technology. Chemical fertilisers and pesticides pollute our air and water. Agricultural chemicals, leave residue in food that may cause cancer or genetic damage. Soil and energy resources are being depleted. We use non-renewable energy resources to produce artificial fertiliser. In the future we may be forced to make radical adjustments on such agricultural practices.” (Oelhalf, 1978).

Today we truly realise the impacts of the modern farming. Pretty (1995) summarised the environmental impacts as follows.

- ◆ Contamination of water by pesticides, nitrogen fertilizers and manure, causing harm to wildlife and disrupting the ecosystem.
- ◆ Contamination of food and water by pesticide residues and other chemicals.
- ◆ Affect the health of farm workers and general public including children.
- ◆ Depletion of groundwater and loss of wild foods and habitats.
- ◆ Displacement of traditional varieties and breeds.

There are serious social and economical impacts which came out as increasing debts, farmer suicides, labour displacement particularly of women, loss of traditional knowledge and mounting costs of water and other natural resources. Although this has not been studied in all its intricacies, concerns were raised in the eighties and nineties by many people. This resulted in experimenting on ideas like organic farming, natural farming etc. and the whole concept of sustainable development itself.

In 1992 Rio conference provided a frame for the indicators of sustainable development under four categories.

1. Social aspects
2. Economic aspects
3. Environmental aspects including water, land, atmosphere and waste and
4. Institutional aspects of sustainable development.

Among the whole framework agriculture has been given a prime position because of following reasons.

- ◆ Agro ecosystems occupy large areas of land which is far more than any other major activity like industry. The understanding was that hence whatever happens in the agriculture sector can have some environmental effects.
- ◆ The main product of agriculture is food and hence one of the main foundations of human society (Lele, 1991)

Agriculture sustainability has been defined by many people and concepts have been developed. In one concept it is said that agriculture sustainability can be achieved by increasing system diversity and through the development of new farming systems which reduce the external dependence of farmers. (ILEIA, 1992). Internal cycling of nutrients and energy is fundamental to the sustainability of an agriculture system.

One of the most talked about aspect in agriculture today is about its sustainability- economical, social and ecological. During the last two decades world over and especially in the Asian region lot of experiments were started by NGOs, farmers and governments in the agricultural field to make it sustainable. The experience of Green Revolution in most of the Asian countries are quite similar; there was a period of growth in the 70s and later a gradual decline in productivity and an increased incidence of pest infestation and loss of soil fertility and biodiversity. The miracle of high yielding seeds lost its charm among the farmers and some of them actually have started to think about their traditional seeds and knowledge.

They have started analysing the relationship between soil, seed, and knowledge of the farmer. Although these are good trends considering the future of farming, majority are still left out of this process and trying hard to overcome the issues confronting them. This is especially true with small and marginal farmers who are the majority in our country. The situation in Kerala is also not different.

In the eighties many individual farmers had started to analyse the problems of modern farming with the increasing chemical inputs and they started experimenting on other methods of farming based on the practical experience on natural farming by Masanobu Fukuoka in Japan who pioneered in this way long before and developed a model for the world.

These individuals tried and experimented and expanded their fields of activity and formed a collective of organic farmers in the State. They continue to experiment trying to keep the organic integrity at the local level. Still until very recently the government did not take any initiative in promoting this method of farming.

Now there is a sudden euphoria about introducing organic farming in many areas by various agencies. Many of them focus on organic fertilizers alone, rather than on the philosophy and fullness of organic agriculture where the resources are internally circulated and regenerated by the farming system itself.

Few panchayaths in Kerala have shown interest in introducing the idea and practice, to the farmers of respective panchayaths. Venganoor panchayath is one among them. Already they are supporting self help groups of women, and recently individuals, to adopt such farming techniques in their field.

Venganoor panchayath

Venganoor panchayath is situated in the south eastern part of Thiruvananthapuram district . It forms part of the Athiyannoor Block panchayath in Thiruvananthapuram district. The panchayath still maintain a position among the agriculturally important regions within the state. Historically the panchayath is famous for its agricultural productivity and supplying rice and other food materials to the Travancore kingdom. It is also important to note the fact that probably the first strike by agricultural labourers for increased wages was organised in this area by Shri. Ayyankali in the 1920s.

Venganoor panchayath has an area of 12.60 square kilometres and a population of 48830. Density of population is 2840 per square kilometre. According to the topography the panchayath can be divided in to 5 zones. There are 15 wards in the panchayath and the literacy rate is 86.84 percentage. A survey conducted by the panchayath in 1997 showed that there are more than 5000 graduates , above 2500 post graduates and above 2500 professionally qualified people in this panchayath. This shows the human resource richness of the panchayath. According to the survey major occupation of the people in the panchayath is agriculture. About 43 percent are living by this occupation mostly as agriculture labourers and some as marginal and landless farmers. Other main occupations within the panchayath are stone quarrying, cottage industries, coir, construction, trade, transport and communication. The economy of the panchayath is very largely dependent on agriculture including poultry and fisheries. Agriculture is mainly rain fed and the main crops cultivated are coconut, banana, tapioca and vegetables like cowpea, bittergourd, amaranthus and cucumber. Out of 200 hectares(500 acres) of paddy land less than 3 acres is put to paddy.

There is one Krishi Bhavan in the panchayath to help the farmers, Vegetable and Fruit Promotion council(KHDP before) and a Veterinary hospital . There are fertilizer and pesticide dealers and farmers also go to Neyyattinkara to get the materials. For seeds and seedlings farmers are mostly dependent on village markets in places like Aralummood and also Agriculture College, Vellayani under Kerala Agriculture university.

There has been major changes in agricultural practice in the panchayath during the last 35 years according to the 10th plan report of the panchayath. It says that these changes has led to a variety of environmental problems such as drinking water shortage, loss of employment, shortage of hay, labour migration, non-availability of pesticide free food etc.

Venganoor Panchayath once rich in water sources now is under acute water scarcity at least for a period of 3-4 months every year. Water shortage and lowering of water table has become a major issue in the last 3-4 years as told by many farmers, and women.

Both the survey and also the field investigation bring out two major changes which happened over the years, especially during the last decade (1) Conversion of paddy land or elas for other crops mainly banana, vegetables and recently tapioca.

(2) Negligence of the gardenland and homesteads leading to biodiversity loss and hardening of soil.

The study results are summarised in the following chapters.

Water Situation in Venganoor panchayath

“In 1952, according to Planning Commission study 232 villages in India were without any water source. In 2002 this number has increased to 90,000 villages. In 2003, this figure has reached 1 lakh.”

Water is the essence of life on earth. All civilizations in the world were, and are rooted on the availability of fresh water. Agriculture being the base of every human settlement, water is the most important element required for sustaining it. In Kerala, a State which experienced one of the worst droughts in recent times, water is the hottest issue. More than $\frac{3}{4}$ of water used by human is for irrigating crops and hence agriculture was the worst hit in this water erosion. In Venganoor Panchayat, water shortage is the main problem faced in sustaining agriculture. This is a paradoxical situation since the panchayat is endowed with a diverse water resources like wells, ponds, streams, and paddy wetlands. During the last 10-15 years a great change has happened in the agriculture practices in the panchayath with more emphasis on commercial cultivation, that too by marginal and landless farmers. Trying to meet both ends they have literally changed the cultivation and the hydrological cycle, with total dependence on external inputs. This could be one reason for the scarcity of water felt in the panchayath. There are equally important other factors also which have played a role in water depletion.

Terminology

1. Ela:

It is the natural wetland part coming between a horse-shoe shaped elevated part or small hills, and will be the lowest point. The whole watershed area of the ela along with the ela can be considered as a separate unit or micro-watershed, having an independent water regime. The watershed areas of elas are usually steep slopes, the edaphic and biological health of which influences the balance of the ela-system. They are traditionally cultivated with wet rice, with water stagnation for 6-10 months a year. Thus elas act as water reservoirs of the land. Every ela will be associated with a system of ponds, tanks and small streams. Elas are places of tremendous wetland biological diversity including many species with direct economic advantage to the local

people. Along with rice, elas supports the food security of the land with other food items like a variety of fish, crustaceans, colocasia and similar species.

2. Kulam:

'Kulam' is the local name for ponds. The kulams in ela system are usually found in the head part of the main body of the ela or on the head part of the sub-parts of the ela. The kulams are the water reservoirs for the traditional rice cultivation systems of the elas. The kulams are traditionally protected with bunds strengthened with natural lining of strong rooted plant species like pandanus, bamboo, poovarasu (*Thespesia populnea*) and crops like arecanut and coconut. These vegetations and the kulam support rich faunal and floral diversity, including bird species like bitterns, herons, egrets, and water hen. Kulams are having natural water outlets within them which keep on replenishing them. Traditional waterharvesting ponds, which are used to collect rain water and water from streams and other flows are called 'chira', which is also a part of the ela system and often referred in the local parlance as kulams.

3. Oottukuzhi:

It is the local name used to denote natural water outlets or springs, which often gives, rise to streams. The local people often depend on them for their water requirements. They are usually lined by flora as in the case of a kulam.

4. Thodu:

It is a small stream arising from the oottukuzhis or separately from joining of many small springs of water. They collect and drains out the water from the whole water shed area of each ela, into a river, sea or lake. The thodu are perennial and are the essential parts of the ela system as they irrigate the whole ela. The thodu collects almost all the seasonal flows from the higher parts and usually borders the elas. Hence most elas will be having two thodu, with exceptions of large elas like the Venganoor ela having a single thodu fed by many other small streams. Often, thodu are connected by man made devices like shutters or spill ways with every pond and chira of the ela and thus water regulation for cultivation is effectuated. Thodu are also protected and separated from the elas by bunds, which are strengthened similar to the kulam. The thodu is a wonderful source for local freshwater species of fishes like varal and crustaceans, which added to the food security of the region. In this panchayat, all the thodu except the Thuravankonam, Moongottukonam and the Venganoor thodu, flows directly into the Vellayani lake. These three directly flows into the Lakshadweep Sea.

5. Kayal:

Kayal is the Malayalam term used to refer a water body (lake), connected to a sea, i.e. kayal will be a brackish water region, with salt intrusion during tidal periods. But Vellayani lake is not a brackish water source and is the second largest fresh water lake in the state of Kerala. (The Malayalam term for a fresh water lake is '*Thadakkam*'). Vellayani Lake is referred to as a kayal because it is connected to the Lakshadweep sea through a manmade canal connecting the Punchakkari part of the lake to the Karamana river. But there is no salt water intrusion into the lake and is still a fresh water source. This connection was made for facilitating draining out of water from the lake, for paddy cultivation in the lakebed. This was called Kayal-cultivation and was stopped by the government during 1993 period, following a Legislative committee report on the impacts of the cultivation on the locality. But a huge part of the kayal in the Punchakkari has been reclaimed by construction of bunds and is still cultivated with paddy.

Water Bodies

1. Vellayani Kayal (Vellayani Lake)

It is the second largest fresh water lake in Kerala. Wards - 2 (Muttakkad), 4 (Panangodu), 5 (Nellivila) - of the Venganoor panchayat are touching the kayal and kayal is an irrigation source of the panchayat. Now a new irrigation system (Lift irrigation) is being implemented in the panchayat. It is done by lifting water from the kayal by using pumps to the NIP- Canal, for irrigating the areas where the NIP-canal is not able to supply water.

Kayal is not directly used for irrigating crops in the panchayat. But due to the presence of Kayal, wells dug in nearby plots yield water perennially and these wells are utilized for irrigating crops. The crops thus irrigated include coconut, areca nut, banana, vegetables, tapioca and some fruit trees (insignificant)

Vellayani Kayal, being a fresh water source in the main irrigation source of the area. But reclamation of the kayal is posing threat to the existence of the kayal.

2. Neyyar Irrigation Project (NIP) Canal:

Venganoor panchayat comes under the ayacut area of Neyyar Irrigation Project (NIP), which is one of the first irrigation projects in the state. The project served the farmers

for a very short period by giving water at the right time and also providing other inputs like fertilizers and seeds through the Command Area Development Authority (CADA). But discussions with farmers revealed their frustrations about the project. The uncertainty in the flow of water is forcing the farmers to shift from traditional crop like paddy to vegetables, banana and tapioca. Venganoor Panchayath, once famous for its Elasa and rice paddies do not have any paddy cultivation now. This has also led to the poor maintenance of all related water systems like ponds, streams and tanks.

People say that they have not seen water flowing through the Vellayani west branch of the Vizhinjam branch canal for the last 8 years. They told that many of them gave away their land for laying the canal expecting a regular flow of water. Now the canal is just a dumping ground for household waste including plastics. The canal has seriously affected the hydrology of the region, forming a hindrance to both surface and subsurface flow of water. Farmers in the Koliyoor area told that two major farmers of the region, who used to cultivate paddy in the elasa and also other crops in the slopes, using the water from the NIP canal, later stopped cultivation. Since then those two farmers stopped paying for the water and they reported to the NIP that they do not need water any more from the project and this resulted in the stoppage of water flow and the consequent drying up of the canal. This proves itself to be an example of the vulnerability of such centralized water supply systems where ordinary people do not have any control over the decision making process. It is now understood that the Government has started winding up the work of Command Area Development Authority of the NIP, as the objectives of the projects have been achieved and the people in the command area of NIP are already self-sufficient! What will be the impact of this move on the regulation of water through the canal system is yet to be seen.

Vizhinjam branch canal is the sub main canal of the Left Branch canal of Neyyar reservoir. It is (C & P – i). The Vellayani west branch canal starts from the Vizhinjam branch canal near the Venganoor junction and flows through Kalluvettankuzhy, Porodu, Chirayil, Cherukonam & Koliyoor and enters the erstwhile Thiruvallam Panchayat (now under Thiruvananthapuram Corporation limits).

These two canals are main irrigation sources of the panchayat. Water reaches the Panchayat, only when the Left branch canal is carrying water. Usually whenever the Dam reservoir is full and water is allowed, during the peak rainy seasons and during the summer season (used to stay for a month in the earlier times, according to the locals), water reaches the area. Water is available during monsoon times and during summer. But farmer of the area complains that for past few years, the canals are not having water during critical times. In the

Venganoor area farmer say that water is available for less than a week during the summer, that too, only up to Vawamoola area. Water seldom reaches Porodu area. Only after constant agitations and pressures water reaches Porodu. But it would be a lean flow from Porodu onwards the canal is silted, overgrown with weeds. Plastic and other household wastes are being dumped in the canal. Chitazhakulam, Chirayil, Cherukonam and Koliyoor-parts of the canal have not received water for past 8 years.

Farmers say that in earlier times water was available in the canal, even during summer times. Water used to remain in the canal for upto one and a half months. But now both availability and quantity of water has dwindled in the canal. Farmers complain that during critical periods of the crops water is not available. They perceive this situation as a possible result of siltation and capacity of reservoir, poor maintenance of canals and negligence from the part of authorities.

Recently maintenance works are being carried out in the canal under the life irrigation schemes.

