Dr. N. Sivayogan

PROCEEDINGS OF JAFFNA SCIENCE ASSOCIATION

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SRI LANKA

1999

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1998

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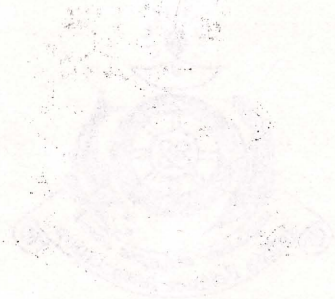

This volume is a record of the Proceedings of the Sixth Annual Sessions of the Jaffna Science Association. This contains the Presidential Address, Addresses of the Chairmen Sections B, C & D and review lectures which were presented at the Annual Sessions of the Association held at the University of Jaffna in June 1998.

I wish to thank the Vice Chancellor, Prof. P. Balasundarampillai; Dean, Faculty of Medicine, Dr. R. Rajendraprasad; Mrs. R.. Mahesan and the members of the Department of Biochemistry and Computer Unit for their generous support.

Prof. (Miss) V. Arasaratnam
Editor of this Proceedings
1999. 03. 14

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SCIENCE AND SOCIETY

*PROFESSOR V. K. GANESALINGAM

INTRODUCTION

The Chairman, General Secretary, Sectional Chairmen, members of the Committee of the Jaffna Science Association, Professors, Lecturers, Friends, Well Wishers and Students.

First of all I convey my heartiest thanks to all the members of the Jaffna Science Association for electing me as the 7th President of J.S.A in 1998/99. It is indeed a special honour. This is an opportunity for me to share with you some of my experiences.

It was a difficult task to select a topic common to all of you, specially when there are members specialized in their own field of study, namely Pure Science, Applied Science, Medical Science and Social Science. Although I have to touch on my own discipline, I would cover up some topics in which I am interested. However, all will agree that all the disciplines in Science, Arts, Social sciences and even the aesthetic studies have grown fast, perhaps very much faster in recent years than decades ago.

Whatever and whenever we study, teach or do research the subject matter should be interesting to the public, the society in which we live. Any study which does not have a boosting property to the standard of living of the common man, specially, at the grass root level, will not have any impact on the society. Therefore the society should be provided with the minimum facilities which are needed for a reasonable standard of living. Likewise, I also feel that knowledge of Science too should be provided to the society for its upliftment.

Therefore, my talk today is entiled "Science and Society".

SCIENCE AND SOCIETY

1. Nature of Science
    - 1.1 Science and accuracy
    - 1.2 "Black Box"
    - 1.3 Benefits of Science
    - 1.4 Disbenefits of Science
    - 1.5 What does a society need in Science?

2. Safeguard of society from the ill effects of Science
    - 2.1 Safeguard from chemicals
    - 2.2 Use of Botanicals
    - 2.3 "Alternate" agriculture
    - 2.4 Standardization and quality control
    - 2.5 Safeguarding consumers
    - 2.6 Prevention of animal extinction

1. NATURE OF SCIENCE

1.1 Science and accuracy

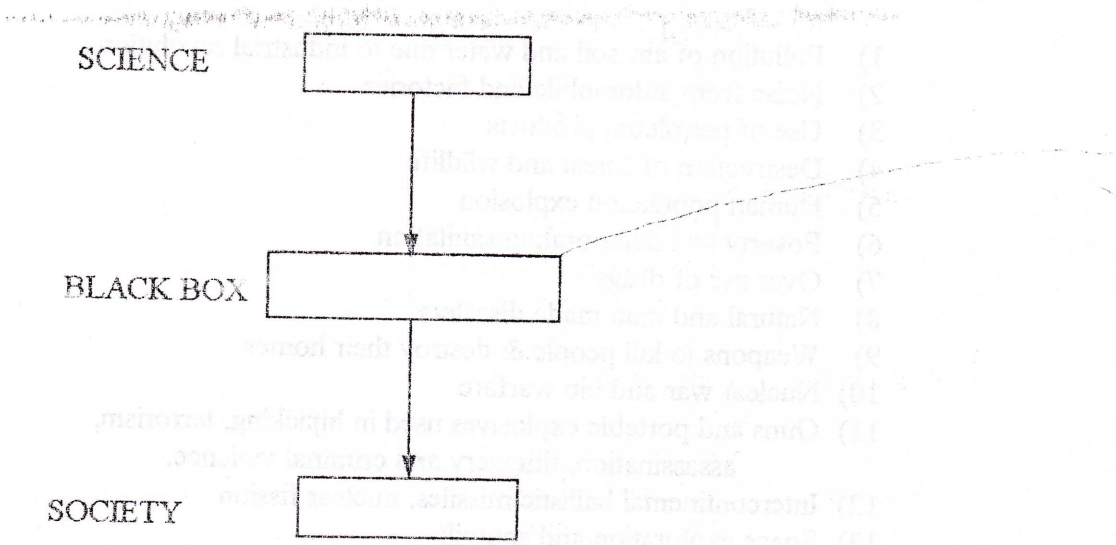
Science is based on fixed laws. Science deals with facts. Science proves things and makes no assumptions which cannot be verified. A single scientific method will produce the same results whenever it is done under constant environmental conditions. The scientific techniques are universally applicable to all disciplines. The scientific findings are the only or the best ones (Poole,1985)

In science, accurate results are presented with dependable data.

The science is more dependable because,
a) Science is neat, tidy and controllable;
b) Science values dependability;
c) Science is objective;
d) Science is neutral;
f) Science depends on replicability (Sechrest,1987)

1.2 "Black Box"

Science cannot penetrate society directly. There are some ways and means for science to be used by society. The ways and means are referred to as the "Black Box".



The Black Box Consists of the following:

1) Research & Development
2) Funding agency to support it.
3) Socio economic priority
4) Environmental problems
5) Limitations (Willy, 1997)

1.3 Benefits of Science

The benefits of science to the society are numerous. To mention a few, consider the following:

Comfortable home to live
Paramount medical facilities
Excellent clothing
Plenty of food
Advanced communication & transport system-Fax, E mail, Internet etc.
Helpful machinery & Equipment
Improved educational industrial and agricultural development
Atoms to automatic weapons
DNA & RNA to create new lives
Cloning to obtain an exact copy of the mother without sexual contact
Space exploration, sputnik & planet visit. (Thring ,1977)

1.4 Disbenefits of Science

Although Science has uplifted society to an incredible stage, the marriage between science and society has not always been a happy one. A healthy relation between science and society has never existed (Jackson, 1987). There are ever - increasing disbenefits too to human life due to the following factors:

1) Pollution of air, soil and water due to industrial revolution
2) Noise from automobile and factories
3) Use of petroleum products
4) Destruction of forest and wildlife
5) Human population explosion
6) Poverty and deteriorating sanitation
7) Over use of drugs
8) Natural and man made disasters
9) Weapons to kill people & destroy their homes
10) Nuclear war and bio warfare
11) Guns and portable explosives used in hijacking, terrorism, assassination, thuggery and criminal violence.
12) Intercontinental ballistic missiles, nuclear fission.
13) Space exploration and sputnik

(Thring, 1977)

Out of all the disasters, the most important man made disaster to us at the moment is the ongoing war. War leaves behind,

Army of widows
Army of cripples
Army of thieves
Army of poor, displaced, destitutes and orphans.

1.5 What does a society need in Science?

The standard of science must be more explicit in society. People should have a pollution free atmosphere. Factory produced materials should be perfect and durable. Food and agriculture should be produced at low cost and disease free. Transport, communication, electricity, energy, industry, water supply and other needs should be reliable and dependable. Hospitals should show high standard in many ways such as medicines, diagnosis, treatment, warding and counseling. The laboratory analysis should be perfect and non-ambiguous. Research technique should be modern with sophisticated instruments and equipment. Teachers should be more scientific and more modern in their work. The student should develop thirst in finding new and up-to-date scientific information, no matter in what part of the world such work has been done. Therefore we need critical, self-correcting and accurate scientific methods of unquestionable integrity to improve the scientific trend in our society.

2. SAFEGUARD OF SOCIETY FROM THE ILL-EFFECTS OF SCIENCE

2.1 Safeguard from chemicals

The environment is threatened by the chemicals used in the pesticides. As the pesticides are toxic by their nature, even small amounts can have a severe impact on environment. Therefore FAO has recommended the use of pesticides under "limited control" with particulars that the producer should state clearly the toxicity of the product, instruction to use and the amount of residues in the pesticides. Failure to adopt such information is illegal and offenders can be taken to courts.

In Sri Lanka, there are a number of statutes in which there are pollution control:

Acts to safeguard from chemicals:
Control of Pesticide Act No. 33 of 1980
Plant Protection Ordinance of 1924
Fauna and Flora Protection Ordinance of 1937 amended by Act No. 44 of 1964 and No. 1 of 1970
Marine Pollution Prevention Act No. 59 of 1981
Factories Ordinance No. 45 of 1942
Factories Amendment Act No. 54 of 1961
Factories Amendment Law No. 12 of 1976
National Environmental Act No. 47 of 1980
Petroleum Ordinance of 1887
Gas Ordinance of 1869 as Amended by Ordinance No. 29 of 1947
Agrarian Services Act No. 58 of 1978

The lesson learnt from DDT is that any chemical brought to the market has to be evaluated with regard to their effects on the environment before use. Therefore in 1974 the newly formed UN Environmental Programme (UNDP) took up the task of establishing a chemical register - the International Register of Potential Toxic chemical (IRPTC). The data profiles prepared by IRPTC includes identification of chemicals substances and characteristics and to estimate their hazardous effects on man and the environment. There are two other organizations - the International Agency for Research on Cancer (IARC) and the International Programme of Chemical Safety which contribute to the control of toxic effects of chemicals.

Therefore, the chemical has to be used with the knowledge and properties available, and with the information available from various national and international organizations established for this purpose (Kandasamy, 1988).

Spray of pesticides in ultra low volume of spray mechanism instead of traditional knapsack sprayer is introduced and practiced in order to make use of the ingredients effective for pest control and to prevent contamination on the environment, namely soil, air and water.

2.2 Use of Botanicals

Chemicals from plants, such as phenols, quinones, alcohols, acids and lactones are isolated and used against insect pests. This is being used as alternate to synthetic pesticides which have undesirable effects on the environment.

Azadiractra indica, the margosa is a wonderful tree that grows in the wild. Azadiractin isolated from this plant is used as feeding deterrents, growth inhibitors and antifeedant. The ingredient of the seed kernel extract is marketed in bottles and used as synthetic insecticides. Science has made the best use of this plant for society in place of toxic chemicals which cause environmental hazards (Ganesalingam, 1986).

In addition to this , this plant is used for medicinal purposes, as such this plant is described as "Village pharmacy" which contains several components of medicinal value in the rural areas. Investigation of this plant for its effect as pesticides, medicine and antiseptic is being done in many parts of the world.

2.3 "Alternate agriculture"

There are so many chemicals used in agriculture to obtain desired products. For example, fertilizers, insecticides, weedicides and hormone preparations are used to obtain vegetables, fruits and cereals of better quality and quantity. Now it is realized that use of chemicals are not desirable as these chemicals cause problems to the health of humans.

The National Research Council of U.S.A. put forward some modern trends in agriculture entitled "Alternate agriculture" consisting of greater use of natural nutrients, reduced use of synthetic pesticides, and making use of naturally occurring beneficial biological interactions and diversification of crops and livestock. This was described as "The New Bible" for farmers and "Resources of the Future". The results, no doubt, gave an impressive benefit. It is consisted of crop rotations, biological pest control, soil and water conservation and diversification of crop and live stock. The primary concerns were sustainable, ecological and regenerative farming operations, rather than environmental and potential health problems and possible pesticide residues on crops. Such ecological farming methods, of course, are definitely more beneficial in the long term in sustaining crop field in a developing society.

2.4 Standardization and quality control

In order to safeguard society, any product produced should have high quality, potency, purity and standard. Apart from these, cost at a competitive price is also important for the society. Therefore it is necessary that our society be protected from unfair trade practices and exploitation.

In order to safeguard the society, the Sri Lankan Standards Institute offers a series of service, such as

Product certification scheme,
Laboratory Accreditation scheme,

Industrial meteorology
Quality consultancy service,
Standardization and quality management

The Certification scheme and National Quality Awards scheme provide a significant contribution to the quality development programme of this country. The establishment of the National Accreditation Body (NAB) to co-ordinate and supervise all the quality related activities is an advantage to society.

Quality control of pharmaceuticals, testing food beverages, maintenance of sanitary conditions of food processing institutions, hotels and bakeries have been brought under the law in Sri Lanka by the following Acts :

Food Act No: 25 of 1980
Cosmetic Device and Drugs Act No: 27 of 1987

Local production and imported foods and consumer articles are monitored by the Standard Act No: 6 of 1987.

The testing facilities are available at the Government Analyst's Department and Sri Lanka Institute of Scientific and Industrial Research.

2.5 Safeguarding consumers

The quality and price guarantee are offered to society on many items such as household, agricultural, medical technology and consumable.

The right to safeguard the consumers is guaranteed under the following statutes:

Consumers protection Acts No: 1 of 1979
Food Act No: 25 of 1980
Cosmetic Device & Drugs Act No: 27 of 1980
Sales of Goods ordinance No: 1 of 1896

The regulations under the above act supplies the information in regard to quality, date of manufacture and expiry, ingredients, price and instructions to use. If the society is knowledgeable, it can overcome this hindrance. The above legal provision definitely protects the society in a court of law.

Three basic terms are very often used in quality management. They are:

The Good Manufacturing Practice (GMP)
Quality assurance
Quality control
Laboratory testing
Inspection
Validation

The Quality Control Considerations (QC)
Safety
Potency
Consistency
Purity
Efficacy

The Quality Assurance Service (QAS)
Purity
Efficiency

2.6 Prevention of animal extinction

All over the world many animals and plants which are very useful to the society are in danger of extinction. The number of threatened taxa is just over 5000, comprised of 698 mammals, 1047 birds, 191 reptiles 63 amphibians, 762 fishes and 2250 invertebrates (IUCN, 1990).The growth of the human population is the main cause for the animals and plants to be in danger. As the number of people is increasing, more land is needed which results in destruction of forests. This renders the animals and plants no favourable place to live and the whole group die and disappear. Once they are lost, their biodiversity is lost for ever. Several species of animals are being lost. Some of them are elephants, rhinoceros, tigers, whales, bats, birds and other invertebrates. They are killed for horns, medicines, oil, skin, museum specimens and various other benefits. Most of them will become extinct unless precautions are taken to save them. They have evolved for such a long period and losing them is a real loss from the evolutionary point of view. They cannot be seen, unless as fossils after several years.

Protection of wild life should be accompanied by the protection of nature reserves. Protection should be directed towards the species that are most endangered, which are listed in the Red list of threatened animals. Realizing the endangered species, steps are taken to save them. The collaborative efforts between World Wide Fund for Nature (WWF) and International Union for Conservation of Nature(IUCN) owe the greatest debt to the conservation tasks taking place all over the world for the benefit of the society and fauna and flora.

A World Congress on National Parks and Protected Areas has been held each decade since 1962. The objective of the Congress is to promote the development and most effective management of the world's natural habitats, such as mountains, wetlands, woodlands, sea shores, rivers, deserts and plains, so that they can make their optimum contribution to sustaining human society.

The World Conservation Monitoring Centre (WCMC) is a joint venture between the three partners in the world conservation strategy namely the World Conservation Union (WCU) ,the World Wide Fund for Nature (WWF) and the United Nations Environment Programme (UNEP) . This mission supports conservation and sustainable development with the available world data for global conservation of threatened species.

3. IMPORTANCE OF TEACHING

"Education is acquisition of the art of the utilization of knowledge"

-A.L. Whitehead.

3.1 Education and society

A full education must enable a person to have,

Head or Intellectual Brain
Heart or Emotional Brain
Hand or Physical Brain

(Thring, 1977)

Head or Intellectual Brain: We concentrate on educating a person to be an intellectual. But we fail to make him think by himself. The students have to be left to think by themselves what is right and what is wrong. We give the answer in our teaching and they copy it. They are not allowed to use their brain, but they copy what we express from our own thinking. Likewise they should be allowed to think about the aim of their life. If people are educated to use their own conscience, they will do better in their life than preaching to them what to do.

Heart or Emotional Brain: We should develop the student's heart to sympathize for others. It is necessary to show him poverty. He should be made to experience poverty. He will develop a sympathetic heart and an emotional brain. He should avoid taking any kind of groupings such as race, religion, class and tribe. He should be educated to such an extent that he develops his heart and brain to consider all human being as "one people".