1. Kulams (Ponds)

a. Sarkaru Kulam

Location: Ward I (Muttakkad)

Seasonality: Perennial

It is a perennial source of water. It is used by the families in the nearby areas for washing and bathing purposes. It is lined with granite and mortar. There is no natural floral lining. The pond is full of lotus and water lily growth. The pond is not used as a drinking water source. Locals complain that the quarry workers misuse the pond for washing lorries and other vehicle. The kulam was the main source of irrigation in the Koliyoor area, when paddy was practiced. But there is no paddy in the ela and hence over the years the importance of the pond as an irrigation source got reduced and now it is rarely used as an irrigation source. By road widening, the flow alongside the pond was destroyed, which used to supply the water for paddy. This flow was, earlier, joined by a perennial flow from the pond, which is still present but is diverted to a private well on the corporation area (erstwhile Thiruvallam Panchayat). A small tunnel was built, passing beneath the road for taking this flow into the well. This at no cost should be allowed, as it is a

clear case of water privatisation and the public is denied of water rights. The kulam is neglected, but is a potential source of irrigation and is able to provide water for even paddy cultivation.

b. Bund Kulam (Koliyoor – Vavamoola bund)

Location: Ward 2 (Kovalam)

This kulam cannot be counted as a pond, in strict sense. It is a mere extension of the Vellayani kayal. There is no natural lining in the pond. It is not used for irrigation, bathing or any other purposes. It is dumped with plastic waste and is a forgotten pond. It is not having relevance as an irrigation source.

c. Valiyakulam

Location: Ward 3 (Aazhakulam)

Seasonality: Perennial

Valiyakulam is a potential irrigation source for the Chirayil – Cherukonam area. It is a big kulam and is connected to a nearby flow (valiyakulam thodu). The system of connection between the kulam and the thodu is not functioning now. Farmers complain that this system if properly maintained, the pond could be successfully utilized for irrigating the Muttakkad ela. Valiakulam is poorly maintained. It is filled with aquatic plants, algae and silt. Cannot be used for drinking but was once a perennial fresh water source. Nowadays, used by the locals only for bathing & washing. Small seasonal waterways leading to the thodu near the kulam are also in poor condition. People from other places use this pond for washing & bathing, as a result of which the pond is polluted. The pond was in full glory some years back, but now a days during summer the water level goes down.

d. Chirayil Kulam

Location: Ward 3 (Aazhakulam)

Seasonality: Perennial

Chirayil kulam is located near the Chirayil temple. It is a potential water source and is lined by mortar and granite. There is neither any natural plant growth as lining nor any natural floating flora. Pond has over the years diminished in its status, to end up as a mere tank due to this. The watershed area of the kulam is very steep and heavily eroded. The land in the head part of the kulam was observed slid in. The Chirayil pond and Valiyakulam can be used for irrigating the whole Muttakkad ela and if it could be done, paddy cultivation is possible. Now the whole ela is under banana, tapioca and vegetables. The Chirayil kulams feeds a thodu – Chirayil thodu, which is used to irrigate the ela. This thodu along with the Valiyakulam thodu irrigate

coconut, banana, tapioca and vegetables. Vegetables cultivated here includes amaranthus, bitter gourd, snake gourd, ashgourd, pumpkin, cow pea, etc.

e. Aazhakulam

Location: Ward 3 (Aazhakulam)

Seasonality: Perennial

Aazhakulam is located close to the Aazhakulam temple. It is used for irrigating the Aazhakulam ela. In the ela, banana, vegetables and tapioca are cultivated and the kulam is the sole source of water for these crops. But the kulam is poorly maintained. It is lined with cement from all sides. The water in the kulam is of poor quality and is not used by locals for drinking, washing or any other household uses. The main use of this kulam is for bathing cattle and for irrigation of the Aazhakulam ela. A pump is installed which draws water to the harbour. Locals report massive fish death during 2003- rainy season.

f. Porodu Kulam

Location: Ward 4 (Panangodu)

Seasonality : Perennial

The Porodu kulam is not the best maintained source, but is used widely for bathing, washing, bathing cattle, etc. Now the pond is under the threat of being filled up for National Highway – extension. This kulam is the most important reservoir feeding the Panangodu ela. Destroying this pond may have serious impacts on the water availability of the ela. Both the Oottukuzhi are in better condition and is comparatively better conserved. Natural plant & tree growth is there around the porodu oottukuzhi but chittazhakulam oottukuzhi is devoid of any such growth and is facing threat of sliding in of sides. The kulam is a potential source of irrigation for the whole area. The Porodu thodu flowing alongside the kulam is fed by the kulam. The pond can be used to irrigate the slopes of the region, where water shortage is serious. The pond is lined by cement from all sides. There is no natural growth in and around the kulam. Porodukulam is under threat of being destroyed by the highway-extension going on.

g. Vawamoola kulam

Location: Ward 5 (Nellimodu)

Seasonality: Perennial

This kulam is one of the worst maintained and is in extremely poor condition. The Vawamoola thodu flows alongside the kulam and is connected to the kulam. The thodu used to feed the kulam but due to sand mining the level of the thodu dipped from that of the connection tube between the two and thus water is not getting collected in the pond. The kulam is used only for bathing cattle. It is lined by cement and granite and there is no natural growth. The pond is not used for irrigating the area, but is a potential source.

h. Ammanthottathu kulam

Location: Ward 13 (Venganoor)

Seasonality: Perennial.

This is an artificially lined pond. Ammanthottathu kulam is a perennial source of water & is used by the locals. It is lined by granite and mortar & is devoid of any natural flora & fauna. There is a connection to the Chirathavilakom thodu. The kulam is connected to the Chirathalavilakam thodu and is used to irrigate banana, vegetables and tapioca in the ela. The water in the pond is crystal clear, unlike the other ponds in the Panchayat. Pond is the main source for washing and bathing for the locals.

i. Anoor Kulam

Location: Ward 9 (Panayarakkunnu)

Seasonality: Perennial

Anoor kulam is an artificially lined small pond built for irrigating Venganoor ela. There is a pump house near the pond, which pumps water to the upper parts of the slope (Venganoor) for irrigation. Earlier this pond was used for bathing and washing. But later storm water from the nearby road was directed into the pond by storm water drains. After this, people stopped using it for household uses. Now it is used for irrigating banana, vegetables and tapioca in the ela. The kulam is overgrown with algae and floating plants and is and is poorly maintained.

j. Kuryathi Kulam

Location: Ward 9

Seasonality: Perennial

This kulam is also artificially lined and hence there is no natural flora. The kulam was overgrown with algae and flora, but was recently cleaned by panchayat. The kulam is used for irrigation, washing, bathing and bathing cattle. It is one of the major irrigation sources of the Venganoor ela.

k. Mangalasseri kulam

Location: Ward 9 (Panayarakkunnu)

Seasonality: Perennial

It is situated near the Kuriyathi kulam. Mangalasseri kulam is a neglected pond but is a potential irrigation source if properly maintained. Though artificially lined, it is not adequate to prevent washing in of huge quantities of soil. The ponds is silted and overgrown with grass. It is on the brink of destruction. It is only used for irrigating the ela cropped with banana, vegetables and tapioca.

l. Mekkottukonam kulam

Location: Ward 9 (Panayarakkunnu)

Seasonality: Perennial

It is situated in the Mangalathukonam side, about 200 metre from the Venganoor ela. The Kulam is a potential and excellent water source. It is artificially lined from all sides. It is overgrown with floating plants. It is used for washing and bathing and is not used for irrigation. It used to be the main irrigation source of the erstwhile Mekkottukonam ela, which is fully filled and planted with coconut, arecanut, etc. There was a thodu from the kulam which irrigated the whole ela and joined the Venganoor thodu (Vizhinjam thodu). This thodu was later filled up for constructing a road.

m. Mangalathukonam kulam

Location: Ward 10(Mangalathukonam)

Seasonality: Perennial

This kulam is an excellent in source of water, but is not used for irrigation. It is artificially lined out soil is being washed in from all parts of the water shed region. The kulam is full of water lily and other plants.

n. Puthukkulam

Location: Ward 11 – Ward 8 (Chavadinada - Kattachal kuzhi) in the Venganoor ela.

Seasonality: Perennial

Puthukkulam is the largest kulam (4.5 acre) in the Venganoor Panchayat. The Puthukkulam is the largest kulam in the panchayat but is poorly maintained. It is connected to the NIP-Vizhinjam branch- end. The water from the canal is stored in the kulam. The kulam was observed in very poor condition during the study period. A panchayat project for desilting

the kulam has rendered the 4acre kulam waterless. People of the locality were experiencing severe water stress with no water to drink, wash, bath and irrigation. The kulam is lined with rubble and concrete from all the sides and is devoid of any natural vegetation lining.

It is the largest irrigation source is the Venganoor ela, but not utilized well. The pond waters to crops like Banana, tapioca and vegetables.

o. Kattachal Kulam

Location: Ward 11 (Kattachalkuzhy)

Seasonality: Perennial

The Kattachal kulam is in pretty poor state. It is a more or less triangular kulam with concrete lining on two sides. The kulam was a major one in the past and is almost dry. There is no natural growth (flora). There is clear evidence of soil erosion which is bringing in soil to the kulam. The kulam is connected to the ela (Venganoor) and irrigates banana, vegetables and tapioca. But the capacity of the pond is getting low due to the siltation.

p. Marthandam Kulam

Location: Ward 12

Seasonality: Perennial

This is a big pond constructed primarily for irrigating paddy in Venganoor ela. But now the water level in the ponds is very low and water is not reaching the connection to the Venganoor thodu. There is a pump-house near the pond, which is not functioning. The locals complain that it never functioned after its construction. The pond is full of water plants round the year. It is occasionally cleaned up but is not used for irrigation, but is a potential source. It is artificially lined and inside the pond, another lining (another wall) is present, the construction of which doesn't seem to have a positive effect on the agricultural scene of the location.

q. Thuravankonam kulam

Location: Ward 15 (Thozhichal)

Seasonality: Perennial

It is the only kulam on the Kovalam side of the panchayat. Earlier there were three but the other two were filled for commercial uses. Thuravankonam kulam is big and poorly managed. The Thuravankonam kulam is almost a dumping yard. Plastic bottles, covers, etc. are causing trouble. Due to erosion from the 3 sides, during rains, kulam seems muddy coloured. A pumpset is installed near it (1 ½ years ago) for using the kulam for agriculture, but is not yet in functioning stage because there is no power-connection. No natural growth around the pond.

The Kulam is a potential irrigation source, but is not utilised. Now it is used only for washing and bathing.

2. Oottukuzhi

a. Kulavarathala

Location: Vellar area of ward I (*Muttakkad*)

Seasonality: Perennial

This is a perennial source of water for the local people. It is poorly managed, with people bathing and washing polluting the source. It is a potential drinking water source. There is no natural growth around it. It is not having much relevance as an irrigation source.

b. Vellar

Location: Vellar area of ward I (*Muttakkad*)

Seasonality: 8 – 9 months.

This used to be a perennial source but is not so now. It is not a potential irrigation source but can cater to the household needs of people, seasonally.

c. One above Kulavarathala

Location: Vellar area of ward I (*Muttakkad*)

Seasonality: 4 months

This is a rainy season source. Not used for irrigation.

d. Chunakkarippara Oottukuzhi

Location: Koliyoor area of ward II (*Kovalam*) – near Ravindran Nair Road

Seasonality: 9 – 10 months.

It was a perennial source. It is poorly maintained. Lack of annual desilting, natural flora, and degradation of soil in the watershed area have affected the oottukuzhi. It is very shallow due to siltation. Originally it was strong enough to sustain a flow down towards the Koliyoor ela, now it is a weak source and can be used for irrigation of a smaller area, if well maintained. If possible to regain its lost glory, it is an important source for the Koliyoor ela.

e. Cherukonam Oottukuzhi

Location: Ward III (*Aazhakulam*)

Seasonality: Perennial

It is a good source of water. It is artificially lined and protected. Fed by the whole Cherukonam micro-water shed, it caters to the household needs of the people in the locality. Gives rise to a small flow, which later joins the Valiyakulam thodu. It can be used as an irrigation source.

f. Porodu Oottukuzhi

Location: Ward IV (*Panangodu*)

Seasonality: Perennial

A good source, having natural lining and is a source feeding the Porodu thodu. It is to be protected for the well being of the Porodu thodu and is an important source for a limited area. But the Porodu thodu is a major irrigation source; so this Oottukuzhi is very significant for the agriculture in the Panangodu ela.

g. Chittazhakulam

Location: Ward IV (*Panangodu*)

Seasonality: Perennial

A good perennial water source; given rise to Chittazhakulam thodu which feeds the Panangodu ela. But is not well maintained. There are chances of caving in of banks and needs natural reinforcement. It is directly an important water source for the locals and a very important irrigation source.

h. Kaipallikkuzhi

Location: Ward 14 (*Kalluvettankuzhy*)

Seasonality: Perennial

It is an important perennial water source. It feeds the Panangodu thodu (Porodu & Kumbiliyodu). But the watershed area is eroded and has less water holding capacity. This oottukuzhi still has natural lining of *Pandanus sp.* But is polluted by people directly entering it for bathing and washing using soaps and detergents. It need to be properly maintained considering its significance as an irrigation source.

i. Vawwamoola

Location: Ward 5 (*Nellivila*)

Seasonality: Perennial

Powerful and good water source. It perennially feeds the Vawwamoola thodu. It is because of this oottukuzhi, that the thodu flows round the year. It is artificially lined and protected. Is significant for the irrigation of the Vawwamoola ela.

j. Nedinjil

Location: Ward 5 (*Nellivila*)

Seasonality: Perennial

It is a powerful oottukuzhi and is always in full glory. It resembles an artesian well in its outburst (throughout the year irrespective of season), and is easily the most powerful ootukuzhi of the panchayat. Water gushes out and flows towards Nedinjil ela. But is the most poorly maintained Oottukuzhi. People directly enters the Oottukuzhi for bathing and washing. It is polluted and is with no natural lining. If well maintained it could be used to irrigate some area. The watershed region is under poor maintenance, with poor soil condition and water holding capacity.

k. Nedinjil 2

Location: Ward 5 (*Nellivila*)

Seasonality: Perennial

Closely situated and similar is condition to Nedinjil 1 – Oottukuzhi; bad in condition. It is completely silted and overgrown with grass and other plants. It is severely misused and is having no natural growth.

l. Nedinjil 3

Location: Ward 5 (*Nellivila*)

Seasonality: Perennial

This is a small oottukuzhy but is well protected and small flow originates from it, flowing towards Nedinjil ela. It caters to the needs of the locals. But there is no natural protection. People pollute the source by bathing. It is significant as an irrigation source.

m. Kumili

Location: Ward 6 (*Venniyoor*)

Seasonality: Perennial

It is a small Oottukuzhi poorly maintained. It feeds the pumphouse central thodu. It is significant as an irrigation source.

n. Mangalathukonam

Location: Ward 10 (*Mangalathukonam*)

Seasonality: Perennial

Originating near the Mangalathukonam kulam, it feeds the Mangalathukonam – Kattachal thodu in rainy season. During summer it is a bathing and washing source of water to the locality. It is artificially lined and protected.

o. Venniyoor No. 2

Location: Ward 13 (*Venganoor*)

Seasonality: Perennial

This is a neglected small oottukuzhi situated in between some houses upstream of the Ammanthottathu kulam, near the Chiruthalavilakam thodu. It gives rise to a small and perennial flow feeding the thodu; cannot be directly used for irrigation. But is important for the ela (Venniyoor) and should be protected immediately.

p. Venniyoor no. 3

Location: Ward 13 (*Venganoor*)

Seasonality: Perennial

It is a perennial, small oottukuzhi feeding the Venniyoor thodu and is almost destroyed. The oottukuzhi is shallow nad needs immediate attention.

q. Chirathalavilakam

Location: Ward 13(*Venganoor*)

Seasonality: Perennial

It is a very important oottukuzhi and it gives rise to the Chirathalavilakam thodu. It is a very important source as it is useful to irrigate the Venniyoor ela. But is in bad condition – siltation, lack of natural growth, etc.

r. Kumbiliyodu

Location: Ward 14 (*Kalluvettankuzhy*)

Seasonality: Perennial

It is an important source, giving rise to the Kumbiliyodu thodu, which later joins the Porodu thodu, forming Panangodu thodu. The Oottukuzhi is powerful and is perennial. It is also in neglected state. It is an important drinking water source and is used for supplying water, a

solar – powered – pump is installed and water is pumped upwards to feed the drinking-water-pipeline – system.

3. Thodu and Other Flows

a. Kulavarathala flow

Location: Ward I (*Muttakkad*)

Seasonality: Perennial

This is a small stream flowing towards the sea. The extension of the bypass road has obstructed the original hydrology of the area and has disturbed the natural course of the flow. The low is passing through a colony and is not used for irrigation. This is not a potential irrigation source, as there is no cultivable area along its short flowing track, of about 100 metres.

b. Sarkarukulam flow

Location: Ward I (*Muttakkad*)

Seasonality: Perennial

This flow is originating from the Sarkarukulam and is completely diverted into a private well on the Thiruvananthapuram corporation-side (erstwhile Thiruvallam Panchayat). For this purpose, the owner of the well has constructed a tunnel beneath the road, and the water is completely utilized for private use. This flow was once a good thodu, which fed the Koliyoor ela. But due to the construction of the road along the ela, the thodu was filled up. The thodu was joined by seasonal flows (4 months) from upper side (present K.S. Road). But construction of road, quarrying in the upper reaches, etc has seriously disturbed the hydrology of the area. The surplus water (above the diverted volume) in the flow is diverted into near by coconut plantation (planted by filling up the head part of the Koliyoor ela.)

c. Chunakkarippara flow:-

Location: Ward II (*Kovalam*)

Seasonality: 2 months (only during rains)

This was a better flow, with 9-10 months seasonality, but due to many reasons the flow is lasting only during rainy days and is almost a storm water drain now. The flow starts from the Chunakkarippara oottukuzhi. Earlier (before the construction of NIP canal) a seasonal flow (4-5 months) from Mullanvazhy region near the K.S. Road used to joint this flow, but after the NIP canal came, this flow got stopped. This flow is not an irrigation source, but it carries storm water

to the Koliyoor thodu, which irrigates banana vegetables and tapioca in the ela. The flow was worst hit by road widening.

d. Koliyoor Thodu

Location: Koliyoor ela - Ward I (*Muttakkad*)

Seasonality: 9-10 months

This thodu is the irrigation source for the Koliyoor ela and is formed by joining seasonal flows and Sarkarukulam flow. This was a perennial flow and was earlier joined by Chunakkarippara flow.

e. Valiyakulam thodu

Location: Ward III (*Azhakulam*)

Seasonality: Perennial

It is flowing from near the Valiyakulam and is joined by the flow from the Cherukonam ootukuzhi. Cherukonam flow starts from the cherukonam oottukuzhi, and joins the Valiyakulam thodu. This thodu irrigates the Muttakkadu ~~da~~ along with Chirayil thodu. Chirayil thodu later joins the Valiyakulam thodu. This thodu lacks natural lining but has fish population. The thodu enters the tail part of the ela where the ela has been converted into coconut plantation. This thodu is joined by a seasonal flow (1 month during rainy season). There are chances of sliding in of banks.

f. Chirayil thodu

Location: Ward III (*Azhakulam*), Ward II (*Kovalam*)

It starts from the Chirayil kulam, and feeds the Muttakkad ela. But chirayil thodu is completely diverted to irrigate banana and vegetables of the ela. It later joins Valiyakulam thodu, near the Muttakkad-Koliyoor road. The natural route of the thodu remains dry and is overgrown with grass and other plants.

g. Panangodu thodu

Location: Ward 14(*Kalluvettankuzhi*); ward 4 (*Panangodu*)

Seasonality: Perennial

This thodu is formed by two flows.