Hand or Physical Brain : We teach practical in the laboratory with chemicals, various equipment or apparatus, animals, plants and men. The hands are used in conjunction with brain to do a good dissection or chemical analysis or a successful operation. Thus the hands are to be made anything worthwhile through experience such as scientific inventions, books and literature, arts and crafts. These will reflect the richness of his hand and brain.

Therefore , Education should be able to give the society the following:

To know the developments in the field of study
To make the research towards developments.
To make such contribution to the society
To be a human being
To be a good citizen
To help others in need
To use the brain and hand to produce results
To live as a part of society.

3.2 University teaching

Although the university teachers were concerned with teaching, the research component has became an important quality criteria for academic standard in recent times. But however, teaching and research are considered as a single role of a University teacher. If a lecture is based on research, it will be ideal and advantageous to both the teachers and the students. The research could be continued by any of his students if the need arises.

If a teacher stops his research he will be far away from the frontier of knowledge of the recent findings and cannot fit into the University teacher's expected caliber. It is rather important that teaching and research merge together to become excellence in a particular field. This is the salient result of the findings in the western universities in recent research (Sandrasegaram, 1998).

A conscientious, an outstanding teacher and a researcher says that he cannot use the same notes the very next year as new things appear in the journals and periodicals and that the text books are outdated. The quality of teaching will innovate the society to a great extent. Thereby more students will get interested in studies. This will help to reduce illiteracy and one will expect that all are educated in a society.

3.3. Quality assurance

Most emphasis is made on the quality of education in most parts of the world. According to Anderson (1997), the committee for the Advancement of University teaching in Australia is more concerned with quality enhancement rather than quality assurance. The Higher Education Funding Council of England has initiated a review of teaching quality assessed by trained team of specialists. In Sweden and Denmark, the quality of undergraduate education depends on the number of graduates passing out rather than the number of students entering the University. The Universities in Europe and North America have their own methods of quality assessment of the University teaching systems, although they move from elite to mass systems. In the developing countries too quality assessment is more important because the teaching period is more, due to translation, consultation and teaching in vernacular languages. Under such circumstances it is not possible for University teachers to excel in specialized teaching spheres.

It is indeed necessary not only for the students to study Arts, Science, Medicine, Engineering or Agriculture, but also their education should suit well to the needs of the society in which they will practice their profession.

The quality of teaching and the prospects of students will be made better if the following are satisfied:

The Curriculum be suited to society
Students be stimulated by teaching
Learning resources be supplied
Laboratory equipment and consumable be available
Teachers be competent and possess academic excellence
Students be carefully looked after
Career guidance be available

Quality assessment be made periodically
Knowledge be enhanced by several ways.

4. IMPORTANCE OF RESEARCH

4.1. Local "Cottage industry"

Indigenous scientific research related to local problems using available natural resources has to be carried out for the national development (Ramakrishnan, 1998). Our society has to acquire national wealth by way of research and development, specially in industry, agriculture, science and medicine

Research related to local "cottage industries" such as, clay, coir, weaving, handicrafts;

Research on Chemical industries such as, Ilmenite, Limestone, Glass sands, Iron ore, Graphite, Dolomite, Mica, Gems and Koalin (Ramakrishna, 1998);

Research on agriculture such as production of vegetables, tobacco, grapes, wine, fruits, jam, beer, toddy, arrack, hybridization, pesticide, weedicide, integrated pest management;

Research on animal production such as, cattle, goat, poultry, milk, cheese, fisheries, cloning and biotechnology;

Research on environmental problems such as, harmonious ecosystem, eco-friendly environment, sustainable energy production etc. have to be undertaken.

Such research could be undertaken not only for the academic interest but also as contribution to the economic development of the region where the university is located.

4.2. Natural resources

Natural resources that we have, can be subjected to intensive research to obtain the best value. Plants have chemical values. Soil has agricultural values. Air has industrial values. Marine waters are in plenty and fisheries values are varied. Forests have potential values of timber, flora and fauna. Natural ponds, lakes and estuaries have different kinds of animal species. Thus the natural resources can be harnessed and harvested in industrial way such as,

Obtaining Natural Resources (available in plenty)
Basic Research (Universities)
Applied Research (Research Institutes)
Production Development (Research & Development)
Production (Industry)
Marketing (Commerce)
Consumers (Target Group)

4.3. Industry and Universities

Industries and Universities should work together on applied research which is beneficial to both. Industries can sponsor the type of research they need to be carried out in the Universities on a contract basis. Thus the marriage between industries and Universities could be healthy, productive and last longing.

It is recognized that industry and University will prosper when they work in collaboration . However, a balance should be kept up between the two. It is a process of transformation of the raw materials into a product, which when sold has a profit to pay for the employees, satisfy those who invested the money into it (the shareholders) and to produce surplus resources. Such resources go for educational and social welfare systems of the country. In such a process raw materials, labour machines and capital are involved. In such a study ,the scientists of various disciplines come together and carryout successful research which will cost millions of rupees . By making use of such studies industry can produce finished products of good standard of quality in adequate quantity at the right time for marketing and at right price to avoid competition . This will encourage the industries to produce more. So, this is a good team work in which the scientists become a partner and bring new perspectives to the industry and effects good improvement in the produced goods.

Here comes the partnership between industries and Universities. Not only does this partnership bring about opportunities on both sides, but also it leads to economic growth and prosperity.

4.4. Process of Research

A scientist uses the most appropriate process for research investigation. For convenience, these processes have been divided into three steps. However, different investigations could be carried out in different ways, depending on the nature of the problem.

The details of the three. steps are as fellows:

Planning the investigation
Identification of a problem
Selection of suitable methods
Selection of suitable equipment
Design of experiments
Preparing materials and methods.

Carrying out investigation
Performing experiments
Performance of specific techniques
Making accurate observations
Collecting data
Description and report qualitative & quantitative data.

Interpretation and conclusion
Organizing the data in a suitable form
Analysis and interpretation

Extrapolation the data to the target
Comparing the data with that of others.
Suggesting further investigation, preparation of monograph

Many Universities in the West, have performed marvelous investigations and acquired national wealth. The "Bench research" goes to the field: specially in the field of Agriculture, Biology, Chemistry, Industrial Physics, Medicine etc. They demonstrate well in the class room as well as in the field. This is the result of the research performed in the Universities and institutes.

As the research-education was practiced in 19th century in Germany, scholars and researches from western Europe and U.S.A were attracted with their research in Germany. From then onward the German concept of University research and education was acknowledged and adopted in many other Universities of the world to enhance the research activity (Sandasegaram, 1998). This was introduced to the developing countries in 19th and 20th centuries.

Although it may be interpreted that the research is unrelated to curriculum and research is related to discovery, the research is really a biproduct of learning and knowledge which is important and indispensable in a society.

4.5. Interdisciplinary approach

Interdisciplinary approach (Ganesalingam, 1994) to a problem causes co-operation and integration of team of research workers, who will see the matter more clearly from different angles and arrive at an appropriate solution. Mostly there is overlap between allied fields. The demarcation of a particular fields is not possible. Therefore people of different or allied field, when work with partnership and with joint spirit will be able to obtain the results without any ambiguity. Joint authors or multiple authors will be able to see the matter more clearly than a single researcher because an individual will see at one direction only. Such collaborative work is more challenging and fruitful. For this matter, a team of workers will do it better than a single person.

The interdisciplinary research achieves fruitful solutions and crosses the traditional boundaries. Solid state physics and cellular biology merge to study cytometry for analysing cell components. Lasers and computers are used to analyse the nature of the cell. Robotics and psychology combines to study vision. Pesticides combines entomology and toxicology. Plants, animals and human beings are taken together in environmental biology. Computer comes in all the disciplines. Cancer and Aids cannot be studied fully without the knowledge of cell biology, immunology and biochemistry. Physics and Chemistry form important components in medicine, dental and veterinary sciences. Economics, Commerce and Management are considered in Engineering and Agriculture very much.

This is to say that no one discipline stands on its own, isolated. With the knowledge expanding on, one aspect will embrace the knowledge of other disciplines, specially the very close disciplines.

This is why, even in undergraduate and graduate level, we encourage the students to choose different subject combination he or she wishes. In the Universities of United States this system is much more elaborate.

4.6 Science and Technology

Science and Technology for development programme has been established to support scientific activities for the benefit of the developing countries by the European Community Union. This programme covers (1) Tropical and sub tropical agriculture and (2) Medicine, health and nutrition in tropical and sub tropical areas (UNIDO, 1990).

The growing importance of biological system forms a global action in scientific, technological and industrial development as outlined in the following programme.

A. Tropical and subtropical agriculture

1. Improvement of agricultural products, crop production, food and agroindustrial crops, crop genetics, crop protection, live stock production and fisheries, stock-farming animal, genetics and reproduction, veterinary, medicine, sea and inland fisheries aquaculture, improved forestry production in both humid and arid areas.

2. Conservation and better use of the environment-appraisal of resources, water resource and their use, soil management and protection, better management of fragile environments.

3. Agricultural engineering / mechanization and post-harvest technology; Agricultural engineering / mechanization of product conservation and processing.

4. Production systems - crop systems and production systems.

B. Medicine, health and nutrition in (sub) tropical areas

(1) Medicine

Infectious tropical diseases; parasitological, bacterial, viral and mycological diseases; Non- infectious tropical diseases, genetic disorders, acquired diseases.

(2) Health

Health services, operational research, organization, management and models environmental health, water - related diseases, traditional medicine, medicinal plants.

(3) Nutrition

Nutritional deficiencies, impact on agricultural, food and socioeconomic strategies on nutrition.

Impact of agriculture, food and socio-economic strategies on nutrition.

Relationships between production, storage systems, food habits and state of health of populations.

Bio - availability of nutrients

The emphasis is placed on tropical agriculture such as integrated management of agricultural resources (for reducing food storage), protection of environment (for reduced ill effects due to environmental hazards) and tropical health research (for preventing major tropical diseases).

C. Genetics

Genetic studies are growing towards agriculture in recent times. There is a belief that genetic knowledge will enhance the agricultural products, animal products, human health and intelligence in the following studies:

Genetics of agriculture and food
Genetics, environment and society
Genetics and Medicine
Population genetics and evolution
Gene structure and function
Genomic organization
Molecular genetics & application
Developmental genetics and neurogenetics
Genetic engineering and Biotechnology
Enzyme engineering breweries and cordials.

5. SCIENTIFIC EXCELLENCE

5.1 Papers and publications

Scientific discovery is always due to expert knowledge, logical thinking, systematic investigations and persistence. One needs a great deal of energy, stamina and curiosity to be a productive scholar. The scientific excellence arises from social interaction, social location and groups concerned. This resulted in production research groups, whose contributions are enormous and invaluable.

One of the most marked trends in contemporary science is the explosion of knowledge by way of papers, publications and books. It was estimated that between 20 and 25 millions publications have appeared since the invention of printing press (Jackson, 1987). A tremendous volume of papers have been produced and new journals have been created year by year.

The Science Citation Index (SCI) published by the Institute for Scientific Information Institute (ISI) is built around the world by linkages. ISI processes 7,000 different journals. Each week 2500 issues are received with 4,200 articles and 38,000 references to be processed. Two million papers are published each year in 80,000 different sources. Scientific and technological information is increasing at a rate of 13 percent a year or doubling every 5.5 to 7 years (Dubin, 1990). The citation tells not only the list of publications of an author, but also identifies the citation as to how many papers and

publications of the author concerned have been referred by other authors. This will help the individual researcher. This is an indication that knowledge is advancing in many frontiers to build up a new society of advanced civilization.

Scientific inquiry needs a critical, self- correcting and accurate scientific methods of unquestionable integrity.

Scientific finding is reached only if it is analysed and reanalysed based on replicability with more sophisticated analysing tools.

5.2. Academic dishonesty

The quality of some scientific findings are doubtful due to dishonest, incompetent and careless research workers in science and this could be explained by two examples (Sechrest,1987).

(a) The fabricated data on race and IQ by Cyril Burt have been cited in literature (Gould, 1981).

(b)The contamination of cancer cell colonies put forward by Hela (Gold, 1981) appears to have done considerable damage and at a cost in the field of cancer research.

Sometimes the results produced are untrustworthy due to fraud, bias, undetected errors and other obvious and reasonable errors (Sechrest, 1987).

At a conference in London of editors of prominent medical journals, it was revealed that research misconduct was common and they have discovered fabrication, falsification or plagiarism in the research papers they received for publications. There are cases which have been published by extracting the matter from different journals and submitted as their own. It was also discovered that the same study has been published in different journals several times. U.S office of Scientific Integrity investigated 100 cases of this nature and 30 percent were found proved.

As the research papers and publications are crucial for academic success, promotion, and for obtaining big research grants, the academic dishonesty takes place. It is obvious that such achievements are based on false premise.

Therefore, the Scientists who do cheating in their findings do more damage to science and to the scientific principles and thereby commit an inexcusable offense against society. Therefore, all scientists should be honest in their scientific dealings, if they wish to serve the society.

5.3. Lack of Scientific excellence

There are some scientific dilemmas that take place quite often. For example, in medical science, the illness is defined as the easily recognized departure from natural health. So much so, in order to find where normality ends and illness begins is a big problem. This is quite obvious in some diseases like anaemia, hypertension and obesity. They do not have sharp demarcation .

Likewise, the common surgical problems also do not have clear indication of need of surgery. In a study of 1000 patients of tonsilar infection, screening was necessary for surgery. First 650 patients out of 1000 were recommended for surgery. Out of 350 patients left, 157 were revealed the necessity for surgery by the second doctor. The third doctor examined the rest of 193 patients and he recommended 86 patients for such surgery. Lastly the fourth doctor recommended 39 patients out of remaining 107 patients. As a matter of fact, ultimately 932 out of 1000 have to undergo tonsilar operation instead of 650 patients who were recommended initially by the first doctor (Venkataraman, 1997). Thus, the failure to recognize accurately the patients for such treatment or surgery is obviously the lack of scientific excellence. Lack of proper investigation by the doctors concerned, or the lack of proper equipment or the lack of patients co-operation may also be considered as the factors. However, another question arises whether the disorders that have been discovered be treated medically because simply they have been discovered. Here again the academic excellence is the answer.

Patients are prescribed drugs even for slight illness such as "feeling weak", "headache" , "loss of appetite" without clinical examination. This is also due to lack of academic excellence. It was shown that in India nearly 40 percent of prescription by general practitioners and 60 percent of consultants are unnecessary, and irrelevant or may be harmful. A report of U.S Department of Health states that there are more deaths by drugs than due to accidents. This is probably the cost we pay for lack of academic excellence.

6. SCIENTIFIC COMPETENCE

6.1. How to keep up scientific competence

In order to enhance the science knowledge in a society it is necessary that the academics need to continue to develop and maintain academic competence throughout their work life. Due to knowledge explosion and rapid changes in the science and technology, the scientists and professionalists have to enhance their competence. Although technical information becomes outdated quite often, it is apparent that continued enhancement of knowledge is necessary in all fields of science. The remedy is to "catch up" with the fast flowing scientific development when competence starts declining. Failure to maintain the academic competence, decline of knowledge will lead to professional obsolescence. This is very serious when scientific and technical changes are more rapid. Updating involves information seeking, educational activities and usage. Updating should be a continuous process throughout the career. Updating process is achieved by acquiring knowledge by sources such as libraries, laboratories, seminars, "person to person" interaction and "informal conversation".

Some specific skills needed to keep up the scientific competence are as follows;
Learning new knowledge and skills
Selecting appropriate methods relevant to work
Thinking about correction methods
Correcting inadequate work quality
Correcting inadequate work quantity
Reducing absenteeism

Giving due recognition for work
Preparing performance report
Working towards profit
Working towards rewards and prizes

6.2. Obsolescence

Obsolescence is defined as mismatch between knowledge and application. The knowledge changes rapidly in the scientific and technological spheres. If application power has not grown with that of knowledge, such application is outdated . Text books cannot be dependable because, new books appear with modern knowledge so that the previously printed books become old and outdated. Not only the knowledge and books are outdated, the curriculum too is outdated within a short period. At a conference of 45 Deans of Faculty of Engineering at Massachusetts Institute of Technology held in 1986 , it was decided that the rate of innovation in electrical engineering was growing so rapidly that new subjects are added to the curriculum in every four or five years (Dubin, 1990).

6.3. "Shelf life"

The shelf life is applicable for a product manufactured by a factory. The product is rendered useless after the expiry date. Likewise, the knowledge acquired by a person is outdated after a few years due to the growth of the knowledge in the field concerned. The full knowledge that we acquired when we were graduates will be outdated to a great extent now technicalwise and academicwise. A half life of five years means after five years the knowledge that we acquired is only 50 percent; other 50 percent has to be discarded because it is out dated.