- a. Porodu flow.
- b. Kumbiliyodu flow

Porodu flow starts from Porodu oottukuzhi and Kumbiliyodu flow from Kumbiliyodu oottukuzhi. Both flows are in bad condition with banks caving in, erosion and absence of natural

lining like pandanus or even ferns. Porodu flow is also fed by porodu kulam; but the connection, due to poor maintenance, is not functioning. The flows and the Panangodu thodu are artificially lined.

h. Chittazhakulam flow

Location: Ward 14 (*Kalluvettankuzhi*).

Seasonality: Perennial

This flow is a perfect example of a destroyed thodu. This was one of the two thodu. (the other being Panangodu thodu) in the Panangodu ela. Later it was reclaimed, by filling up, for constructing the RKN road alongside the ela. Thus the water flow, which originates from Chittazhakulam oottukuzhi, started flowing through the ela and is much diverted off its original route for irrigating banana, tapioca and vegetables.

i. Nadayil flow

Location: Ward 4 (*Panangodu*).

Seasonality: 9 – 10 months.

Nadayil flow starts from the location of the erstwhile Nadayil kulam. It flows most of the year, except during peak summer. It was a perennial flow 10-15 years back. It joins the Chittazhakulam flow and is important in irrigating Panangodu ela.

j. Vawwamoola thodu

Location: Ward 5 (*Nellivila*).

Seasonality: 5-7 months.

This thodu starts from the head part of the Vawwamoola ela, above the Vawwamoola kulam. It is connected to the kulam such that whenever there is fbw in the thodu, the kulam gets water and thus is stored. But due to sand mining in the thodu, the level of the thodu has gone down to such an extent that water level of the flow went below the connection tube and water cannot reach the kulam. This has resulted in low water levels in the kulam and thus water cannot be used for agriculture. This thodu is fed by the Vawwamoola oottukuzhi. The thodu is completely diverted into private property (made by reclamation of the lake) and lacks flow in its natural route.

k. Pump house central thodu

Location: Ward 6 (*Venniyoor*); ward 13 (*Venganoor*)

Seasonality: 11 months

This thodu was a perennial source of water feeding the Venniyoora ela. Originating from behind the Kumili pump house, (ward 6) it enters ward 13 (Venganoor) and joins the Chirathalavilakam thodu. It irrigates banana, vegetables and tapioca in the ela. The thodu now runs dry possibly due to the drawing of water by the Kumili pump house. The thodu is also fed by an oottukuzhi behind the pumphouse.

l. Mekkottukonam flow

Location: Ward 9 (*Panayarakkundu*)

Seasonality: 9 – 10 months.

This is another example of destruction of a perennial thodu for construction of road. (Mangalathukonam to Venganoor Junction). The whole Mekkottukonam ela was reclaimed and converted to coconut plantation 15 years back; but still the Mekkottukonam thodu was flowing which was later filled and road built. Thus the flow started running into the ela and was diverted much to irrigate coconut.

m. Mangalathukonam (*Kattachal*) thodu

Location: Ward 10 (Mangalathukonam) & 11 (*Kattachalkkuzhi*)

Seasonality: 4 months

This flow was a perennial one when Mangalathukonam ela was a wet land under paddy cultivation. Now it flows only during rainy season. It starts from the Mangalathukonam oottukuzhi, and it flows towards Venganoor ela. The thodu lacks flora and fauna and is severely eroded at Kattachal part.

n. Venganoor thodu (*Vizhinjam thodu*)

Location: Ward 9, 10, 11, 12.

Seasonality: Perennial

This is the longest thodu in the panchayat. It enters the Venganoor panchayats from Pallichal Panchayat and drains Pallichal, Balaramapuram, Venganoor and Vizhinjam and flows into the Lakshadweep Sea through the Vizhinjam fishing harbour. It is collecting flows from Bhagavathinada, Plavattu, Mekkottukonam, Mangalathukonam and from parts of Vizhinjam Panchayat. It is indirectly connected to Plavattukulam, Bhagavathinada kulam (Pallichal) and 8 kulams in Venganoor Panchayat – Mangalasseri, Kuryathi, Aanoor, Mekkottukonam, Mangalathukonam, Kattuchal, Marthandam kulam and Puthukkulam.

The thodu is artificially lined all along its path. This prevents natural growth; but the thodu is overgrown with colocasia (a wild relative of the cultivated species), and other plants and grasses. Having a stream lined flow, the thodu is poorly maintained.

Formerly this thodu along with the kulams, irrigated the whole Venganoor – rice growing – ela. But now it is a narrow lean flow and for the first time in the memory of the farmers of the locality was completely dried up during the drought of 2004 (February – March).

o. Moongottukonam thodu

Location: Ward15 (*Thozhichal*).

Seasonality: Perennial

This is the only existing thodu in Thozhichal panchayat. It starts from a private coconut plantation near the Malankuzhy quarry and flows into the Kovalam Tourist area (Vizhinjam Panchayat) near the Vaikkol kulam (Vizhinjam panchayat). The water level in the thodu fluctuates depending on the water exploitation from a big well situated on the head part of it, which is owned by a farmer. The thodu is joined by 2 seasonal (4 months) flows. Moongottukonam thodu is one of the most diverted thodu the panchayat. The natural route is destroyed in some parts due to

1. widening of the nearby road.
2. sliding in of banks due to lack of lining.

The water flow enters a private coconut garden and rejoins the normal route later. This thodu is under the threat of being filled up for road construction. It now irrigates Thozhichal ela, which is under banana, tapioca and vegetables.

p. Thuravankonam flow

Location: Ward 15

Seasonality: Perennial

It starts from a private coconut plantation and is joined by a seasonal (6months) flow from Thuravankonam kulam. It was a big thodu but was filled up for road construction, and it almost completely disappears into private land and now faces the same problems of other such thodu.

Problems Faced by the Water Sources

Specific problems:

A. Thodu

1. Diversion into private lands

The diversion of thodu is a common scenario in the panchayats. Moongottukonam thodu, Chirayil thodu, Chittazhakulam flow, Mekkottukonam flow, etc, are at some point or other being completely diverted into respective elas for irrigating banana, vegetables and tapioca. The Sarkarukulam flow is completely diverted into a private well. This kind of diversion destroys the natural route and ecology of the flow. This also results in disturbing the streamlining of flows and thus stops the flow from reaching tail ends of the elas.

2. Lack of natural lining and caving in of banks

The banks of thodu used to have natural lining of plants like pandanus. This is lacking. Most 'thodu' are lined artificially with granite and cement. This destroys the ecology of thodu by preventing growth of plants and thus affecting flora and fauna of the thodu. Indirectly it results in erosion underneath as no roots of plants are present to hold to soil. Caving in of banks happen at many points.

3. Construction and widening of roads

This is the most important reason of destruction of thodu. Many thodu are completely destroyed – Mekkottukonam thodu, Sarkarukulam thodu & Chittazhakulam thodu. The unscrupulous widening of road by filling up thodu is seen as a common and easy way. The Moongottukonam thodu is the next victim, as the locals discuss the prospects of making a road by filling the thodu up. Filling up of the other thodu has created difficulty in irrigating the fields.

4. Dumping of Plastic Waste

It is found everywhere. Plastic covers, toys, bottles, etc, are found clogging the natural routes of the thodu, polluting the water sources and thus posing threat to the environment.

B. Kulam

1. Lack of Natural Lining

There is no natural growth along the sides of the bank. All the ponds in the area are artificially lined. Lack of plant growth like pandanus, bamboo, etc. has destroyed the chances of

natural regeneration of the pond. Absence of natural lining, prevents chances of holding soil together and also causes soil being washed in by rainwater. This ensilts the water sources and also results in polluting the sources.

2. Poor Maintenance

The ponds are poorly maintained. Many ponds are silted due to washing in of soil by rainwater. Lack of natural growth, which could act as natural barriers, to washing in of soils, adds to this. Mangalasseri kulam is a typical example. Marthandam kulam, kuryathikulam, valiyakulam, Mekkothukonal kulam, etc. are overgrown with grass and other plants. Aazhakulam is severely polluted by washing in of pollutants from the road also. Washing and bathing using soaps and detergents, bathing cattle, etc. also pollutes the pond and increase the algal growth.

3. Dumping of Plastic Waste

Plastic covers, bottles, foot wear, containers, toys, etc. are being dumped into the pond.

4. Poor Water holding Capacity of the Water shed Area

The watershed areas of the elas are having poor waterholding capacity. There is less soil cover due to monocropping of coconut, tapioca and also fallowing. Soil is left exposed to agents of erosion and hence water is not given time to infiltrate and percolate down into soil and this causes poor recharge of subsoil water table.

C. Oottukuzhi

It faces all the problems faced by ponds Oottukuzhis are the potential fresh water (Drinking water) sources. But people pollute these sources by directly entering them for bathing and washing. Use of soaps, detergents and other toiletries are problematic to oottukuzhi.

D. Vellayani Lake

The main problem faced by the kayal is reclamation. People reclaim the kayal by indirectly filling it up or by planting coconut trees and then slowly filling up the space in between. Venniyoor, Muttakkad, Chunakkari, Vawwamoola – areas have seen reclamation of kayal. The formation of bunds along the kayal might have also disturbed the eco system. Fishermen of the area complain of fish deaths, decrease in fish population – of karimeen, varal, etc. over the years. The natural growth along the banks are being replaced by coconut. But wherever coconut was planted to reclaim kayal, the trees yield poorly; most of them are non-

yielding with pencil-tip symptoms and retardation of growth. Destruction of natural flora and fauna has affected the bird population of the kayal. Absence of natural plant growth prevents nesting of birds and disturbs fish population. Farmers recall the occurrence of large number of egrets and herons in the area, which over the years have reduced in numbers.

10 years back part of the lake used to be dewatered and cultivated with paddy. In 1993, the state government decided to stop kayal-paddy, following the K.P.Noor-ud-din committee report. Pollution of the lake from pesticides was one of the major reasons behind such a decision. But still pesticide-contamination of the kayal continues, by washing in from all the panchayats in the watershed.

Common Problems faced by Water Sources

1. Artificial Lining of Sources

All the 'kulams' and many 'thodus' in the panchayat are artificially lined with cement. It is harmful to the sources in 2 aspects.

- a. It prevents natural growth. Had there been plant growth on the periphery, the roots would have held the soil. Under the artificial lining, especially in thodu, the flow undermines the lining, causes erosion and the lining and sides collapses destroying the natural route and in some cases completely diverting the thodu. (e.g. Moongottukonam thodu). Lack of natural lining causes washing in of soil.
- b. It prevents proper and timely maintenance. Whenever maintenance is required, people tend to depend on panchayat authorities to do it. As the inputs like granite, cement, sand, implements and skilled-labour are needed for repair, it is expensive. So farmer or other local people hesitate to do it. If the lining were natural, any farmer would have easily maintained/repared it. It is impossible for any local self Government to incur expenditure for repairing lining of every local water source. The planners and the locals still tend to believe that artificial lining is inevitable for the protection of water sources. Complicating and jeopardizing local practices and decision making and disrupting natural systems are the main disadvantages of artificial lining. It is a case of wastage of public money, time and environmental destruction.

2. Lack of community based/co-operative systems for maintaining and controlling water sources.

3. Reclamation of

(a) Water sources

(b) Ela – paddy wet lands – for coconut plantations and construction purposes. Paddy lands being water reservoir, their destruction seriously affects the water regime. Farmers have started connecting the declining water levels with the destruction of paddy lands and absence of rice cultivation.

Reclaimed Water Sources

A. Pond

In the panchayat, 4 kulams were reclaimed over a period of 15 years.

B. Nadayil kulam

This was located near the RKM Road near the Panangodu ela. (Ward 4). It was reclaimed for some unknown reason. The area was then planted with coconut. The kulam was an irrigation source for the Panangodu ela. A small flow (Nadayil flow) flows alongside this location. This was a perennial source, but after the kulam was destroyed, this flows for only 8-9 months.

C. Kallukulam

This was located on the Thozhichal area (ward – 15). This was also reclaimed and a house was constructed on the place.

D. Thuravankonam cheriyakulam

This was an irrigation source for Thozhichal ela (ward 15). This small pond was filled and an ‘Anganwadi’ was built by the panchayat.

E. Small kulam at the start of the Pump House Central thodu (ward 6.)

Some locals recall the presence of a small kulam, reclaimed 10-15 years back.

F. Thodu

1. Mekkottukonam thodu
2. Chittazhakulam thodu.

3. Sarkarukulam thodu.

All these thodu were reclaimed for constructing road. The escalation of land-prices by the construction of a road pushes the people to support construction of new roads, even by destroying water sources. This reason, along with vested interests, results in destruction of such precious water sources. These thodu have declined into small flows and much diverted now into private lands.

Water Sales

Drinking water shortage is a prevalent reality in some parts of the panchayat and also in nearby panchayat of Vizhinjam. On the other hand water is available round the year in the ela regions and areas nearby the Vellayani lake. Some people exploit this imbalance in water availability in the panchayat. Water is being taken in tanker lorries, lorries with synthetic tanks fixed, etc., by drawing from areas with no or comparatively less water shortage and being sold in areas having acute water shortage. Water is drawn round the clock from below mentioned areas.

- a. Kayal region:- Atleast 2 points at Chunakkari (koliyoor) part of the lake.
- b. Muttakkad:- From 1 point near the Muttakkad ela from a large well under private ownership.
- c. Panangodu:- From atleast 2 points at Panangodu ela and nearby points.
- d. Venniyoor:- From 1 point at the end of the road leading from Venganoor Junction towards Venniyoor ela.

Impact of Water-Drawing

Exploitation of water from these sources have serious impacts. Lorries work all the day. People complain serious dip in ground water levels. Wells in the regions adjacent to the water-exploitation-points starts drying up during peak exploitation. Even near the kayal, in Chunakkari, farmers complain of depleted water levels.

Moreover it is a case of privatisation of water resources, which has not yet found a place in the agenda of the local self government.

People united and agitated in Muttakkad and Panangodu regions of the panchayat and curbed the water exploitation. But this didn't succeed in Chunakkari region.

Suggestions

- a. Water being public property all the water sales by private parties in the panchayat should be banned.
- b. Over exploitation of water sources should be curbed.
- c. Panchayat should arrange for drinking water for areas with water shortage; this should be done without exploiting and causing damage to water table of any other part of the panchayat.
- d. Panchayat authorities should explore the chances of soil and water conservation, improving the recharge of groundwater table and water harvesting.
- e. Panchayat should organize a committee for ensuring fresh water – Drinking water in areas of water shortage. The committee should work in cooperation with respective watershed users associations and ensure water availability. The committee should appoint ‘water – monitors’ (‘Jala – Samraskshakar’) in each area, to coordinate the activities.

Quarries

Granite Quarrying and crushing are one of the major income generating activities in the Panchayat. Many people are employed in this ‘industry’. Especially in Ward I (Muttakkad), there are 20 quarries (medium sized and small) most of which are abandoned. 5 quarries are still active. These activities have destroyed the geography, hydrology and ecology of the area. Local people complain that granite quarrying has destroyed any chances of agriculture in the area. Huge quantities of water get collected in the quarries, which otherwise would have added to the ground water level and also a part flowed down into the elas (Koliyoor and Muttakkad) and thus useful for agriculture. Accessing these quarry-water bodies is difficult. Most of such ‘granite water tanks’ are under private ownership and they are hesitant in diverting water downwards. Water can be pumped or tunnelled downwards and used for agriculture. Occasionally, this was done during summer time.

Quarrying might have seriously affected the hydrology of the area. More deep and scientific studies are necessary to assess the impact. Quarrying, along with the NIP canal have serious impact on the Muttakkad and Kovalam wards.

The largest quarry (abandoned) in the panchayat is in the Thozhichal ward (Ward XV). It is called ‘Malankuzhy’. It contains huge quantities of water.

All the quarries pose threat to the villages. Swimming or even entering these tanks are dangerous.

Suggestions

- a. Prevent/Ban all quarrying activities in the panchayat.
- b. Conduct a detailed geological & hydrological study to assess the impact of quarrying and scope for re-establishing the hydrological balance.
- c. Action must be taken by the panchayat regarding the management of water in these quarries. Panchayat should acquire all these tanks and make them public-property. Pumping down or tunneling of the water, for irrigation should be done, based on the study results (as per suggestion no.2).
- d. Any action that changes the landscape-quarrying, soil-sales, demolition of elevated land, etc. should be curbed.

Plastic Waste and other garbage

In the survey conducted, plastic waste was found to be one of the major threats. Plastic covers, PET Bottles, disposable plastic cups, plates, foot wear (PVC Synthetic and Leather), other plastic wears like shampoo bottles, laminated covers, medicine bottles and containers were observed in the water sources and farmlands across the panchayat. Plastic soap dishes, PVC toys, soft toys, liquor bottles, parts of motor vehicles, plastic cans (synthetic lubricant oil, paints, varnishes and others) plastic pens, refills, cell-torches, cloth hangars and clips, plastic flowers and other decorative items were found scattered all over the water bodies of the panchayat. But plastic covers and PET bottles were the most common. Plastic covers have contributed significantly to clogging of water bodies, preventing infiltration. It also poses threat to cattle and animals drinking water, make the water bodies look filthy and dirty, and pollute water by leaching out of toxics and cause physical difficulties in cultivation. Farmers and locals complain that outsiders dump plastic waste on to ponds and water flows. People tend to evade from taking on the responsibility and blame each other. But talking to farmers makes it clear that everyone uses and disposes off plastic covers into the environment, especially those covers available in the market for Rs. 0.50 & Re. 1.