The following figures of half life is given by Dubin (1990):

Discipline	Half-life estimation
1) Computers	1-2 years
2) Software system	1-2 Years
3) Gene Technology	3-4 Years
4) Internal medicine	3-5 Years
5) Bio technology	5-6 Years
6) Engineering	5-7 Years
7) Management	5-8 Years
8) Physics	8 Years
9) Economics	8 Years

Although no claim is made for accuracy, this shows the speed of growth of each discipline.

It is estimated that more knowledge will grow within a few years so that the "half life" or "shelf life" may be reduced drastically for subjects like microcomputers, microchips, automation, optical scanners, robots, which are revolutionizing our knowledge.

6.4. Dubin's model

The half life concept of knowledge requires updating our knowledge. The "Dubin Model of Technical updating" gives an idea of how to keep up knowledge up to date.

$$P(U) = M + WE$$

Where,

P(U) : Probability of updating
M : Individual motivation
WE : Work environment.

This model provides a framework for the updating of knowledge. The individual motivation includes prizes, rewards and encouragement. Work environment refers to the facilities where modern laboratory equipment, ample supply of requisites and up to date library. If we have all these items in the society, the scientists will prosper and we will have a modern and meaningful society.

7. CONCLUSION

Science has progressed fast in all the spheres and it will do still faster in the next century.

Science should improve the living conditions of the common man. Our society should be able to use the best advantage of the scientific development for its prosperity and progress. Scientific inventions and findings must go to the grass root level so as to be used in agriculture, industry and the like for national development and economic enhancement.

The disbenefits, that cause harmful effects to the people, animals, plants and the geography of our planet, should be considered carefully. They have serious ill effects explicitly or silently on our society, The Scientists will have to find a way to remedy such problems or find an alternate for solution on a world wide basis. If not our society will have treasure in one hand and poison in other hand.

For this matter, Science teaching and research must be provided with Scientific excellence and competence. The best methods of teaching and research will make more Scientific investigations. Scientific dishonesty should be disregarded as it has negative effect on progress.

Funds and facilities be made available for adopting the best avenues available in science. Our Scientists be exposed to modern knowledge by providing with recent journals, periodicals and books and a visit to reputed research centres of their choice. The scientists should be encouraged in every aspect to pursue new knowledge to be utilized by society.

Our natural resources are our assets. They have to be used to the best of our ability. Enormous investigations should be devoted to obtain the best out of them. We have to depend on them as we are not endowed with better ways to develop our economy. They have to be "digested" with modern technology to be "assimilated" by our society.

The society in turn will have to harvest such natural resources for their own upliftment.

The "Village technology" ," Cottage industry" and "Village Pharmacy" should be up-dated. Without proper technological know-how and appropriate management techniques, no nation can prosper, specially in third word countries. Science and technology, motivation, and production should be our target for these achievements. The scientists, educationists, technologists and management experts should co-ordinate cordially to make our society to progress in a meaningful way.

If our society has to produce wealth, health and prosperity, it is Science which could achieve them. Therefore we have to develop scientific pursuits in our society. Science and society should look after one another for the well being of mankind. This is my message today.

Thank you.

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INTEGRATED PLANT NUTRITION SYSTEMS (IPNS) IN ASIA

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The basic concept underlying the principle of IPNS is the maintenance and often increase of soil fertility for sustaining increased crop productivity through optimising all possible sources such as, organic and inorganic plant nutrients required for crop growth and quality in an integrated manner appropriate to each farming situation in its ecological, social and economic possibilities. The approach is not new since the simultaneous and complimentary use of mineral fertilizer and organic fertilizer have been practiced for many years in many parts of the world. Originally cultivation depended upon the virgin soil of high fertile in nature. Thereafter the incorporation or recycling of organic materials came into practice. The use of easily and readily available mineral fertilizers came into practice with the advent of modern technology for the manufacture of mineral fertilizers in fifties. The mineral fertilizers increased the crop production.

Green revolution made use of several new inputs. The application of mineral fertilizers is one. The application of agro-chemical, such as pesticides, weedicides is another. The third input is the improved planting materials. The application of mineral fertilizers is now faced with new problems. (i) Price of the mineral fertilizers is increasing steadily with the increase in cost of manufacture due to increased cost of fuels, labor etc. In Sri Lanka there is a lift of subsidy in 1990 (Table 1). India has reduced the consumption of mineral fertilizers although there is a need for higher crop production (Table 2). Table 3 shows that country like China going for growing legumes which require low inputs of mineral fertilizers. Second point to be discussed under mineral fertilizers is that the continuous application of mineral fertilizers has resulted in degradation of soil physical properties. For example the percentage of soil organic matter reduced as in Table 4 in Bangladesh. Therefore to improve the soil properties to hold and supply water and nutrients to the plants in desired amount and to overcome the crises due to price like for mineral fertilizers, farmers in every part of the world have started to use both mineral fertilizers and other fertilizers at the same time.

Table 5a and 5b show that when the organic fertilizer is available in plenty as in West China the use of organic fertilizer to mineral fertilizer ratio is low (1: 0.35) when compared to the ratio in East China (1:0.94) where organic fertilizer found is less. When both organic and mineral fertilizers are combined under Integrated Plant Nutrition System, the nutrition balance N : P : K could reach 1.0 : 0.42 : 0.63, a good condition for plant growth. Organic fertilizers are either biological (biofertilizers) or plant and animal manure in origin. Table 6 gives the biological form of plant nutrients. The other organic manure are of plant origin such as green manure plant residues, garbage, cake, compost etc. and animal origin such as farm yard manure, biogas residue, blood and bone meals, and night soil, sewage and sludge.

Table 7 shows a comparison of NPK in organic manure. Properly preserved cattle dung without bedding material shows a higher content of plant nutrients than garbage materials.

*Chairman, Section B of Jaffna Science Association

Table 1: Change in price of fertilizer after removal of fertilizer subsidy in Sri Lanka.

Fertilizer	Price (US$/t)		
	1988	1990	1991
Straight fertilizers			
Urea	58	163	206
Triple superphosphate	58	200	210
Muriate of potash	56	167	194
Fertilizer mixtures			
Tea T 1130	56	130	141
TU 647	57	159	185
Rubber RU 462	54	136	155
RU 465	51	139	158
Coconut APM	56	158	184
YPM	52	144	165
Rice V mixture	60	195	213
TDM	60	170	211
Potato	59	167	180
Chili	61	150	162

Table 2: Food grain production and fertilizer consumption in India (million tonnes).

Year	Food grain production	Fertilizer consumption			
		All nutrients	N	P	K
1991-92	167.1	12.73	8.05	3.32	1.36
1992-93	181.2	12.15 (-4.5%)	8.43 (+4.7%)	2.84 (-14.4%)	0.88 (-35%)

The nutrient content of different plant materials are shown in Table 8. Legumes possess as much as 3% nitrogen compared to 1.1% nitrogen in rice straw. But the potassium content of both legumes and straw reach about 3.7%. Table 9 shows the nutrient contents of some more conventional green manure. *Sesbania aculeata* contains high amount of nutrients nitrogen (4%) and potassium (4.8%). Now the use these organic fertilizers in agricultural practices is cited below.

BIOFERTILIZERS

India and Bangaladesh are the major users of the biofertilizers in Asia. Table 11a and 11b show that the potential for bioferilizer in India is 11.18 10^5 tons but these produce only 2600 tons (0.23%). A similar trend is seen in Bangladesh which produces only 0.05 of the demand as shown in Table 10. *Rhizobial* inoculants alone increase the crop production
in legumes from 30 to 94 % as shown in Table 12. *Rhizobium* inoculation had increased green manure production by 10 - 30% as forage legumes as shown in Table

13. Free living bacteria such as *Azotobactor* and *Azosprillum* increased the production of fodder and grasses as given Table 14. Both *Azotobactor* and *Azosprillum* increase the yield by 6- 17 % and 4 - 21% respectively. The effect of incorporation of *Azolla* on the production of rice against chemical mineral fertilizers in Bangladesh is shown in Table 15. The results show that 50% chemical fertilizer could be reduced when *Azolla* is incorporated in the rice cultivation. Not only nitrogen but phosphorus is also made available to plants in increased amount by soil microorganisms. The use of micro-phos inoculant on the grain yields of some crops in India is shown in Table 16. The effect of phosphate solublising bacteria (PSB) is unaltered even though when phosphorus is not applied to the field. The chief function of PSB is to release the soil fixed phosphorus to plant uptake. The effect of phosphate solublising bacteria is pronounced when the application of mineral fertilizer is reduced to half as shown in Table 17. This Table also shows the influence of *Rhizobium* under these conditions on soybean cultivation in India.