Moreover the use of plastic cover in agriculture is on the rise. Plastic is used in covering fruits and vegetables (bitter gourd, snake gourd, cucumber, pumpkin, ash gourd, banana, guava, mango, etc.) to protect them from fruit fly (*Dacus Sps*), to prevent contact with soil (pumpkin,

ash gourd, jack, cucumber), to protect from sunburn (banana). Plastic covers, synthetic audio and videotapes, etc are used to scare off birds and bats. After single use (1 crop) these plastic materials can be found lying in the field itself; some reaching the water bodies.

Thus both household and agricultural usage of plastic goods are creating damage and obstruction to water bodies and agriculture. Villages testify that the usage of plastic in a modern trend and was not common 3-4 years back. For covering vegetables and fruits newspaper covers were used earlier. Banana leaves were used to cover a banana bunch. According to the farmers, the incidence of fruit flies has increased nowadays, attacking guava and banana, creating troubles. So farmers are using plastic covers in a large extent.

Suggestions

- a. Monitor and regulate plastic use in the panchayat.
- b. Ban the use of plastic covers, plastic disposables in the panchayat.
- c. Prevent dumping of plastic waste in the panchayat, especially in the water sources.
- d. Panchayat should explore possibilities of ecologically suitable alternatives to plastic.

Suggestions to improve/sustain water sources of the Panchayath.

1. Community based water management should be implemented.
 - a. Identify micro water sheds in the Panchayat
 - b. Form '**Micro-watershed-users-associations**' – people living in each micro water shed should be made aware of the watershed concept, presence and importance of watersheds and associations should be formed including people from various sector of the society (Farmers of each micro watershed should be given preference). The control and use of water resources – maintenance and repair, desilting, water control, ensuring vegetative cover in the watershed, soil and water conservation methods in the water shed, decisions on cropping system on the watershed and monitoring the water regime from being exploited by private parties – should be carried out by the association, ensuring community participation.
2. Implement watershed management practices in the watershed area.

3. Protect the water sources using natural plant growth/lining – plants like pandanus, Bamboo, tree species, etc. should be used which can strengthen the periphery and prevent soil being washed in.
4. Prevent diversion of thodu.
5. Avoid artificial lining of water sources.
6. Prevent water sales and over exploitation.
7. Waste, automobile waste, bathing, cattle, etc. Avoid polluting water sources – soaps, detergent, plastic
8. Control sand mining from the thodu.
9. Prevent unscrupulous widening and construction of roads by destroying water sources.
10. Prevent reclaiming water sources, ela, and kayal.
11. Prevent crops causing heavy soil erosion – monocropping of coconut and tapioca – in the watershed area.
12. Prevent planting of foreign tree species like *Acacia auroculiformis*, *Eucalyptus* sps, *Hevea braziliences*, etc.
13. Monitor and control chemical use in the watershed area – pesticides, chemical fertilizers, industrial chemicals, plastics.
14. Prevent destruction of landscapes – quarrying, soil-sales, etc.
15. Conduct ecological/ Biodiversity studies in Vellayani kayal to assess its status and explore the scope of improving it.

Agriculture and Cropping Systems

*“Loss in paddy area is opportunity lost in ground water recharge too”- Sunita Narain,
Down-to-Earth*

Ela

There are 8 elas identified in this panchayat with a total area around 200 ha.

1) Chunakkari (Koliyoor ela)

The head part and the kayal part of the ela is already reclaimed to coconut plantations. The ela is having banana, tapioca and vegetables as crops.

2) Muttakkad ela

The kayal part of the ela has been reclaimed and planted with coconut. The crops are tapioca, banana and vegetables.

3) Panangodu ela.

The kayal part of the ela, below the Pananagodu-Venganoor road is completely reclaimed for coconut formation.

4) Aazhakulam ela (smallest ela; comes to about 2 acres below the Azhakulam)

This ela was under rice like all other elas in the area, but is partly reclaimed for coconut and the wet land remaining is under banana and vegetables.

5) Venniyoora ela.

It is still a good and potential ela, though the kayal part of it is completely converted for coconut. The trees thus planted present a pathetic scene of stunted growth and are not at all bearing. Kayal in the area has also been reclaimed for coconut.

6) Vawwamoola ela

It is a small ela with only tapioca, banana and vegetables as crops. The kayal part has been converted for coconut.

7) Venganoor ela

It is the largest ela, only part of which comes in the panchayat. It extends to the Pallichal and Vizhinjam panchayats

8) Thozhichal ela

This ela is partly converted to coconut and is in poor state. The ela is an extension of a larger ela, including the Kovalam ela, which lies in the Vizhinjam panchayat.

Crops and Cropping Systems in ela

1. Rice:- Present only in Panangodu, Venganoor and Venniyoor elas that too not more than 1 acre (total)

a. Rice – Cowpea is the only rotation.

2. Banana: dominates the elas when water is available.

a. Banana – vegetable mixed cropping – amaranthus and colocasia being the vegetables used

b. Banana – vegetable rotation – cowpea, snakegourd and bittergourd are the rotation vegetables used.

c. Banana- tapioca rotation.

Banana varieties used

1. Robusta and dwarf Cavendish group
2. Nendran
3. Njalipoovan
4. Palayamkodan
5. Red Banana

3. Coconut:

Mainly by reclaiming elas – Muttakkad, Venniyoor, Koliyoor and Panangodu.

It is monocropping of coconut and is heavily irrigated. Most of such plantations are poor yielders. The majority of coconut trees in the kayal part of the reclaimed elas are stunted with no yield at all

4. Tapioca:

Dominates the elas along with banana. Needs less water and hence is preferred in summer times, as there is no need for water management.

Varieties: 1. Gandharippadappan.

2. M-4.

These three dominates the scenario.

5. Vegetables

- (i) Snake gourd
- (ii) Bitter gourd
- (iii) Amaranthus
- (iv) Coccinia
- (v) Bhindi/Okra
- (vi) Solanaceous crops – Chilly, Brinjal
- (vii) Pumpkin
- (viii) Ash gourd
- (ix) Melon/Cucumber

Crops in Higher area/slopes

1. Coconut:

West Coast Tall variety is the most popular one.

- (i) Coconut monocrop:- This is the most prevalent cropping system in the whole panchayat. Only coconut trees are present with interspaces dominated by *Eupatorium odoratum* and such woods. The landowners, many are absentee landlords, given an annual ploughing just before the monsoons. This renders the soil exposed to the rainwater and is washed off. Thus soil, depleted over the years, become conducive for the *Eupatorium* to grow. All wards in the panchayat have coconut monocropping. This kind of cropping in slopes has resulted in extremely poor soil condition. The lateristic soils, exposed to sunlight, water and wind, is depleted of its fertility and is having very poor water holding capacity. Rain water gets less time to percolate and infiltrate and is flowing down causing severe soil erosion. Sheet and hill erosion in monocropped coconut gardens are evident all along the panchayat. This affects the perennial-nature of the water sources of panchayat.
- (ii) Coconut – Banana intercropping

It is done in patches in the panchayat. The Banana varieties used are Robusta, Red Banana, Cavendish group, Nendran, Palayamkodan and Njalipoovan. Njalipoovan and palayamkodan are widely used.

(iii) Coconut – Tapioca intercropping

Tapioca is considered a very popular intercrop in coconut gardens in most parts of the panchayat. Continuous inter-cultivation with tapioca has rendered the soil poor by exposing them to erosion.

(iv) Coconut – Black pepper

It is observed in many parts of the panchayat, but still not a popular system.

(v) Coconut- Banana – Vegetables

(vi) Coconut – Vegetables

(vii) Coconut – Arecanut- Banana

This was observed in the reclaimed elas, especially in the Thozhichal ela.

2. **Monocrops**

Tapioca: Tapioca is monocropped in many parts of the panchayat in patches, mostly in the slopes. It was observed in the slopes below the NIP-canal in the Chittazhakulam area and also in Mekkottukonam region. The land is left fallow after the crop. This practice has seriously affected the soil health of the plots.

3 **Other Cropping Systems and crops**

a. Homestead system.

b. Betel wine (i) in homestead

(ii) As a part of coconut based systems.

Both are very rare to locate in the panchayat. This crop needs very good management and care, but is remunerative. But betle vine is not a popular crop in the area.

Recommended Micro and Macro watershed for undertaking soil and water conservation activities.

A. Those Draining into Vellayani Kayal

1. Koliyoor (Chunakkari)
2. Muttakkad
3. Panangodu
4. Venniyoor
5. Vawwamoola.
6. Nedinjil.

B. Those draining directly into the Lakshadweep Sea

1. Vellar (into samudra –beach area)
2. Venganoor (into Vizhinjam harbour area) Mekkottukonam, Mangalathukonam.
3. Thozhichal (into Kovalam-Eve's Beach area.)

The watershed area of the panchayat is of a common agricultural pattern and faces similar problems. The whole area is heavily dominated by coconut and open spaces are very few. The watershed area is steep slope and due to poor management of the area, the soil has depleted considerably. The area is facing serious problems of soil erosion and soil is very poor in structure and fertility. Soil is naturally laterite, which heavily depends on the topsoil and humus for retaining its fertility. Severe soil erosion, loss of biodiversity, mono cropping and other faulty agricultural practices and negligence from the part of the landowners have destroyed any chances of regeneration of the soil. Almost all the water resources in the watershed area are neglected and hence have compounded the issues. There have been occurrences of serious water shortage in the past few years in the panchayat and the 2004 drought was the worst in the near past. Considering the fact that rainfall has not been on the lower side considerably, this clearly indicates the poor water holding capacity of the soil in the watersheds.

Biodiversity

A. Natural Flora and Fauna

(1) Ela

Elas in the panchayat are facing serious problems. Elas are wet-paddy-lands, where Rice (*Oryza sativa*) was the main crop. The floral and faunal diversity in the area are related to the wetlands and also to paddy. The ecology of the ela depended on paddy cultivation in the past. But over the years, paddy cultivation declined to lower levels and at present it is present only in a few elas summing up to less than 100 cents (in around 200 ha paddy lands). Elas of Koliyoor, Muttakkad, Panangodu, Venniyoor, Vawwamoola have been partly reclaimed. Mekkottukonam and Mangalathukonam elas regions of Venganoor ela are completely reclaimed. All these have affected the biodiversity and water availability of the elas.

Farmers report the absence of *Pandanus* species, *Colocasia sps*, *Centella asiatica*, *Cyperus sps*, wild rice and many such plant species.

Frogs, snakes, earthworms and insects are also declining in numbers. Farmers observe the immense reduction in number of frog species. Snakes like checkered keel back (Neerkoli), Cobra, Rat Snake, etc are very rare to spot. Insects especially dragonflies and damsel flies are also less in numbers. Detailed study is required regarding the biodiversity of the region.

2.Higher lands

The slopes of the panchayat are dominated by the coconut (*Cocos nucifera*). Other tree species generally found are:-

1. Jack (*Artocarpus heterophyllus*)
2. Mango (*Mangifera indica*)
3. Tamarind (*Tamarindus indicus*)
4. Morinda (*Morinda coriea*)
5. Aini (*Artocarpus hirsutus*)
6. Acacia (*Acacia auriculiformis*)
7. Arecanut (*Areca catechu*) and other trees in very few numbers.

Agricultural Biodiversity

The agricultural biodiversity has reduced considerably in the Pnchayath. Many crops and cropping systems which was followed in the panchayath has ceased to exist. The crop diversity also reduced.

Discussions with aged farmers revealed that they used to cultivate pulses like green gram, horse gram, black gram etc in the homesteads. The panchayat also had groundnut, sesame, ragi, and maize under cultivation. They pointed out that these cultivation of these crops disappeared with the spread of coconut. According to the shade in the coconut plantations such crops could not be cultivated and slowly the tradition disappeared. People have even stopped cultivating the traditional tuber crops like yams.

Crops Present

1. Rice
2. Cowpea
3. Tapioca

Varieties of tapioca present were,

- (a) M-4
- (b) Gandharippadappan. Manjanoorumuttan
- (c) Kariyilappothiyan
- (d) Hraswa.

4. Banana

Varieties Present

- a. Cavendish group and Robusta
- b. Nendran
- c. Red Banana
- d.** Palayankodan
- e.** Rasakadali

5. Solanaceous

- a. Brinjal
- a. Chilli

6. Tuber Crops and Rhizomes

- a. Elephant foot yam
- b. Dioscorea sps
- c. Colocasia sps (All these are insignificant and not commercially cultivated)

7. Bhindi/Okra

8. Cucurbitaceous crops

- a. Snake gourd
- b. Bitter gourd
- c. Ash gourd
- d. Coccinea species
- e. Pumpkin
- f. Cucumber/melon

9. Spices

- a. Clove
- b. Nutmeg
- c. Ginger
- d. Turmeric
- e. Black pepper
- f. Vanilla

These spice crops are not cultivated in a large scale.

10. Others

- 1. Coconut
- 2. Arecanut
- 3. Cocoa (in small numbers)

Decline in crop bio-diversity

The cropping system diversity and crop biodiversity in the area has been hit badly by the changed agricultural situations. The farmers in the panchayat does not posses crop breeds of

their own. They either buy them from commercial outlets or from some other farmers. This loss of indigenous seed materials have affected all crops. Several cropping systems also disappeared over the years.

1. Rice and Rice based Systems

Rice is the worst hit crop in the panchayath, along with tree crops. Indigenous varieties of rice are not used in the panchayath any more – Kochuvithu, Chuttiaryan, Kutticheradi, Kulavali etc. were cultivated in the panchayat in the past. Paddy has almost disappeared totally from the panchayath .Most of the elas are under commercial cultivation of banana, vegetables and tapioca. Primarily landless farmers are cultivating the ela in leased in plots and are interested only in high profit crops.

Endangered or extinct cropping systems:

1. Rice-Rice-Cowpea
2. Rice-Rice-black gram
3. Rice-sweet potato
4. Rice-Rice-Sesame
5. Annual (11 month) single crop-Rice.

All these systems disappeared from the panchayath over the years.

2. Banana

The banana varieties which are no longer in cultivation or are insignificant are.

- a. Poovan
- b. Poonkolli
- c. Padathi
- d. Annan
- e. Karinkadali
- f. Koombillakkannan
- g. Monthan

At present farmers grow banana varieties popular in Chalai market, or any other wholesale market, only. The above-mentioned varieties were cultivated and were mostly a part of the homestead system, which now rarely exist.

3. Tree Crops

The tree crops like mango, jack, jamun, have also declined to alarming levels. In the whole panchayat, local and indigenous varieties of mango are fast declining in number. Local mango varieties are very rare.

Mango varieties present are mainly grafts and almost all are younger ones. (Below 15 years of age).

Mango varieties present in the past and which may be found in very few numbers:-

1. Nattumanga (Juicy variety not be cut into pieces but insertions made and juice consumed)
2. Pansara (Panchasara) Manga.
3. Ponthan Manga.
4. Kottukkonam (most common variety now) and few other varieties in small numbers.

Jack

1. Thaen varikka
2. Muttam varikka
3. chembarathi varikka etc. are some of the jack varieties in the panchayat.

Jack also faces all the problems of mango and is in a similar condition.

Due to high timber value of the tree, almost all the jack trees have been cut down for construction purposes. Jack is present in the panchayat but mostly younger ones.

Jamun: In the general survey and observation, jamun could not be found. Farmers testify that it was present in these parts but is not found now.

Guava, jamba, wood apple, Annona species, etc are found in homesteads; but none of the trees are considered as agriculturally important.

4. Tapioca

1. Njarukku
2. Kalikalan
3. Anakkomban
4. Kariyilappothiyan
5. Mananoorumuttan (ADD)

were the varieties cultivated in the Panchayat; but they are rarely found nowadays. M-4 and Gandharippadappan are more found

5. Groundnut

Groundnut was one of the major crops in the past. But is not cultivated in the panchayat at present. The changes in cropping systems, lack of open hands, and lack of feeds and expertise are the reasons for the decline of the crop.

6. Horse gram

Horse gram was a prominent intercrop of coconut gardens and a crop in garden lands. Cultivation of horse gram is absent in the panchayat now.

7. Millets

2 millet-crops were present in the panchayat

- a. Chamai (*Paspalum scorbiculatum*)
- b. Thenai (*Setaria italica*)

Both were cultivated for consumption of grains and for medicinal and purpose. Chamai was considered an antidote for snakebite (the victim was given chamai-gruel as an antidote). Both crops are completely absent. Intrusion of high profit crops and new cropping systems contributed to their decline.

8. Tuber Crops

Tuber crops other than tapioca is not enjoying a place in the present situation.

- a. Yams – *Dioscorea sps* (Kachil, Cherukizhangu ,nanakizhangu)
- b. Tannia (Palchembu)
- c. Colocasia (Seemachembu)
- d. Sweet potato
- e. Elephant foot yam

All these tuber crops are having comparatively lower status in the agricultural systems. Sweet potato is not cultivated and yams are very rare. Others are scattered and insignificant.

9. Rhizomes

- a. Ginger
- b. Turmeric

Both were common intercrops in coconut gardens but can not be seen in large scale now.

Results of the survey

Apart from the field a survey was done in the Venganoor panchayath among farmers to have an in depth analysis and understanding of agriculture situation in the panchayath . 90 farmers were interviewed with a semi structured questionnaire . The results of the survey are summarised below.

- a. Out of the 90 farmers interviewed 51 are full time farmers and 39 undertake farming as a secondary occupation.
- b. Among the 90 farmers , 36 have studied only in the primary class, 31 have reached SSLC, 18 have passed SSLC and 5 farmers did not give any details.
- c. Out of the 90 farmers , 47 farmers cultivate fully on their own land , 24 farmers cultivate on own land and also on leased land and 20 farmers are totally dependent on leased land. Out of this main intensive cultivation is undertaken in the leased land, which include the paddy land.
- d. Main crops cultivated are banana (72 farmers) , tapioca (40 farmers) and vegetables (45 farmers) . Most of the farmers cultivate more than one crop, either in rotation or in a mixed manner.
- e. 70 farmers surveyed generally follow a crop rotation and the types of rotation goes up to 24. Most common crop rotation practiced by the farmers are cowpea-banana and tapioca-banana. Out of 90 only one farmer follow paddy-paddy-sweet potato rotation, which is one of the traditional crop rotation that were followed in the panchayath.
- f. Out of a total land area of 525 acres rice occupies 2.98 acres, vegetables- 45 acres, tapioca- 28 acres, banana- 12 acres, nendran banana- 28 acres, ginger- 0.36 acres, turmeric- 0.23 acres, yams- 0.50 acres, fodder grass- 2.44 acres and coconut 19.77 acres. It totals to about 140 acres, but gross cropped area is higher. It clearly shows that there is gross under utilisation(not utilising the land fully) and mis utilisation(cultivating only few crops continuously) of the land in the panchayath.
- g. The survey also revealed that only 50 farmers do mixed farming which is also mainly coconut based and the intercrops mainly include banana, tapioca, cowpea, pine apple, other vegetables, ginger, turmeric etc. which are also mainly cultivated as single layer crop and also in small scale. So in the panchayath there is no mixed cropping in practice in its true sense.

- h. There are 39 wells, 22 ponds and 15 streams in the surveyed area. Other water sources include canal, lake, pipe water supply, rain water collected in pits etc. The study also showed the fluctuation of water level in the wells, from a maximum level of 40-50 feet to 0.5 feet within a short period after the rains. There are about 19 dead water sources within the surveyed area, which are dead due to various reasons. Farmers told four main reasons for the recent water scarcity in the panchayath- absence of water flow through the canal of Neyyar Irrigation project, loss of paddy cultivation in the panchayath, water sales and also destruction of water sources.
- i. The survey showed that the farmers maintain very few animals which are an important part of agriculture. Among the 90 farmers there are 31 farmers who maintain 62 cows, 4 farmers who own 5 buffaloes, 24 farmers who own 57 goats, and only 11 farmers who have poultry. This shows that the availability of organic manure is very limited in the panchayath with this animals in hand and hence if the farmers have to develop a sustainable agriculture it should be a priority.
- j. Farmers depend on many agencies for information, the survey revealed. Maximum number of farmers depend on their fellow farmers for the information support. Other important source is television, radio and print media. 7 farmers depend on pesticide dealers.
- k. Many constraints farmers showed in sustaining agriculture in the panchayath - 1) 26 farmers told that lack of availability of good land for cultivation is a major constraint 2) loss of fertility of soil is considered as a major problem by 20 farmers 3) Non-availability of good seed is another issue as pointed out by 18 farmers and also the survey showed that most farmers buy seeds and seedlings from outside agencies 4) water issue was raised by many (47 farmers) 5) Scarcity of green manure is one important constraint pointed out by 8 farmers, but more than this the study showed that except using cowdung farmers generally do not resort to any green manure application 6) 54 farmers pointed at the labour shortage as a main block in improving the agriculture situation 7) All farmers resort to pesticide application, but nobody raised the pest problem as a major issue 8) Storage and processing is not a problem felt by the farmers mainly because they cultivate vegetables, banana and tapioca which have already market and processing efforts are not found anywhere in the panchayath. 9) Transportation is also not a major issue since farmers sell mainly to middle men or market developed by Kerala Fruit and Vegetable Promotion Council and also to a certain extent in the local market.

l. The status of biodiversity in the panchayath is abysmally low as shown by the survey. Maximum number of trees which occupy the panchayath is coconut. When 90 farmers were interviewed the number of trees showed are as follows:

1. coconut - 4783
2. mango- 205
3. jack- 455
4. horticulture trees which include medicinal trees- 898
5. forest species which include trees like teak, mahogany, neem etc. - 797
6. other trees- 73

The number of trees which farmers own ranged from 2 (coconut) to 657(645 coconuts, 5 mangoes, 4 jack trees and 2 tamarind).

Recommendations to Develop a Sustainable Agriculture Plan for Venganoor Panchayath

Considering the very poor agricultural situation in terms of external dependence in the panchayath and also the worsening water and biodiversity crisis and crisis in the availability of human resource, following recommendations are suggested to improve the situation in the panchayath in terms of developing sustainable agriculture; sustainability both in terms of economy and ecology by developing systems which is self-generating.

1. Establish Community Seed Banks

One of the main problem found in the panchayath is lack of availability of good feeds. Farmers have lost the habit of keeping seeds. Even though banana is one of the main cultivated crop in the panchayath, every year farmers get the suckers from Tamil Nadu. In the case of vegetables local seeds are not available and every season farmers buy the seeds from outside.

So it is necessary that seed availability is ensured at the panchayath level since it is one of the costliest input in agriculture. Quality of seeds also cannot be ensured when the farmers buy seeds from outside and these seeds will not get time to acclimatize to the new situation and perform well unless other inputs are given. Some of the womens' groups can be trained to develop seed banks since traditionally women are the seed keepers and this will help them to regain their forgotten knowledge base and also this will contribute to the local economy.

2. Improve the availability of green manure crops

The study shows that panchayath lacks in the availability of green manure. This is a hindrance to change to organic farming, as told by many farmers. Planting of trees suitable for taking green manure is important. Nurseries of such tree species should be developed within the panchayath. Apart from this green manure seeds should be made available for the interim phase, when farmers change from chemical based farming to a sustainable one.

3. Availability of Other manures – neem cake, coconut cake etc.

Soil improvement is the foundation on which the idea of sustainable agriculture can be brought in. Both the soil structure and soil fertility are in a bad state in the panchayath which needs a restoration plan to regain its lost vigour. Organic manures like neem cake, coconut cake, etc. would be needed at least in the interim phase of change. Making available good manures is thus important. The present coconut mills working in the panchayath can be linked to the agriculture development of the panchayath. Locally available neem cake is also not of good quality. A need based forecasting is needed to procure good quality cake and make it available to the farmers. Now farmers get these manures from outside and they are unable to afford it, as discussions with them revealed.

4. Animal Husbandry

A paradoxical situation prevail in the panchayath. Those who depend on farming are either marginal farmers or landless people. People who own the land generally are not dependent on the land for a living. Those who cultivate are not in a position to keep domestic animals and they all buy cowdung at exorbitant cost. If these farmers have to go for organic and sustainable agriculture there should be a mechanism to increase the number of domestic cattle in the Panchayath and cowdung should be made available at appropriate cost.

Another important factor to be looked into is the availability of good feed for the cattle, chicken and goats. Now most of the farmers who keep animals feed them with artificial food and in many instances the milk and eggs we get can even be detrimental to health. There are very few people who grow fodder grass or get their grass from banana and vegetable fields. We don't know how much pesticide residue will be there in this grass from the field, considering the amount of pesticides being used for both these crops. Because of the total loss of paddy cultivation, availability of straw is absent within the panchayath. Farmers say that it is not economical to buy fodder or straw and maintain the cattle. So they opt for cattle feed. It is also a reality that there are no indigenous varieties of cattle with the farmers. New hybrid varieties are less resistant to diseases and they eat a lot. This also escalates the cost of production. Hence it is

good to have a plan for re-introducing indigenous varieties of cattle, so that it will be possible for the small and marginal farmers to keep them contributing to agricultural sustainability.

5. Conservation of Soil and Water Resources

This should be given top priority since these are the two important pillars in sustaining agriculture and livelihood. In Venganoor panchayath, both are in very bad state of affairs. It is essential to build awareness among people, strengthen the grama sabhas based on this so that future development planning will seriously look into this matter.

6. Orienting younger generation towards agriculture

Agriculture is no more an option for the younger generation in the panchayath. Majority of the farmers are now more than 35 years old and even they continue in agriculture because there is no other option in front of them. Although this is the general trend there are some young farmers in the panchayath who are very much interested in this way of life . But they do not get any recognition either from the family or from the society. It is important that such youngsters are identified and given support. They are the building blocks for the development of sustainable agriculture in the panchayath. Provisions should be made to expose them to other farmers, organisations and programmes to deepen their understanding of agriculture and improve their knowledge base. More youngsters should be identified and encouraged to undertake farming as an employment or livelihood option.

7. Training of Farmers

All farmers surveyed, and the general observations from the field show that farmers of this panchayath are generally ignorant about the ways of sustainable agriculture . They have also to a certain extent lost their traditional knowledge and skills and are not exposed to the new trends in agriculture. Hence awareness building as well as systematic training and skill share are very much important among the farmers.

8. Processing Units

Some of the agriculture products can be processed and marketed like jackfruit, coconut, pepper, banana, vegetables, medicinal plants, etc. This can be developed at the household level or as a small scale industrial unit. This will help in generating less hazardous sustainable job opportunities within the panchyath.

9. Assessment of Employment Opportunities

Pattern of employment within the panchayath needs to be assessed. This will help in human resource development. Younger generation must be exposed to the hidden livelihood options in the agriculture sector. Developing joint programmes, for soil and water conservation and regenerating agriculture, between panchayath and peoples committees is urgent. Regeneration of the ecosystem can actually bring in employment opportunity. An attitude of voluntarism has to be developed among the people, especially younger generation. This alone can make a lot of change in the society in a sustainable manner. From each ward volunteers have to be selected and trained to generate local expertise on sustainable development.

10. Homestead Development

“Most women and unemployed men sit at home, watch T.V. and become unhealthy”. This opinion was shared by many during the interview. Nobody is ready to take an initiative since ‘common good and collective work’ has gone out of their mind. Per capita land holding is very small and hence people neglect it totally. Hence it is important to start from this small piece of land which they own, starting with 3-4 crops, and later increasing the diversity. This will help in soil improvement and water conservation, and also will improve the nutritional uptake of every household and if properly planned can bring some income also.

Generally the agriculture planning is crop specific, but to develop a sustainable agriculture, area, soil and season all have to be taken while planning is done. Schemes and programmes have to be developed to support this. Through homestead farming, children also will get a chance to know and learn about basic things which is lacking in the education system.

11. Rejuvenating Paddy Cultivation

Venganoor panchayath has one of the biggest ‘ela’ in Trivandrum district. 10 years back many of these elas were under rice and slowly they all got changed to other crops, due to various reasons. This has actually depleted the water resources, resulted in the lowering of water table and displaced many people from the land especially women. There is hardly a sample of the rice plant within the panchayath to show to the children. This is actually destroying the foundation of a culture and livelihood, slowly and steadily. Children are thus alienated from the land, and they never get a chance to learn about the fundamental things in life. So bringing back paddy is essential. For this support is needed, plans have to be developed to re start paddy cultivation and also for marketing rice at a reasonable price. Ideas like organic rice cultivation, crop rotation etc. have to be built into the planning process.

12. Conducting festivals related to water conservation, seed protection, soil management etc.

Festivals used to have a deep-rooted influence in our psyche. So to attract people for sustainable agriculture, some sort of such festivals have to be developed or the old ones have to be brought back meaningfully. Traditionally we had many of these, but they lost their meaning in the development paradigm of today.

Pesticide Poisoning and Health Policy

In the early part of 1990s the working party of the World Health Organisation (WHO) and the United Nations Environment Programme (UNEP) estimated that world wide there are three million cases of acute severe pesticide poisonings a year. In addition they also estimated that pesticides cause 700,00 specific chronic effects and 40,000 unspecific chronic effects. Majority of the poisonings and most of the deaths occur in the Third World. During this period global pesticide sales were three million tons of active ingredient. The projection then was this will be doubled in another ten years, especially in the developing countries.

The predictions have come true and in the last decade pesticide use has increased tremendously in most of the Asian countries including India and within the country some states have been identified with high levels of use of pesticides like Andhra Pradesh and Punjab.

Over the last 40 years pesticide use has increased in all the states in India, however small or large the amounts may be. The situation in Kerala is also not much different. In the year 2002-2003, farmers in Kerala bought about 72 varieties of pesticides and the maximum demand is for insecticides like carbofuran (furan), chlorpyrifos, fenvalerate, methyl parathion, phorate, and quinalphos. Fungicides in great demand are copper oxy chloride, copper sulphate, mancozeb, and weedicides include paraquat di chloride, 2,4-D and glyphosate. From the official data it can be seen that in Kerala majority of the pesticides used belong to the organophosphorous group of pesticides and one single carbamate compound dominates the scene, furadan or carbofuran which is extensively used in banana cultivation. These two groups of pesticides generally act on the nervous system of an animal. A lot of literature is available on the occupational poisoning of workers by these pesticides and also about the impact on the communities living near farms where these pesticides had been sprayed. In the present agriculture study in Venganoor panchayath many people, both farmers and the people living near farms narrated about their experience while applying pesticides like phorate, furadan and metacid. Two farmers told that in the 90's when they were applying furadan in banana field suddenly they developed symptoms like over sweating, dizziness and later they fell unconscious in the field. In the rural areas such incidences may be rare or common. But there is no recording of such instances, mainly because the farmers become normal after a period of illness and they do not go to see a doctor. People living nearby the farms told that they do not complain about the problems created by pesticides like severe headache, vomiting sensation, loss of appetite, dizziness etc. since most of the farmers are either poor or their friends and relatives and hence

do not like to create any problem for them. What they tell is to bring in strong regulations on sales and use of pesticides and a strict implementation of the same

“Pesticides are toxic chemicals deliberately added to our environment. They are poisons by design whose purpose is to kill or harm living things. They can kill or harm human beings as well”. (Marion Moses,2002). It is well known that many of the pesticides being used in farms, orchards, plantations, paddy fields are highly toxic. It is also said that farmers and agricultural workers are heavily exposed to pesticides while working in the field. The availability of highly toxic pesticides, lack of information and knowledge of their hazards, aggressive marketing by the industry as well as poverty, illiteracy, and lack of health facilities lead to the poisoning in the rural areas. A study done in two districts in Kerala showed that (Usha, 2003) similar situations prevail in Kerala where accessibility to pesticides and aggressive marketing and lack of information about the chemical lead to very high levels of pesticide use. Documents prepared by Pesticide Action Network Asia Pacific reveal that women in Asia have more direct and heavier exposure to pesticides than their sisters in other regions. They also mix pesticides and pour them into the spray containers which is an even more serious health risk since they are handling the concentrated products. They receive no education or training in how to use them properly or how to protect themselves and in many instances they get poisoned by the pesticides.

There are many factors which contribute to the impact of pesticides on human beings and there are three major ways through which pesticides affect human health.

The major factors contributing to the impact of pesticides on human beings are the following.

1. How hazardous or poisonous a pesticide is

Pesticides are classified into four categories by World Health Organisation (WHO) and also by United States Environmental Protection Agency(USEPA) depending on its toxicity. Toxicity is decided by laboratory experiments on rats or mice. The less it takes to kill the animal the more toxic it is. The more toxic pesticides are classified under Class I.

2. How pesticides get into the body

Pesticides get into the body through four ways – by breathing them in, by swallowing them, through the skin and through the eyes in cases of splashes or spills. Many people including workers think that breathing is the major way by which pesticides enter the body. But, the major route of pesticide absorption into the body is through the skin. Some body parts, like genital area is an area of high absorption, as also face, neck, armpits, forearm etc. If the skin is damp or wet, or if there is a cut or rash, pesticides will enter the body faster and in large amounts.

Since women have thinner skin than men they absorb more pesticide under similar levels of exposure.

3. How long pesticides stay in the body

The impact of pesticides also depends upon the duration of its stay in the body. Different classes of pesticides stay in the body differently. The most persistent are the organochlorines, but the most common today are organophosphorous pesticides which are less persistent.

Effect of pesticides on human health

There are long term and short term effects on health due to pesticides.

1. Immediate Effects

The immediate effects are called acute effects and they can appear within minutes or hours or few days of exposure. The most common acute effects are irritation of the eyes, nose and throat, skin rashes and itching. Some pesticides cause allergic dermatitis like benomyl, captan, dichlorvos, malathion, etc.

Once pesticide get into the body through the skin, it enters the bloodstream and cause poisoning. The impact can be seen as headache, dizziness, nausea, vomiting, cramping, breathing difficulties and blurred vision. If the poisoning is severe and proper treatment is not received the victims can even die.