Table 3 - Mineral fertilizer cost and total input cost (US $/ha) in China.

Crop variety	Total input	Mineral fertilizer	Input (%)
Corn	106	55.4	52.2
Wheat	136	60.9	44.8
Soybean	51	11.5	22.5
Cotton	166	79.4	47.8
Peanut	159	37.0	23.2

FARMYARD MANURE

Application of farmyard manure is nothing new to the farmers in Asian countries. But with the development of mineral fertilizers, the amount of farmyard manure application has been reduced due to several reasons; the chief reason being that they are very bulky and possess small amount of nutrients. But their contribution to the fertility of the soil is of paramount importance. The moisture holding capacity of the soil is increased by the incorporation of farmyard manure as in Table 18. This table also reveals that size of the soil aggregate formed increased when farmyard manure is applied in contrast to the application of mineral fertilizer alone. The incorporation of cattle and poultry manure had increased the yield of tomato and cabbage in the mid country wet zone of Sri Lanka (Table 19). Combination of chemical fertilizers with cow-dung increased the yield of potato, mustard and wheat in Bangladesh from 50 - 100% as shown in Table 20. Similar trend was noticed when rice was cultivated with the combination of both inorganic fertilizer and cattle manure in Bangladesh as in Table 21. In an experiment on growth of coconut in Sri Lanka the application of goat dung has increased the % N in the leaf and number of nuts as given in Table 21.

Table 4: Depletion of soil organic matter status in different agro-ecological regions of Bangaladesh during last 20 years.

Names of regions	Land Type*	Average croping intensity %		Organic Matter % (Average)		Total**
		1969-70	1989-90	1969-70	1989-90	
Madhupur Tract	H.L.	150-200	150-300	1.78 (1.3 -2.4)	1.2 (0.6-1.7)	32.58
Barid Tract	H.L. & M. H. L.	100-200	100-200	1.45 (1.06 - 2)	1.15 (0.9-1.4)	20.69
Old Himalayan piedmont plan	H.L.	100-200	200-300	1.32 (1 - 1.65)	1.2 (0.8-1.5)	9.0
Tista meander flood plain	H.L. & M.H.L.	150-200	200-300	1.55	1.23 (1.0-1.5)	20.6
Northern and Eastern hills	H.L. & M. H. L.	100-200	200-250	2.04 (1.49-2.46)	1.32 (1.0-1.5)	35.3
Old Meghna esturine flood plain	H.L.	200	200-300	2.16 (1.92-2.61)	1.17 (1.0-1.5)	45.8
High Ganges river flood plain	H.L.	100-150	200-300	1.21 (0.64-1.61)	0.98 (0.3-1.4)	19.0
Old Brahmaputra flood plain	M.H.L.	150-250	200-300	1.56 (1.09-2.16)	1.23 (0.9-1.5)	21.15

*H.L. - High Land and M.H.L. - M.H. Land
** Depletion of Organic Matter (%)

Table 5a: IPNS system and agricultural production in China.

Zone area (10^6 ha)	Cereal production (10^6 ton)	Organic manure (10^6 Tons)			Mineral fertilizer (10^6 Tons)		
		N	P_2O_5	K_2O	N	P_2O_5	K_2O
East 33	160	3.57	2.30	4.73	7.12	1.81	0.70
Middle 47	180	4.11	2.49	5.57	6.50	2.18	1.51
West 30	100	4.93	2.69	5.93	3.50	1.01	0.14

East including 11 provinces, Middle 9 provinces, West 10 province.

Table 5b: NPK ratio in organic and mineral fertilizer as in China.

Zone area	Organic manure $N:P_2O_5:K_2O$	Mineral fertilizer $N:P_2O_5:K_2O$	Organic: Mineral	Total $N:P_2O_5:K_2O$
East	1.0:0.64:1.32	1.0:0.25:0.10	1.0:0.94	1:0.41:0.54
Middle	1.0:0.60:1.36	1.0:0.25:1.36	1.0:0.84	1:0.46:0.70
West	1.0:0.55:1.20	1.0:0.29:0.04	1.0:0.35	1:0.44:0.72
Total	1.0:0.59:1.29	1.0:0.29:0.14	1.0:0.70	1:0.42:0.63

Table 6 : Biological form of plant nutrients (Biofertilizers).

Nutrient	Organism	Habitat	Rate of fixation (kg / ha)
N	*Rhizobium*	Symbiotic	20-25
N	*Azotobactor*	Non-symbiotic Free living	10-20
N	*Azospirillum*	Non-symbiotic Associative	10-20
N	Blue green algae	Photo synthetic free living	25-30
N	*Azolla* (fern) BGA (anabaena)	Photo synthetic Free living	25-30
P	VAM (vesicular, arbuscular, mycorrhizal)	Symbiotic	
P	*P. striata* (micro-phos)	Free living	
P	*B. polymyxa* (micro-phos)	Free living	

Table 7: A comparison of the NPK contents of a garbage organic fertilizer and cattle manure marketed in the upcountry region of Sri Lanka.

Material	Total nutrient content (%)			$N+P_2O_5+K_2O$ (kg/t)
	N	P_2O_5	K_2O	
Garbage organic fertilizer	0.93	0.02	0.36	13.1
Cattle manure	1.69	0.32	1.37	33.8
Cattle dung	1.74	1.68	0.92	43.4

Table 8: The nutrient content of organic manure.

Type	Cg/kg	C/N	N (g kg^{-1}) T-N	N (g kg^{-1}) H_2O-N	P_2O_5 (g kg^{-1}) T-P_2O_5	P_2O_5 (g kg^{-1}) H_2O-P_2O_5	K_2O (g kg^{-1}) T-K_2O	K_2O (g kg^{-1}) H_2O-K_2O
Rice straw	376	33.6	11.2	-	1.5	0.7	37.1	31.1
Chinese milk vetch	400	15.5	25.8	-	4.3	2.6	19.2	16.7
Radish	386	11.9	32.4	-	10.2	7.8	39.9	32.8
Rape	367	23.2	15.8	-	8.4	6.4	37.6	32.0
Broad bean	383	11.8	32.4	-	7.1	5.0	34.8	29.3

Table 9: Nutrient content and C:N ratio in the green leaf and green manure.

Crops	Total N (%)	C:N	Total P (%)	Total K (%)
Conventional green manure				
1. Annuals				
Sesbania aculeata	3.97	21:1	0.37	4.80
Crotoleria juncea	1.90	44.1	0.34	3.68
2. Perennials				
Gliricidia sepium	2.76	33:1	0.28	4.60
Pungamia glabra	2.78	33:1	0.27	0.19
Non-conventional green manure				
1. Trees (leaves and twigs)				
Azadiractha indica	2.83	70:1	0.28	0.35
Delonix elata	3.51	27:1	0.31	0.13
Delonix regia	2.76	32:1	0.46	0.50
Pheltophoreum ferugenum	2.63	34.1	0.37	0.50
2. Weeds				
Aduthoda vesica	1.32	60:1	0.38	0.15
Parthenium hysterophorus	2.68	30.1	0.60	1.45
Echhornia portulacastrun	3.01	29:1	0.90	0.15
Lpomoea cornea	2.01	43:1	0.33	0.40
Calotrophis gigantea	2.06	64:1	0.54	0.31
Cassia pistila	1.60	121:1	0.24	1.20

Table 10: Area of grain legumes and present use and future demand of biofertilizer in Bangladesh (1990 - 91).

Grain legumes	Area ha	Approximate demand of biofertilizer (Ton)	Present production & use of biofertilizers (Ton)	Additional need of biofertilizer (Ton)
Lentil	210,122	210.0	0.5	209.5
Chickpea	102,834	103.0	0.5	102.5
Mungbean	57,895	58.0	0.2	57.8
Blackgram	68,421	68.0	trace	68.0
Cowpea	5,263	5.0	trace	5.0
Other pulses	.....	.....	.....	.....
Khesari+pea	27,530	27.0	trace	27.0
Groundnut	38,500	39.0	0.5	38.5
Soybean	2,186	2.2	1.8	0.4

Table 11a: Potential of Biofertilizer in India by 2000 AD.

Name of biofertilizer	Potential (000'tonnes)
Rhizobium	235.00
Azotobacter	162.61
Azopirillm	177.16
Blue green algae	267.72
Phosphate solubilizing microorganism	275.51

Table 11b: Production of different type of biofertilizers during 1992 / 93 (in tones) in India.

Organizations	*Rhiz*	*Azot*	*Azos*	*PSB*	*BGA*
Central Government/ State Agriculture Departments	650	215	155	60	-
Agricultural Universities	24	10	4	2	-
Institutional Agencies	300	125	110	25	-
Private Companies	175	60	30	55	-
BGA sub centers	-	-	-	-	600

Table 12: Effect of Rhizobial inoculants and chemical fertilizers on Chickpea, Cowpea, Groundnut and Soybean in various locations of Bangladesh (1988-92)

Input	Chickpea		Cowpea		Ground Nut		Soybean	
	*G.Y	%In#	*G.Y	%In#	*G.Y	%In#	*G.Y	%In#
Control	693	-	715	-	1258	-	815	-
Inoculant	985	42.0	1030	44.0	1660	32.0	1582	94.0
NPKS	942	35.9	1020	42.6	1540	22.4	1203	47.6
PKS+ Inoculant	1262	82.0	1810	153.0	1850	47.0	1931	136.9

*G.Y- Grain Yield in kg/ha, % In# -% Increase

Table 13: Effect of *Rhizobium* inoculation to some important Forage Legumes.

Crops	Green forage yield (g/ha)		Percent increase in yield over control
	Without inoculation (Control)	With *Rhizopium* inoculation	
Cultivated legumes			
Cowpea	392	457	17
Rice bean	215	245	14
Cluster bean	257	285	11
Lablab bean	225	247	10
Berseem	685	830	21
Persion clover	610	765	25
Lucerne	592	757	28
Pea	285	328	15
Indian clover	237	272	15
Pasture legumes & shrubs			
Stylo	360	455	26
Siratro	195	220	13
Butterfly pea	317	415	31
Centro	228	285	25
Hedge lucerne	235	269	14
Subabool	338	377	11
Shervri	325	363	12

Table 14: Effect of non-symbiotic nitrogen fixing organisms on yield of some cultivated non legume fodder crops and range grasses.

Crops	Green forage yield (q/ha)			Increase in yield (%) Over control	
	*Control	With Azot	With Azop	Azot	Azop
Annual crops					
Sorghum (*Sorghum biclor*)	412	470	45	14	10
Maize (*Zea mays*)	388	433	428	12	10
Teosinte (*Zea maxicana*)	327	352	340	8	4
Pearl millet (*Pennisetum*)	318	338	345	6	8
Dinanath grass (*Pennisetum pedicilatum*)	560	655	678	17	21
Oats (*Avena sativa*)	425	490	465	15	9
Perennial crops					
Nepiar-pearlmillet hybrid	1368	1460	1539	7	12
Guinea grass (*Penicum maximum*)	792	865	905	9	14
Tmothi (*Satiria spehacclate*)	665	712	780	7	17
Signal Grass (*Bracharia decumbans*)	570	658	642	15	13
Pasture grasses					
Buffelgrass (*Cenchrus ciliaris*)	287	325	308	13	7
Birdwood grass (*Cenchru cetigerus*)	165	187	175	13	6
Blou buffel grass (*Cenchrus glaucus*)	215	245	229	14	6

Azot. - *Azotobacior*, Azop. - *Azopirillium* and * Without inoculation.

GREEN MANURE

Tables 8 and 9 show that the green manure contain 1.32 - 3.97% N, 0.24 - 0.90% P and 0.15-4.8% K. Some of the green manure suitable for some field crops are given in Table 23. Sunhemp, *Sesbania*, cowpea, and leaves of *Gliricidia* and *Thespesia* are commonly used as green manure for field crops. In the rice fields prior to planting of rice as much as 20t/ha of green matter can be grown and ploughed in the filed as given in Table 24. They can contribute from 40 to 200 kg N/ha. Green manure contribute both the development of physical and chemical properties of soil. Table 25 shows that green manure increases as much as 60 % total N and the organic matter in soil by 35 %. The application of green manure has increased the rice and maize production by 12 and 30 % respectively as shown in Table 26.

Table 15: Combined effect of Azolla and chemical fertilizer* on HYV bore rice at different locations.

Location	Yield(t/ha)	
	80 kg N	40 kg N + *Azolla*
Mymensingh	6.1	6.4
Kishoreganj	6.2	6.5
Comilla	5.3	5.0
Gazipur	6.4	6.3
Bogra	4.1	4.5
Khulna	5.5	6.7

Azolla = 100 gm/m^2 (fresh wt.)

* PKSZn fertilizer applied as recommended based dose.

Table 16: Effect of IARI micro-phos inoculant (phosphobactria) on grain yields of crops in locational trials.

Crop	No. of Trials	Increase due to inoculant (%)	
		Without Phosphate	With rock Phosphate
Rice	7	10-20	5-15
Gram	3	10-30	15-25
Wheat	8	7-42	5-50
Lentil	2	-	13-15
Potato	2	30-50	-

Table 17: Response of soybean Var. JS-71-05 to top dressing of biofertilizers 1992 - 93.

Treatment	Yield(q/ha)		
	1991-92	1992-93	Average
Full fertilizer (20:60:20)	19.44	23.38	21.41
Rhizobium(Rh)	16.11	28.12	22.11
PSB	16.77	27.64	22.20
Rh + PSB	18.27	27.65	22.96
Check	14.16	21.98	18.07
Half fertilizer(10:30:10)(F)	16.11	18.56	17.33
F + Rh	19.33	27.98	23.65
F + PSB	18.88	27.64	23.62
F + Rh. PSB	20.55	29.24	24.89
SED	1.232	0.197	
CD at5%	2.528	0.399	+

Table 18: Long term effect of fertilizers and FYM on some physical properties of soil (0-30 cm) in fixed rice-wheat-cowpea system (after 9 years of cropping).

Treatment	Soil aggregate mean weight diameter (mm)	Organic matter (%)	Moisture content (cm^3) at -33 bar	-15 bar
Control (N P K)	1.09	2.50	0.30	0.13
100% NPK	0.73	2.65	0.29	0.13
100% NPK +FYM (@15 t/ha in rice)	1.20	2.88	0.33	0.13

Table 19: Effect of cattle and poultry manure application on tomato and cabbage yields in the mid country wet zone.

Treatment	Yield (t / ha)		
	Tomato*	Cabbage**	Tomato***
Control	2.83	4.67	3.17
NPK	19.99	28.06	11.50
10t/ha CM+	15.13	19.75	11.55
10t/ha CM+ NPK	20.29	23.88	13.43
10t/ha CM+ ½ NPK	17.21	28.69	15.43
05t/ha PM+	15.62	27.18	19.62
05t/ha PM+ NPK	20.24	30.15	18.60
05t/ha PM+ ½ NPK	17.70	30.53	17.22
20t/ha CM	15.63	29.60	15.98
10t/ha PM	16.25	26.62	14.77
CV %	19.98	24.26	24.42
LSD (0.05)	5.47	10.29	5.87

*, **, *** - Crop sequence
\+ - On dry basis CM and PM rates work out to 6.5 and 3t/ha respectively.

Table 20: Combined effect of chemical fertilizer and organic manure on wheat, potato and mustard during 1992 - 93 Rabi season.

	Average Yield (t/ha)					
	Wheat at Ranpur	Increase (%)	Potato at Bogra	Increase (%)	Mustard at B. Baria	Increase (%)
Control	1.6	-	13.0	-	0.4	-
Chemical	3.1	93.7	27.0	107.7	1.1	175.0
Chemical fert+CD	4.2	162.5	32.0	146.0	1.5	275.0

Blanket application of NPKS @ 140-25-35-20 kg/ha
CD= Cow-dung application @ 5t/ha

Table 21: Effect of integrated use of organic and inorganic fertilizers on the grain yield of modern rice in a Boro-Fallow-*T. Aman* cropping patter (t/ha).