2. Delayed or Chronic Effects

Pesticides also can cause problems later in the life of a person or a community. They can result from low levels of exposure over a long period of time. They can occur even if there has never been any apparent health problems during the time of exposure to pesticides. The three major chronic effects from pesticides are cancer, neurological damage and adverse effects on the reproductive system.

Many pesticides are known or suspected to cause cancer in laboratory animals. The U.S. EPA has classified pesticides into groups of known, possible or probable causes of cancer in humans (Marion Moses).

There is now a large body of evidence that pesticide exposure is a risk factor for cancer, especially in children. Studies done in United States, several European countries, Brazil and China show that children of parents who are occupationally exposed to pesticides are more likely to get leukemia, brain cancer, non-Hodgkin lymphoma, soft tissue sarcoma and Wilm's tumour.

There are also many studies done throughout the world on farmers, pesticide sprayers and factory workers exposed to pesticides that link cancer in adults to pesticide exposures.

There is also evidence from the laboratory animals that pesticides can cause permanent damage to the brain and nervous system. Low levels of exposure to neurotoxic pesticides like organophosphates to the developing brain can potentially affect brain development in complex and subtle ways that are difficult to observe and measure.

Such potential effects include effects on memory, judgement and intelligence as well as personality, moods and behaviour. There are even human studies that show permanent effects on the brain and nervous system years after apparent complete recovery from pesticide poisoning.

Pregnant women and children are more susceptible to chemicals like pesticides. Recent studies show that certain pesticides like Aldrin, Carbaryl, Carbofuran (furan), 2,4-D, endosulfan etc. can cause endocrine disruption and this affect the hormone levels at critical period of development of the brain at very low levels of exposure to these pesticides.

Many commonly used pesticides are reported to cause birth defects, sterility and foetal death in laboratory animals. Dibromochloropropane (DBCP), one of the pesticide used in banana cultivation in many countries is a proven cause of sterility in human males (Global pesticide campaigner, 1998). Human studies have also shown increases in the spontaneous abortion, stillbirth, infertility and birth defects in workers handling pesticides.

People having ailments like asthma and allergies are more susceptible to pesticides even at low levels. The commonly used pesticides like pyrethrins, organophosphates and methyl carbamates have found to cause this. Pesticides can also cause irregular heart rhythms and weaken the immune system. According to the public health experts the only effective treatment is to avoid exposure to the pesticide. But in reality pesticides are used in ways that maximise opportunities for human exposure and environmental contamination. Most regulations have failed in preventing these. The present study also bring out such situations of exposure, how such poisonings were handled, and what followed later.

On one side just because a pesticide is used according to label directions, it does not mean that potential harmful effects are not occurring. On the other hand the situations in developing countries as also in Kerala is that of multiple exposure, where people are getting exposed to a cocktail of pesticides, either occupationally or otherwise. The possible synergistic effects of these combined and mixed exposures have not been studied because the laws that regulate pesticides do not require the kinds of tests to be done. The younger the individual the

greater the impact from toxic exposures. But this is not given due consideration while employing children to handle pesticides.

Acute effects of pesticide exposure

The present study looks into the problems or symptoms of pesticide exposure to the people, immediately after the exposure to them.

“Three farm workers were transported to the emergency room by their supervisor. They had been working in a vineyard when a nearby cotton field was aurally sprayed with pesticides. The spray had drifted downwind into the vineyard where about a dozen people were working. Many of the workers began to complain of a variety of symptoms, including difficulty in breathing, irritation of the eyes and throat, and nausea. The sickest workers were taken to the emergency room, while others were being seen in a local clinic. There was no information available yet about what the workers were exposed to.”

This is one of many incidents happen in the fields where pesticide application is undertaken. However, large numbers of such poisonings go undiagnosed and unreported each year. Children under six years of age represent more than half of acute reported pesticide poisoning incidents, usually via accidental injection or dermal exposure.

Physicians should be aware of the pesticide poisoning reporting requirements in California. According to the Pesticide Illness Surveillance Programme any physician or surgeon who knows, or has reasonable cause to believe that a patient is suffering from pesticide poisoning or any disease or condition caused by a pesticide shall promptly report such facts to the local health officer by telephone within 24 hours and by a copy of the report within seven days. Failure to report can cause penalties and the country health officers must report to agricultural commissioner of the country. The most pesticide illness data are obtained from workers compensation reports.

Similar reporting systems prevail in many countries but not in India so that affected people or authorities here never get any chance to influence the pesticide policy of the country.

The recent reports on Endosulfan poisoning of the people of Kasaragod district in Kerala was thought provoking and a serious discussion has started among the public within the State and also outside. The International Forum on Chemical Safety of (United Nations) also have started looking into the acute effects of pesticides all over the world. During the last 45 years media also have slowly started reporting such incidents. The present study is a logical

continuation of such enquiries and a process to compile the information as far as possible within the State of Kerala.

Methodology

One of the important change which has happened during the last 4-5 years is that media has become very sensitive to the issue of pesticides. The initial enquiries with the labour unions and official departments showed that they do not keep any record of pesticide poisonings which happen in their respective jurisdiction. So the study had to base on the newspaper reports for a period of 5 years and also some field visits and direct investigations. The main lacuna in this study is that since most of the newspapers have local editions and generally “less important” news items like pesticide poisonings come only in the local pages, it was not possible to go through all local editions of newspapers and thus do an exhaustive media coverage. Main newspapers depended for the study was Hindu, Mathrubhumi and Madhyamam daily and local editions of Madhyamam and Mathrubhumi from Idukki, Thiruvananthapuram and Wayanadu districts. Some of the incidents were heard through personal communication from local people who are concerned about the issue. Hence the study has not attempted to do an exhaustive collection of data, which is impossible within a span of one year, but it tried to look at most of the issues which appeared in the media, by undertaking direct investigation in the field.

During field visits people narrated bits and pieces of many other poisoning issues which happened over the years, and which has faded from their memory. Nowhere in the official records such incidents could be seen. Thus we are losing a valuable data regarding the poisoning of people by pesticides which otherwise would have helped in the planning for chemical safety and safeguarding public health and for emergency preparedness. This report is a beginning, trying to analyse the situations in which pesticide poisoning occurred, what followed later and how things can be improved in future by proper planning at the panchayath level and policy formulations at the state level.

Documentation of Pesticide Exposure

Pesticide Exposure

Case : **One**
Date : April 20th 2004
Place : Vembayam, Trivandrum (Dt)
Chemical Used : Furadan

Furadan, a carbamate pesticide, used in banana cultivation poisoned 30 people including children. One child was seriously affected and had to be hospitalised. Aliyad Vellanikkal ela is the place where it happened. People living near the banana garden were the ones who got poisoned by this chemical. They were taken to a private hospital in Venjaramoodu. Since there were no doctors in the Government hospitals at Kanyakulangara and Vamanapuram, which are nearer to the community the impacted people had to be taken to a private hospital far away. With the support of one panchayath member, local people gave a complaint to the police station at Venjaramoodu. Three women and one girl child continued to suffer from skin allergies, and swelling of the body on the third day of the incident. One woman had to continue her treatment in the medical college, Trivandrum.

Source : Mathrubhumi Daily, 21st April, 2004
: Direct field investigation, interviews with the farmer who applied the pesticide and also the affected people.

Case : Two

Date : July 2004

Place : Keezhattur, Perinthalmanna, Malappuram (Dt)

Chemical used : Roundup

Roundup, a herbicide, used in a rubber plantation, caused health problems to the people staying near the plantation. The plantation is 2500 acres large and has rubber, coffee, coconut, cashewnut and silver oak. There are 112 permanent labourers and 150 temporary labourers employed in the plantation. A worker has to spray 2.5 litres of the pesticide in a day for a wage of Rs.80/- and it has to cover an area 10 acres. The spraying of herbicide is going on for the last few years but recently people staying near the plantation and are dependent on a stream, which is coming out of the plantation for their daily needs, started to complain about health problems and sent a complaint to the authorities including Pollution Control Board (PCB). Management later stopped the spraying of roundup but resorted to another chemical and the workers protested and said that they cannot do the pesticide spraying any more. There is a temporary stoppage of this activity but uncertainties prevail and the people are worried.

Source : Interview with a journalist who did the

investigation of the issue.

Case : **Three**
Date : July 10^h, 2002
Place : Kottathara Panchayath, wayanad (Dt)
Chemical used : Phorate

Phorate an organophosphorous pesticide used in a banana field caused acute poisoning problems for the children, studying in an upper primary school in the Panchayath. The incident happened in the morning hours when the children came to the school. There were no casualties luckily but many children were badly affected and lost consciousness and had to be hospitalised in Kalpetta district hospital which is almost 20km away from the village. The co-operation of local people and jeep drivers, and the doctors in the hospital helped the children for a fast recovery. The district administration also intervened.

The Kottathara Upper Primary School is situated in a valley dropping down from a hill. The school open to a 2.5 acre field where banana is planted. Even though the teachers talked to the farmer not to continue with the pesticide application while the school runs, he continued his work. It was drizzling and suddenly vapours of the pesticide got spread in the area and few children started getting headache, dizziness, vomiting sensation, etc. Some of the children became unconscious and a panic situation was created.

The teachers then contacted the ward member and grama panchayat and they arranged the jeeps. In the panicky situation, the teachers made the mistake of calling the children out to the open. In all, 31 children-15 boys and 16 girls, were taken to the hospital. They showed persistent headache, chest pain, breathing difficulties, nausea, giddiness, blurring of vision and stomach pain. One boy showed uncontrolled muscle twitching and convulsions even after 24 hours of treatment.

The pesticide used in this particular incident was Umet (Phorate 10%) manufactured by untied phosphors Ltd. Mumbai. The label on the pesticide packet said “keep away from children.....Do not use in situations if there is a possibility of harming bees, birds, animals and fish.....Do not eat, drink or some during application.”

Source : Local editions of Madhyamam, Malayala
Manorama and Mathrubhumi daily

: Direct field investigation and interviews with teachers, students, parents of affected children, doctors, district collector, local people and panchayath member.

Case : Four

Date : June 6th, 2003

Place : Vazhavara, Kattapana, Idukki (Dt.)

Chemical used : Phorate

An accidental poisoning of a boy child (one and a half year old) by phorate resulted in death of the child. The grandmother of the deceased is working in a cardamom plantation and on that fateful day she had brought some pesticide from the plantation and carelessly put it in the house. The child while playing took out the packet and consumed the poison and later started developing symptoms like convulsions. His mother who was doing the household work could not understand this sudden change but later found out the open packet of pesticide on the floor. She took the child, got into a jeep and rushed to the hospital 10km away. But the doctors could not save the child.

Source : Madhyamam Daily June 7th, 2003

: Direct interview with the mother and grand mother of the child

Case : Five

Date : 26th June, 2001

Place : Meppara, Kattappana, Idukki (Dt)

Chemical used : Phorate

A daily wage labourer (boy 16 year old) died of pesticide exposure in a cardamom plantation in Meppara in Idukki District. His mother is a permanent worker in the plantation. Children like him are employed by the plantations during the season, when there is demand for fertilizer and pesticide application, weeding etc. He died after continuous exposure to the pesticide, phorate, for a week, since he was put in this work. It was drizzling while he fell unconscious in the field. It took some time when other workers saw him lying in the field and

immediately they look him to a homeopathy doctor staying nearby. Realising the gravity of the situation and her inability to look in to such cases she asked them to run to the hospital which is about 20km away and this is a hilly terrain and it was raining. Before reaching the hospital he died.

Source : Madhyamam daily 27th June 2001
: Direct field investigation, discussions with the workers, homeopathy doctor and the hospital staff

Case : Six
Date : 26th June, 2001
Place : Chapath, Kattappana, Idukki (dt)
Chemical used : Phorate

Around 40 women workers in a tea plantation in Chapath, near Upputhura, got exposed to the pesticide Phorate while they were plucking tea leaves in the afternoon hours. It was drizzling then.

Phorate is generally used for tea cultivation. In this plantation also phorate had been used along with bamboo seeds to protect it from insects. This was done in a part of the plantation in the forenoon where the women came to work in the afternoon. Within half-an-hour many of them developed symptoms like dizziness, giddiness, blurring of vision, vomiting sensation, etc. They were taken by the supervisor of the plantation , panchayath member and other local people to a private hospital immediately which is 20-25 km away. Totally 37 women were affected visibly and they remained in the hospital for two days. Even after coming back to the house, the sickness persisted for many and some of them own their own went to the Kottayam medical college which is around 100km away from this place. Apart from the women workers few people who were walking along the plantation also got affected and had to see a doctor.

Source : Madhyamam Daily 27th June 2002
: Direct field visit, discussions with the supervisor of the plantation who took the women to the hospital, local people, affected women and the

doctors of the hospital.

Case : **Seven**
Date : 9th October 1999
Place : Elappara, Idukki (Dt)
Chemical used : Not known

Workers employed in spraying of pesticides became unconscious after exposure to the pesticide for a while. Two men were severely affected and they were admitted to the hospital.

Later on the management decided to stop the particular pesticide from being used in the plantation.

Source : Madhyama daily 10th October, 1999

Case : **Eight**
Date : 31st July, 1999
Place : Chembur, Attingal, Trivandrum (Dt)
Chemical used : Phorate

Around 12 people living near an 'ela' which is now a banana garden, got severely effected by pesticide exposure. The symptoms started appearing late in the evening immediately after the labourer put phorate for banana. It started raining immediately after the pesticide application and the vapour got spread and people living nearby started to get the toxic smell. 12 people were taken to the medical college, around 25 km away and around 15 families were shifted to a school nearby.

To control the pesticide contamination police and fire force were called. Fire force tried to dilute the chemical by pouring in water but it increased the smell and some of the employees became ill. Agriculture department, next day morning, ordered to cut down all the banana plants and bury it under the soil. The local young people who took the initiative to do this developed dizziness, giddiness, chest pain etc. and they stopped work in between. There were even 2 month old and 6 month old children among those who were hospitalised.

Source : Malayalamanorama, Kerala Kaumudi and

Madhyamam Daily, 1st August, 1999

: Direct investigation and interviews with affected people, farmer, panchayath members and local doctors.

Pesticide Poisoning of Women Workers in Cashew Factories in Keralam

Case 1

Date : 18th November, 2003

Place : Chathannoor, Kollam (Dt)

Chemical Used : Chlorpyriphos

More than 100 women workers were hospitalised due to pesticide exposure in a cashew factory in Kollam district. The factory was closed for two days since they had sprayed pesticide in the factory. Workers in the peeling shed were the ones who got affected first. They developed dizziness and vomiting sensation and fell. They were taken to the ESI hospital immediately. One person from the rescue team also developed some uneasiness and had to be hospitalised.

Source : Mathrubhumi Daily; November 19th, 2003

: Field investigation and interviews with the doctor, affected workers and the management.

Case 2

Date: 22nd February 2000

Place: Ezhukon in Kollam District

Factory: Kumaravilasom Cashew Factory

Chemical Sprayed: Not Known

Casualty: Many women workers were taken ill but 4 of the women workers fell unconscious and were hospitalized.

A short description of incident: Women workers fall unconscious in the room where they change their dress. Their dresses were contaminated with pesticide sprayed in the factory on the previous day. A case has been registered under IPC 284 for improper handling of poisonous

substances. The labour union leaders allege that the management did the spraying on purpose as retaliatory measure against the demands of the workers for wages and benefits.

Source of Information : Madhyamam Daily, 23^d February 2000.

Case 3

Date: 7th August 2001

Place: Madavoor in Kilimanoor, Thiruvananthapuram District

Factory: Alphonse Cashewnut factory run by the Olum Exports India limited, Kollam

Chemical Sprayed: Radar 20 E.C (Chlorpyrifos)

Casualty: More than 80 women workers admitted in local hospitals. 5 were admitted to Medical College due to severity of symptoms. All except 9 were discharged the next day.

A short description of incident: Workers who started their work at 8.30 in the peeling sheds were very soon taken ill, some unconscious, vomiting with headache, fatigue. Usually the spraying of pesticide to keep away the mites and insects from the nuts is done on a Saturday and the factory sheds opened for work after a days lay off. But this time spraying was done on Tuesday and the sheds were open for work on Wednesday. The smell and the vapour had persisted and the accident caused. About 650 workers are employed in this factory.

Source of Information: 1. Madhyamam Daily, Malayala Manorama Daily, 8^h August 2001.

2. Direct Investigation of the factory site was done only in April 2002, but the factory was locked out as the factory did not work for long after the incident.

Case 4

Date: 23^d March 2002

Place: Ambalamkunnu, Kottarakkara in Kollam District

Factory: Factory belonging to Kottukkal Prabhakaran

Chemical Sprayed: Radar 20 E.C (Chlorpyrifos)

Casualty: 9 women workers admitted to hospital. Many others were affected, though not severely.

A short description of incident: Pesticide was sprayed in the factory premises at around 5 pm even as the factory workers were just leaving the sheds after the days work. Some workers were affected then and there and others developed symptoms on their way home and even after reaching home.

Source of Information: 1. Madhyamam Daily, 24th March 2002.

2. Direct Investigation carried out a week after the incident.

Case 5

Date: 12th June 2002

Place: Banglankunnu, Nilamel in Kollam District

Factory: D K M B Cashew Factory

Chemical Sprayed: Hyban (Chlorpyrifos)

Casualty: 19 women workers hospitalised after developing symptoms like vomiting, fatigue, dizziness. 17 were admitted at Medical College and 2 at the Kadakkal Govt. Hospital.

A short description of incident: Hyban was sprayed in the previous day and the workers who entered the shed on the next day was affected immediately. There are 195 workers in the peeling shed and 19 of them were severely affected. May others also showed symptoms though not severely.

Source of Information: 1. Madhyamam Daily, 13th June 2002

2. Direct Investigation of the factory and hospital on the 13th June 2002.

Case 6

Date: 17th June 2002

Place: Mavila, Anchal (Kollam District)

Factory: Kumar Cashew Factory

Chemical Sprayed: Malathion 50 E C

Casualty: 103 women cashew workers hospitalized in two private hospitals nearby with symptoms of breathlessness, vomiting and some were taken unconscious.

A short description of incident: Malathion was sprayed to control mites and insects on a Saturday and the doors and windows closed for better effect. On Monday the workers who entered the peeling shed were immediately taken ill. This factory was closed down earlier and there were a number of problems of non-payment of wages and benefits. A police case has been filed and a person who did the spraying arrested. It is soon after this accident that the Government woke up to take serious note of the incidents. The Labour Minister, Sri Babu Diwakaran convened a meeting. The Inspectorate of Factories and Boilers, the State Pollution Control Board and the Department of Health were asked to formulate some immediate steps to contain such accidents in future. Strict orders were issued to all cashew factories regarding the safety measures to be taken.

Source of Information: 1. Madhyamam Daily, Mathrubhumi Daily, The Hindu, 18th June 2002. Madhyamam Daily, The Hindu, 18th June 2002,

Case 7

Date: 30th September 2002

Place: Mellila, Kottarakkara (in Kollam District)

Factory: Saint Gregarious Cashew Factory

Chemical Sprayed: Paramer (Methyl Parathion)

Casualty: 227 women workers aged between 18 and 45 suffered various symptoms and were admitted to the Kottarakkara Thaluk Hospital. They were treated with Atropine and discharged over the next day. Many returned to the hospital with symptoms such as dysentery, persistent headache and vomiting.

A short description of incident: At around 8 am a batch of workers entered the peeling shed which was sprayed with Paramer by male employees of the unit on Saturday. The chemical was mixed with water and applied with a broom. No protective measures were taken. On Monday when the workers entered the shed, a few women fell unconscious. Others felt nauseous, giddy and experienced eye irritation. The shed was poorly ventilated. More of the women became ill and were rushed to the hospital. A police case has been filed. The Food Inspector stated that all the cashewnuts if found contaminated will be destroyed.

Source of Information: 1. Deepika daily, The Hindu Daily, Mathrubhumi Daily, Madhyamam Daily 1st October 2002 and Madhyamam Daily 2nd October 2002.

2. Direct Investigation on the 1st October 2002 at the factory site, hospital and among workers.

Case 8

Date: 3^d October 2002

Place: Baranikkavu, Sasthankotta (in Kollam District)

Factory: India Nut Products Factory

Chemical Sprayed: Not Known

Casualty: 18 women workers hospitalized with vomiting, fatigue, headache.

A short description of incident: The peelings sheds was sprayed with pesticide and the workers who entered the shed the next day felt giddiness and complained. The management asked them to continue working. Within half an hour the women swooned and some started vomiting.

Many women rushed out and those who fell were hospitalised.

Source of Information: Madhyamam Daily 4th October 2002.

Case 9

Date: 7th October 2002

Place: Kuttimoodu near Kallara (in Thiruvananthapuram District)

Factory: Rasi Cashewnut Factory (under the Western India Cashew Company, Kollam)

Chemical Sprayed: KO Forthrien (must be a synthetic pyrethroid)

Casualty: 75 women workers hospitalized in Medical College, Thiruvananthapuram, with vomiting, fatigue and some even unconscious. .

A short description of incident: The accident happened at about 10.30 am. The peeling shed was sprayed with the pesticide on Saturday. Initially the symptoms showed on some women who went to the latrine, later the others also swooned and showed exposure symptoms. It is said that the spray was more intense in the bathroom and latrine. The women were rushed to a

nearby hospital but there wasn't enough facilities. Later they were rushed to the Medical College. The Police have registered a case and the factory sealed.

Source of Information: The Madhyamam Daily, Manorama Daily, 8th October 2002

Case 10

Date: 20th December 2002

Place: Tholadi, Thevikode Panchayath, Kanyakumari District (bordering Thiruvananthapuram)

Factory: Safa Cashew factory (on contract to Asiatic Cashew Exporters, Kollam)

Chemical Sprayed: Radar (Chlorpyrifos)

Casualty: 35 women were hospitalized of which 9 were seriously affected and were admitted to the intensive care unit.

A short description of incident: The working time in the factory is from 6.45 in the morning to 5.30 in the evening. Many of the women came at 7.00. By 8.30 some young girls started developing symptoms like dizziness, stomach pain and started falling. About 40 women work in the peeling shed which was sprayed and they are the worst affected. Even though the women had food in the early morning, the factory managers said that the women did not have food in the morning and that this happened because of fear. The manager was later arrested and a police case charged.

Source of Information: 1. Madhyamam daily, Mathrubhumi Daily, 21st December 2002
2. Direct Investigation of the factory, among workers and the hospital.

Case 11

Date: 15th January 2003

Place: Charummudu, Kollam District

Factory: A Private Cashew factory at Nooranad, Ulavakad

Chemical Sprayed: Not Known

Casualty: 7 women workers hospitalized after inhaling the pesticide fumes.

A short description of incident: The women workers were hospitalized after inhaling pesticide vapours which was sprayed on the previous Saturday. The factory has been closed since then.

Source of Information: Madhyamam Daily, 16th January 2003.

Cashew processing factories are one of the oldest industrial sector in Kerala, now employing around 1.5 lakh workers mostly women. Most of the cashew factories are situated in and around the Kollam and Thiruvananthapuram districts.

Within the last one year atleast nine accidents related to pesticide poisoning happened in these factories, affecting the women workers, especially in the cashewnut peeling shed. Symptoms that the workers reported included vomiting, dizziness, tiredness, severe headache, breathing problem and irritation of the eye and the nose. The pesticide which was used in most of the cases was Chlorpyrifos. Two formulations - Radar 20 E.C and Hyban were used, of which Radar seems to be more popular. Atleast in three cases other pesticides – Malathion 50 EC, Paramer (Methyl Parathion and a synthetic pyrethroid (possible KOrthrien) were known to have been used.

The first of these accidents that got highlighted in the media happened way back in February 22nd 2000 at Ezhucon in Kollam. Here 4 women were hospitalized with serious symptoms. The cashew factory owned by a private management had sprayed the peeling shed and other rooms with some pesticide. The women who came to work the next morning were taken ill immediately after they put on their work dress. It was alleged that the management had sprayed without taking any safety and precautionary measures. Then in August 7th 2001 another accident very similar to the earlier one happened at Madavoor in Kilimanoor (Thiruvananthapuram District). The chemical that caused this accident was Radar 20 EC (Chlorpyrifos). This time the casualty was severe with more than 80 women being hospitalized. The conditions of nine of them were severe and 5 of them were admitted to the Medical College, Thiruvananthapuram, as their condition was not manageable in the local hospitals.

But it was only since March 2002 that these pesticide accidents started happening in epidemic proportions. Since then there has been atleast 9 such accidents, eight of which has been documented in this report. It is also possible that some of the smaller, less intense accidents may not have been covered in the local media and could well have been missed out. Detailed on-site enquiry into five of these ten cases were carried out. The enquiry included visit to the factories, interviews with the owners/managers/supervisors of the factories, visit to the local police station and browsing through their records (FIR and other reports), interviews with the affected women, visit to the hospital and interviews with the doctors who treated the affected persons.

All the accidents happened almost in a similar way. Workers enter into the peeling shed in the morning (work starts mostly at 8.00 am, but in one case the time was earlier at 7.00 am) and very soon they are taken ill with various symptoms. Many of them fall unconscious, and others feel nauseous, giddy, fatigue and experience eye and nose irritation. Many vomit and

some of the cases even reported stomachache. In most cases women rush to the help of the affected and very soon they are also take ill. Much panic is set in and the women in various states of illness, some in swooned condition is rushed in to the nearby hospitals. Most of the factories are located in rather remote corners in the villages and there are only small clinics or private hospitals with very little facilities nearby. None of the hospitals where these accidents happened had any facility to handle possible pesticide poisoning cases, especially when the number of victims reaches high proportions. In some cases the women were taken to the Taluk Hospital, but in many cases the severely affected had to be rushed to the Medical College, Thiruvananthapuram, some 50 km away on an average. This is a larger referral hospital and has better facilities to manage a casualty of such proportions.

Pesticides are sprayed in the cashew factories to protect the cashew stocked in the sheds. While most of the factories spray Chlorpyrifos, the accidents have revealed that there are other pesticides also used. This shows that there is no single chemical that is recommended for use in the cashew factories. All the factories spray pesticide atleast once every month and some of them even resort to two sprays. According to the managements of the factories where the accidents happened they usually undertake spraying on the evening before a holiday or on a holiday. So most of the spraying happens on a Saturday. This according to them would give a 24 hour waiting period before the sheds can be used for work. So, when workers come for work on Monday there would not be any traces of pesticides left in the premises, which can create problems. But in most of the poisoning cases the spraying has happened on other days and not on a Saturday. And even in cases where the 24 hour period was allowed, accidents happened.

The investigation further revealed that the spraying is usually undertaken by a pesticide control agency mostly from Kollam town. The agency is taken on contract to go to each factory of the management and do the spraying. This applicator attempts to cover the maximum number of factories in a day when he comes to an area. This cannot be done on Saturdays alone. In one accident case the spraying was done even before the workers left the factory in the evening and many workers vomited and fainted in the factory itself. Few workers swooned on the way home and some after reaching home. In other cases spraying of pesticide was done on Sunday or other working days in the evening after the workers left the factory. The poisoning happened on the next day morning when the workers come to the factory. In one case there was leakage of the pesticide on the floor where the women sit to do the work. In almost all these cases the clothes which the workers leave behind after work in the factory premises got contaminated and when the workers put it on the next day they got affected. In one case, where Paramer (Methyl Parathion manufactured by Parry) was sprayed, the male employees of the unit

mixed the pesticide in a bucket of water and applied the pesticide themselves using a broom. He said that the operation was a simple enough one that did not require any protective clothes. None of the pesticide applicators in all the cases were adequately protected, it appears. It also seems to be very clear that many of the factories see scientifically managed pesticide spray as a overhead and as a cost cutting measure the spray is done by themselves or by some applicator who is not trained or authorized by the State. Even the selection of the pesticide seems to have been left to the fancies of the applicator rather than the company management or the scientific apex body. Many of the managers/ supervisors did not even know what pesticide was used, even after the accident. In one case, where a major multi national exporter was the owner, the manager in charge of the factories did not know which chemical was being used. All they said was that the spraying work is let out on contract.

In most of these accidents there was an average casualty of 60-70 women and there were accidents where more than 200 women were hospitalized.

Officially, it has been confirmed that no pesticide spraying is recommended for the cashew factories. Cashew Export Promotion Council, the apex body which coordinates export of cashew has a full fledged lab in Kollam to control quality for those business houses that want their cashew tested and certified before export. Even while they do not recommend any pesticide, it was understood that Chlorpyrifos is unofficially accepted as the pesticide that may be used if necessary. This is because, this pesticide is registered and used in the United States. The CEPC gives training to factory managers and personnel about pest control and maintaining the hygiene in the factories. To control the problems due to pests, they recommend phytosanitary measures like periodically removing the waste and maintaining cleanliness in the factory premises etc..

The CEPC is not a regulatory authority. When questioned about the possibility of use of herbal pesticides they said that quality of herbal products is doubtful and studies are not conclusive. About the chemical pesticides use in cashew, the CEPC is quite concerned. The CEPC is hoping that each factory would take decisions on quality control especially after GATT agreement. Since the importing countries have their own quality standards, especially on pesticide residues CEPC hopes that the management of factories will be sensible enough to maintain it.

In most of the cases the management of the factories helped the victims by providing the immediate medical cost. While these could be seen as a humanitarian measure, most of the managements showed undue hurry in getting the patients discharged. In one case, the patients who were admitted to the Intensive Care Ward were seen being shifted to the General Ward.

The doctors wanted to have them observed for 48 hours but the management wanted them to be discharged as soon as possible. Naturally, the accident itself has cost the managements much trouble, including the closing down of work, and the additional medical cost was not to their interest. The victims also were not complaining much. The cashew workers come from very poor background and they need this work badly to support their families. Many of them come from families who have been working in this sector for the last 23 generations. Most of the workers work under managements who take the factories on lease for 1-2 years. So the management can withdraw from the lease and the workers have to work under a different management for the next lease period. There is very little work security and there is a lot of exploitation. The contractors (temporary owners) supply the raw nuts to the factory, get it processed and the graded nuts are exported. So the workers cannot complain about their problems to an authority because there is no permanent authority. Also the workers union also has not taken any interest in such matters and conditions of health of the workers. They have other problems like wages and poor benefits to look in to. They are totally ignorant of the toxicity of pesticides. Since the temporary managers are concerned only about profits they seem to be very casual in this matter because they do not have any long term interest or responsibility in the factory.

Soon after an accident, the fifth in the line, happened in Anchal in Kollam on June 17th 2002, the Government authorities woke up to this shocking phenomenon. The Labour Minister , Sri Babu Diwakaran convened a meeting. The Inspectorate of Factories and Boilers, the State Pollution Control Board and the Department of Health were asked to formulate some immediate steps to contain such accidents in future. Strict orders were issued to all cashew factories regarding the safety measures to be taken. But five more accidents happened between June 2002 and January 2003, which are indicators that the fresh orders seem to have been flouted.

The recommended practice is to bar entry into the treated area for at least 48 hours after treatment. During this time, the treated area is to be left open for at least a day. Neither of these requirements appear to have been met in many of the instances. Interestingly, investigations of all the incidents indicate that knowledge about the procedures is singularly absent among operators of such units and other industrial users of pesticides. Most of the peeling sheds are pucca structures with good roofing, but many of them have poor ventilating ports. Here women squat together in a crowded manner and do the peeling operation. There is a lot of congestion, and the working conditions in itself create a lot of health problems.

The affected women, mostly aged between 18 and 45 are admitted with some of the immediate symptoms of organophosphate pesticide poisoning –

- ❑ Eye irritation
- ❑ Shivering
- ❑ Loss of consciousness
- ❑ Burning sensation inside the nose
- ❑ Giddiness
- ❑ Nausea with/without vomiting

Many women also reported the following symptoms a few hours after the poisoning and into the following day: Abdominal Pain, Body Pain, Pain in Joints, Persistent nausea and vomiting, Loss of appetite, Fatigue Problems with hands/legs, Dysentery and Eye fatigue. In most cases, the women were discharged from the hospital after one or two rounds on IV fluid and Atropine injection, in one-two days. But there were a number of cases where the women returned with multiple symptoms.

The effects of organophosphorous pesticide exposure is known and well documented. While its effects on the Central Nervous System is well known, there are studies which show that chemicals like chlorpyrifos can cause CNS malformations in children whose mothers are exposed at critical periods of pregnancy. (Janette D Sherman, 1995). Due to this and many other findings Chlorpyrifos was voluntarily withdrawn from most indoor uses by the manufacturers Dow Elanco in the United States (ATSDR, 1998). While most of the women have had acute exposure effects, it is very necessary that they be observed for further periods for possible long term health problems. Short-term exposure to Chlorpyrifos, as well as other organophosphates are known to cause muscle weakness weeks after the original symptoms have disappeared. It also induces changes in sleeping patterns, behavior, mood changes and effects on the nerves and /or muscles in the limbs (which appear as odd sensations, numbness, tingling or as muscle weakness) (ATSDR, 1998). Chlorpyrifos can also cause delayed symptoms beginning 1 to 4 weeks after an acute exposure which may or may not have produced immediate symptoms. (EXTOXNET, 1996). Thus it is quite important that many of the victims in the cashew factories need to be monitored for such Organophosphate induced delayed polyneuropathy (OPIDN).

There was mixed response from the hospitals and doctors during the enquiries. While in most cases the doctors who treated the victims knew very well about organophosphate poisoning, some of them were quite ignorant of the provisions and rules regarding pesticide poisoning and the mandatory steps that need to be taken soon after the poisoning cases are admitted. Most of the hospitals, were poorly equipped to handle pesticide poisoning cases,

eventhough they were situated in areas with high pesticide use both in the agriculture and non-agriculture sector as this.

Soon after the accidents there has always been immediate response from the Government Authorities. The Police register a case for negligence in handling poisonous chemicals. In the more serious of cases, they have arrested the owner, supervisor and/or manager of the factory more as a measure to pacify the public outcry. And invariably in all the cases the factory was locked and sealed, so as not to tamper with the available evidence. The Health Services Department, the Inspectorate of Factories and Boilers, the Kerala State Pollution Control Board, the Inspectorate of Food and the Labour Department are the other Government departments that have initiated some action to contain such accidents in future but it is now realized that these actions have not done its purpose. A set of instructions – a sort of code (regulations) have been distributed to the factory management.

But ironically soon after the accident the factory management have invariably come up with an explanation that the accident was only a drama played out by the workers. Many a time they have even gone to the extent of producing evidence. They ask questions like “why only 19 out of 195 women are affected?”. In one case the factory owners son told that the women fainted because they did not eat food in the morning and it was out of fear that this accident was caused”. Many factory owners also blame labour politics behind these accidents. While they accept that pesticide was sprayed and that they are unaware of the precautionary measures, they still feel that they are being harassed in this name. In some occasions, other workers who were not affected also came out in support of the management. In one case they desperately were found trying to convince that the colleagues in the hospital were not actually affected. The closure of the factory after such accidents and the loss of livelihood have put the workers in some sort of “neither here nor there” situation. The managers are also much worried about the pest problems, as even one nut if affected with insects, the whole consignment could be returned and this would be a loss for the factory.

These incidents brings out several troubling facts:

1. There are procedures and safeguards to be followed by operators of industrial units that use pesticides and there is also some awareness of them, but none of them seem to be followed on the site
2. Even where such awareness exists, the procedures and safeguards are seen as inconveniences that can be ignored with no significant harm to health.
3. Doctors and local hospitals are completely ignorant about the kinds of pesticides and poisons in use in their areas, their short-term and long-term effects, and the correct

systemic treatment for patients exposed to such poisons. The hospitals are also ill equipped to handle such casualties.

4. Doctors, hospitals and even the Directorate of Health Services are unaware or tend not to report such cases of poisoning to the Central Insecticides Board. As a result, data on real poisoning due to pesticides is grossly inadequate. In effect, this means decisions taken on eligibility for continued usage of pesticides that are or have to be periodically undertaken by the Central Insecticides Board are done without access to information about the instances of poisoning.
5. Virtually no long-term follow-up of pesticide-exposed persons is conducted, and no evidence is gathered on the long-term effects of the poison on their health. The resultant absence of information is taken to mean the absence of a problem.
6. Banned or restricted pesticides are freely available and used pointing to a total failure in the ability of the authorities to enforce the laws. If manufacturing is allowed, there seems to be little that the authorities can do to prevent the product's sale and use despite the existence of laws banning / restricting the same.
7. While considering the use of a pesticide for a particular purpose or pest, no scientific method is followed. In this instance the CEPC has no recommendations whatsoever, neither do any other departments. Moreover, chemicals like chlorpyrifos are the worst choices, especially because they persist in low levels for very long periods and stick to the soil particles. Women work squatting in the floor and are easily exposed.
8. There seems to be no responsibility on anyone when pesticide spraying is done. In spite of the many acts and rules like the Insecticides Act, the Poison Control Act etc, there seems to be no control or responsibility while undertaking such hazardous activity.
9. There is very little research regarding pest control in the non-agriculture sector, especially in this traditional sector. Cashew is a very sensitive industry and any issue, especially of contamination with pesticides could well affect its market and hence the export earnings and lakhs of livelihoods.
10. While organic cashew is preferred in the world market and its potential is growing at a very high pace, no effort is being taken by the concerned agencies to convert cashew nut production and processing operations into organic.

Other pesticide contamination issues

Apart from the incidents of acute pesticide poisoning there are also other contamination problems raised by the local people and media. One of such issue is the use of pesticides in the

food go down, especially in rice. Aluminium phosphide, malathion, nuvan and deltamethrin are the main pesticides used in rice storages (Ravindran, 2001). In one godown in North Kerala they use aluminium phosphide accounting to Rs. 60,000/- per year. Although the manufacturers advise the workers to take precautions, like using gloves, masks etc. they are not given any such equipments while spraying. Even while manufacturers tell that these pesticides can cause breathing problem, vomiting sensation and dizziness, the conditions of pesticide use are totally casual, the impact on workers is not taken seriously, as is evident from the lack of records kept about their health condition.

Consumers are concerned about issues like this. Many have started writing about this especially about the contamination of vegetables and fruits and have started demanding safe food. Reports are coming out in the media about rare and unknown diseases all over Kerala and also about allergic diseases like skin itching and rashes in villages and where even the doctors are unable to pinpoint the causative factor and remain helpless to suggest any remedy. Some of the issues are linked to water contamination like the health problems and water contamination issue in Kulathupuzha in Kollam District where a whole village lost their sleep due to skin allergies (Anil Kumar, 2001). Later experts told that it is because of the over use of pesticides in the nearby teak and rubber and plantation (Anon, 2001).

Similarly in one of the tea estates in Idukki district, the drinking water was found to be contaminated with pesticides and the health department was forced to arrange alternate water supply for the local people (Anon, 2001b). Although the amount of pesticide was found to be low it raised concern and it was found that contamination happened by the pesticides which ran down from the tea plantation where weedicide use is undertaken regularly. Even though the district rural medical officer asked the tea plantation management to stop the spraying of glyphosate, they ignored it. It is because of the petitions from the workers that the medical officer visited the place and found out the issue. Still the chief medical officer of the company continued to tell that the particular weedicide glyphosate is harmless.

Overuse of phorate is reported from many tea and cardamom plantations in Idukki district which leads to the continuous exposure of workers and the local community to pesticides (Anon, 2001c)

In Malappuram district the use of phorate in banana cultivation has found to result in health problems in 30 houses around the banana field. The reports also showed that it resulted in the deaths of domestic animals and when the police came to investigate the issue, they also

developed symptoms like dizziness and excessive sweating. People who took bath in a near by pond developed skin allergies and irritation in the eyes (Anon.2001D).

A study done by the mass communication students of Kalpetta government college in Wayanad district has brought out lots of issues related to pesticide use in this district. They investigated the death of a tea plantation worker who died due to various diseases, suffering for about five years. His family members told that he used to do pesticide spraying and he was not given any protective clothing while doing this. They also told that he used to develop burning sensation after spraying and to overcome this he used to sit under water for a very long time. Later he started getting joint pains and the situation became worse before his death (Anon, 2002a).

Another worker told them that he used to get lots of problems while spraying pesticides, like severe headache, burning and vomiting sensation. Later it turned out to be persistent stomach ache. The doctors who treated them told that it is because of pesticide spraying which he does as a worker. He also told that now there is no pesticide spraying in the plantation because of price fall and other issues, and he feels much better. Many other workers also told the investigators about eye irritation and stomach pain. In one of the estates they found that the management is careful about pesticide spraying and they provide precautions and also change the workers from pesticide spraying to other work (Anon.2002b).

Pesticides have started affecting the wildlife also, especially in areas near plantations. There are media reports of deaths of animals like elephants and peacocks. In one of the report from Idukki district (Anon,2002 C) a young elephant was found dead in a cardamom estate after eating some food inside the plantation and drinking water from a stream inside the plantation. There is every possibility that the stream is contaminated with pesticides considering the amount of pesticides used in the plantation.

The study brings out the various situations under which the workers and communities are getting exposed to pesticides and develop acute symptoms. In almost all the cases it was sheer luck and good will of local people that saved the people's lives. In spite of all the said problems of pesticides by the manufacturers, there seems to be no emergency preparedness on the part of the Government or other local institutions. Hence people continue to get poisoned everyday either intentionally or otherwise and are left to face all uncertainties which follow.

In the cashew processing sector where the largest number of accidents were reported by the media, the situations have not changed although a meeting was called by Factories and Boilers Department and Pollution Control Board with the management of cashew factories. In

all the incidents casualties did not happen. So even the trade unions do not take this issue seriously, especially in situations of job uncertainties which prevail now. Another thing revealed here is that all the staff at the managerial level are men and majority of the workers are women. When enquired all managerial staff were of the opinion that they did not get affected by the chemical although they were also there. Many of them were of the opinion that only one or two women are truly affected, others are only showing mass hysteria. This shows that they do not want to make any change to avoid such poisonings in future.

In the other cases, poisonings happened mainly in fields where banana and spices are commercially cultivated. One incident, where a boy died, revealed two things, one is that the plantation management employ children below 18 years of age to apply pesticides and second, there is no protection given to the workers while applying highly toxic pesticides like phorate. It also revealed the dangers of using chemical pesticides in remote places where there is no facility to handle the emergency situation and it is even more difficult to bring them to hospitals 20-25 km. away from the field.

The discussions with affected people, local people and authorities brought out one important fact that they do not expect any accident or problem situation like this and so there is no preparedness, as taking precaution, establishing local medical facilities and keeping the required antidotes in district or taluk hospitals. In the plantation sector management is all powerful and even while getting poisoned, the workers are not able to tell their problems to the doctors and generally supervisors are sent to the hospitals to talk to the doctors. In all the cases management was showing a haste to discharge the workers even while they had not recovered from the shock. There is a peripheral support given by the management in terms of hospital charges, which is taken as an act of responsibility by the workers and they are not in a position to demand more support, not only in terms of medical care, but also in terms of precautions.

The two incidents, where children became the victim, show the total ignorance about the toxicity of pesticides and the resultant casualness and arrogance of people who do pesticide application. In one of these cases a small baby died due to accidental consumption of Phorate. The pesticide was carelessly kept in the house which was reachable for a child of 1½ years old. This tragedy also brought out a fact that workers are getting pesticides freely from the plantations for their personal use. In the second case, upper primary school students got exposed to the pesticide while they were in school. The school is situated near a banana (earlier paddy) field and there is no restriction to use pesticides even if there is a school nearby. On the other hand it is becoming more and more clear that children are more vulnerable to chemicals like pesticides.

Even then farmers or government do not think of any sort of regulation to prevent exposure of pesticides to children. This is really problematic in districts like Idukki and Wayanad where most of the schools are situated near plantations which use a lot of pesticides. One of the officers of education department told that the schools do not even have a compound wall and they are just open to the plantations. So it gives the children an opportunity to run to the plantation and if the field is sprayed with pesticide it can directly harm the child.

Apart from the agricultural and storage uses of pesticides, people use a lot of pesticides in their houses starting from the construction of the building to everyday use of mosquito repellents. Statistics show that annual sales of household pesticides in India is worth rupees 1100 crore. Out of this 800 crore is used for mosquito control (Anon ,2004). The chemical allethrin used in various mosquito repellents such as mats, coils and vaporizers, is found to be hazardous to health. A survey conducted by Indian Council of Medical Research ICMR, 2001) among 5920 users revealed that more than one in ten users “complained of a variety of acute toxicity either soon after or within a few hours of use of repellents.” Breathing problems accompanied by headache were the most common problem, and the eye irritation, cough, cold and running nose were other complaints. Two persons even developed asthma.

About 11% of those who used skin cream as mosquito repellent reported skin rash, itching or black spot. Users with strong reactions, leading to asthma or bronchial irritation, eye or throat problems needed treatment.

Apart from this health department undertakes regular mosquito control programmes and they use synthetic pyrethroids. Malathion is also used by fogging in some areas as a preventive measure to control mosquito. In case of malaria occurrence the health department also resort to DDT application. Many people complain of getting severe headache, vomiting, sensation when fogging is done, but nothing gets recorded. Discussion with some of the sprayers in Trivandrum corporation revealed that some of them have skin allergies and breathing problems but they have not taken it seriously since for them job is more important.

Chlorpyrifos is the chemical widely used for termite proofing in buildings including houses. Earlier it was chlordane. Recently in United States, Environment Protection Agency (EPA) restricted the use of chlorpyrifos to outdoors. Many studies done in US showed residues of chlorpyrifos in the blood samples, household articles like mats, toys, etc. even after 3 weeks of pesticide spraying. In India a study done by Centre for Science and Environment (CSE) showed the presence of four pesticides in the bottled water – Malathion, DDT, Chlorpyrifos and Lindane.

Chandra Bhushan of CSE says that Indian regulations are “the poorest in the world”. India lack safety standards for pesticides and continue to use obsolete pesticides like lindane and endosulfan. In India neither the manufacturers nor the Government do not take any responsibility to control sale and use of pesticides, even of those belonging to “highly toxic” group (Lyla Bavadan, 2004).

The Joint FAO/WHO Meeting on Pesticide Residues (JMPR) provides scientific advice to the Codex Alimentarius Commission on regulating pesticide residues in the global food trade. The JMPR is dependent on pesticide companies and member nations to give it basic information, but in India many of the pesticides used are not registered with the JMPR!

Such inconsistencies show a disregard for health and even led Dr. M.S. Swaminathan to remark that the country was quick to learn about the green revolution technology from the west but slow to learn the safety valves that come with the technology.

Although agriculture is a state subject policies are decided at the centre. In the case of pesticides, registration is done at the centre and pesticide, companies get the licence to sell a pesticide anywhere in the country once it is registered. The only way a state can decide to restrict, even if they want, is by keeping records of related health issues and feeding it back to the policy makers and pesticide registration committee. History show that this does not happen regularly in India. In Kerala also Government has not taken such an initiative before, on its own, to ban or even to restrict the use of a particular pesticide.

Poor quality of information from pesticide companies and an absence of a regulatory system by the Government is the situation in India. In the US, 15-20% of the GDP is spent on regulation but in India it is hardly 0.5% (Chandra Bhushan, 2004). A regulatory mechanism that controls availability of pesticides is hence urgently needed.

All over the world, pesticide sale is regulated through agricultural department. Farmers have to specify what they need it for and are then given specific quantities with specific instructions. The Ministry of Agriculture has put forwarded the reasons for the entry of pesticides into food products, as wrong advice to the farmers and supply of pesticides to the farmers by pesticide dealers, wrong disposal practices, effluents from pesticides companies etc. over and above the indiscriminate use of pesticides by farmers, non-observance of waiting periods etc. Still they have not been able to regulate and restrict the accessibility of public to pesticides.

Pesticides and Suicides in Kerala

Suicides are increasing in Kerala at an alarming rate. It is said that a high percentage of people who commit suicide are farmers and generally all classes of people choose to take pesticides to kill themselves. A study done by institute of mental Health and Neurosciences , kozhikode (2004) show that 35.7 percent of farmers took to pesticides to kill themselves. Many factors contribute to suicides but it is said that accessibility to pesticides is one reason which make suicide an easy option to end one's own life when people are in stress. There is another hypothesis and also few studies which says that pesticides themselves can trigger suicidal tendencies in people since majority of the pesticides in use can affect the central nervous system.

While analysing the suicide cases the issue of pesticides have never found to play a prominent role. Although it is true that people can find many ways for suicides in times of distress , it is equally a reality now that pesticides contribute a lot. Nevertheless , no serious thought is given to regulate the accessibility of pesticides to the general public.

In the present study based on suicide reports which came in three main newspapers , The Hindu, Mathrubhumi, and Madhyamam , for an year , it is found that out of the total suicides reported 430 are caused by consuming pesticides. Of this 268 are men, 120 are women and 42 are children. People belonging to 28 different occupations have taken to pesticides to end their lives , in which students rank the top (15). Among the 430, only two are farmers. Others include casual labourers, school teachers, village officers, college lecturers , goldsmiths, government employees, drivers, fishermen, weaver, barber and various other categories of people. There are also suicide attempted cases which comes to around 40 in number. Majority have consumed furadan , still less number consumed cyanide and few others some acids. Name of the pesticides were not reported in the majority cases .

It is a reality in India that anybody can go and buy pesticides including children. Pesticide shops are everywhere in the state. Every panchayath has a minimum of two shops. There are even shops which sell food items on one side of the shop and pesticides on the other side. All these conditions increase the chances of more people buying pesticides and there will not be any questions from the shop keepers.

When people commit suicides police has to prepare FIR , but in most instances they will not mention the names of pesticides. The name furadan is so popular that it gets mentioned by some body and it will be there in the records. But all granular forms of pesticides are considered as furadan by ordinary people since they do not read the labels and this can create wrong data. Doctors generally do a stomach washing when the patients come to the hospital and are given symptomatic treatment. All these dilute the data and hence can not be depended up on.

Recommendations to prevent pesticide exposure in the state

To avoid pesticide poisonings and accidents in the state, following regulations and changes are needed. This is essential to protect the public health within the State.

- 1) Restriction on sales of pesticides, especially of those belonging to “highly toxic” group. Agriculture department should be empowered to take control of the pesticide sales at the panchayat level.
- 2) A monitoring committee should be set up at the panchayat level, to see that, pesticides are not sold and used unnecessarily in the panchayath. The members of this committee should include standing committee chairman (Agriculture), standing committee chairman (Health), local government doctor, agriculture officer, representatives of farmers, pesticide dealers, NGOs, school teachers and women self help groups. The committee should be able to forecast the need of pesticides for an year or a season before hand.
- 3) Pesticides should not be sold to children below 18 years of age.
- 4) Advertisements and promotional strategies of pesticide manufacturers through media as well as locally should be restricted and regulated. Labelling should be more clear and readable.
- 5) Community health has to be given priority in the planning process at the panchayat level. Studies are needed to assess the environmental and human health impacts of pesticides at the village/panchayath level. A system has to be developed to report pesticide poisonings and it should be strictly followed.
- 6) Along with economic development and increasing productivity, social and cultural development also should be given equal or more priority.
- 7) Pesticide education at all levels – farmer, school, household, institutions, media – is essential and should find place in the agriculture and health planning in a panchayat.

- 8) Priority should be given for other methods of crop protection rather than using chemical pesticides. Alternatives should be tried at the household level and in food storages and processing units like cashew factories.
- 9) In plantation districts like Idukki and Wayanad regulations have to be more stringent. Pesticide application near schools has to be prevented by suitable regulations.
- 10) Before the application of pesticides in the field, local people have to be informed by the farmer.

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