Treatment*	1983		1984		1985		1986		1987
	A	B	A	B	A	B	A	B	A
No.	3.1	2.8	2.9	3.0	3.5	3.5	3.2	2.8	2.8
N 80/60	4.3	4.7	3.9	5.2	4.9	5.5	3.7	4.7	4.5
CD+No	4.0	3.2	2.9	3.3	4.1	4.1	3.6	3.0	3.7
CD+N80/60	4.9	5.4	4.9	5.3	5.0	6.2	3.6	4.8	5.1

A - *T. Aman* (BR II) and *B - Boro* (BR3).
*N =urea N, subcripts denote rate (kg / ha) in *Boro /T. Aman*
CD = Cow-dung/applied @ 5t / ha prior to t / *Aman*
Blanket application of PKS @ 25-35-20 kg / ha

Table 22: Effect of goat dung application on growth of coconut in Sri Lanka.

Treatment	Female flowers No.	Nuts No.	Copra weight (kg / ha)	N_2 in 14th leaf (%)
Control	88	23	4.5	2.17
Mineral fertilizer*	120	34	7.0	2.34
Goat dung + PK**	149	40	7.7	2.41
LSD (0.5)	3.1	4.3	0.4	NS

* -3 kg Adult palm mixture i.e. 0.8, 0.6 and 1.6 kg urea, rock phosphate and muriate of potash respectively.

** 1.5 kg goat dung with no urea and reduced amounts of rock phosphate and muriate of potash (taking into consideration the P and K present in dung) such that treatments 2 and 3 received equal amount of NPK.

Table 23 - Green manure suitable for some field crops.

Field crops	Suitable green manure
Rice	Sunhemp, Sesbania, Wild indigo
Sugarcane	Sunhemp
Finger millet	Sunhemp
Wheat	Sunhemp
Sorghum	Sunhemp, Subabool, Cowpea
Banana	Leaves of *Glyricidia*
Potato	Lupine, Sunhemp, Cowpea, Guar, Horse Grain.

Table 24: Biomass production and N accumulation in some common green manure for rice fields.

Local name	Botanical name	Growing season	Output in 45 - 60 days	
			Green matter (t/ha)	N_2 accum-ulation (kg/ha)
Sunhemp	*Crotoleria juncia*	Wet	21.2	91
Dhaincha	*Sesbania aculeata*	Wet	20.2	86
Pillipesara	*Phaseolus trilobus*	Wet	18.3	201
Green gram	*Vigna radiata*	Wet	8.0	42
Cowpea	*Vigna sinensis*	Wet	15.0	74
Guar	*Cyamopsis tetragonoloha*	Wet	20.0	68
Senji	*Melilotus alba*	Dry	28.6	163
Khesari	*Laathyrus sativus*	Dry	12.3	66
Berseem	Trifolium alexandrium	Dry	15.5	67

Table 25: Effect of mulching with gliricidia loppings and pucrarai on the nitrogen and organic matter content of a coconut growing soil in the wet zone of Sri Lanka.

Treatment	Total N (ppm)	Organic-matter (%)
Control*	257	0.63
Gliricidia+	401	0.84
Pueraria+	389	0.85
LSD (0.05)	35	0.17

*- recommended amounts of mineral fertilizer i.e. 3 kg.
Adult palm mixture per palm per year i.e. 0.8, 0.6, and 1.6 kg urea, rock phosphate and muriate of potash respectively
+ - 30 kg (fresh weight basis) added to manure circle.

Table 26: Combined effect of chemical fertilizer and green manuring (GM) in *T. aman* and Maize cultivation.

Inputs	Yield (t/ha)			
	T. Aman	Increase (%)	Maize	Increase (%)
Control	3.9	-	4.6	-
Recom. fertilizer	6.0	33.8	7.8	69.6
Recom. fertilizer + GM	6.8	74.4	8.7	89.1

DRIED PLANT RESIDUES

Plant residues such as rice straw possess very low amount of nutrients as shown in Table 8. It has N 1.12%, total P 0.15 % and total K 3.71 %. Except K , the content of N and P is very low. However when the legumes are harvested in full bloom and dried, they have % N from 1.58 to 3.24, % total P from 0.43 to 1.02 and % total K from 1.92 to 3.99. The large quantity of rice straw available could be a good source of K. The effect of recycling of straw in rice field is shown in Table 27. Rice straw responded to K on the yield of rice in Sri Lanka. Similar trend is obtained in another study in China as shown in Table 28.

Table 27: Effect of straw recycling on rice yield in five agro-ecological zones in Sri Lanka.

Agro-ecological zone	Yield (t/h)		
	NP*	NPK*	NP+Straw+
Low country dry zone	4.5	4.7	5.5
Low country intermediate zone	5.0	5.1	5.7
Mid country intermediate zone	3.9	5.2	5.6
Mid country wet zone	4.6	4.6	4.9

*- Recommended rates of NPK , i.e. low country dry and intermediate zones 100, 25 and 20; mid country intermediate and wet zones 60, 25 and 20 kg per ha respectively.

+- straw obtained from each plot was recycled. In these treatments 10 kg N per ha was reduced from the recommended rates of application for each zone

NIGHTSOIL

In China in the past municipal wastes such as nightsoil, sewage and sludge were used as organic manure directly or just treated through a simple anaerobic process. In recent years the use of these wastes have been decreased with the development of the rural economy, change in values and the advantages of mineral fertilizers. Now these wastes must be rendered non-hazardous according to standards regulations.Nightsoil generated from domestic and public toilets are transferred to storage tanks for fermentation for 2 - 3 months. Thereafter they were separated into water part and residues or sludge. The water part can be used for irrigation in the field. The residues can be used as materials for compost with other solid wastes.

The nutrient content of night soil in given in Table 29 which shows that % N (0.83 - 0.86) is higher than either % P (0.06 - 0.20) or % K (0.06 - 0.07). The sanitary standard of excreta from public toilets (Table 30) suggests that it should be treated to get a safe fertilizer. The anaerobic fermentation in storage tanks should result in bringing a product (urban wastes)for agricultural use as specified in Table 31. China uses about 8 million tons of nightsoil fertilizer annually as given in Table 32. This Table

also show that China uses about 21 million tons of organic manure as against 24 million tons of mineral fertilizers.

Farmer groups who live in the relatively poorer areas, because their labor cost is lower, mainly depend on organic fertilizer and they use the mineral fertilizer input only to adjust their nutrient balance to get a higher yield. At the same time some specific crops like vegetables, fruits, melons, tobacco, tea, potato etc. need more and more organic manure. IPNS techniques in this context can result in higher yields and higher quality produce and higher income.

Table 28: Increase yield effect of different fertilizers, soil and crops (g/pot) in China.

Treatment	Org.	Straw	Vetech	Radish	Rape	Broad Bean
			Red soil wheat			
NK	P	1.1	2.0	2.6	2.3	1.7
PK	N	-0.1	2.2	2.8	1.4	2.7
NP	K	3.3	3.8	5.1	3.8	4.2
			Red soil paddy rice			
NK	P	2.6	2.5	3.4	3.3	3.3
PK	N	1.9	1.9	1.9	1.9	1.4
NP	K	6.6	5.8	6.3	6.5	6.2

Table 29 - Nature content of the nightsoil.

Item	Range	Item	Range
N (%)	0.83-0.86	Pd (ppm)	1.1-1.4
P (%)	0.06-0.20	Total Solid (%)	15.0-22.5
K (%)	0.06-0.07	Moisture (%)	77.5-85.0
Zn (ppm)	66.00-72.00	pH	6.9-7.1
Cu (ppm)	9.40- 9.70	Colitises	10-4-10-5
Cd (ppm)	5.40 - 6.10		

Table 30: Nature of excreta from public toilets.

Items	Range	Items	Range
Moisture (%)	97-99	Total N_2 (%)	0.23 - 0.45
pH	7-9	Total P (%)	0.05 - 0.20
Density	1.01	Total K (%)	0.05 - 0.07
Carbon (%)	0.5 - 1.0	COD (ppm)	5000 - 15000
Proposing acid (ppm)	270 - 680	BOD (ppm)	4000 - 10000
Batanoic acid (ppm)	6 - 210	Total solid (ppm)	14000 - 20000
Ethanoic acid (ppm)	1100 - 1730	SS (ppm)	8000 - 15000
Isobutyric acid (ppm)	60 - 140	Askaris ova	5 / ml
Total acid (ppm)	1490 - 2860	Colitises	10^{-6} - 10^{-5}

Table 31 -Control standards of urban wastes for agricultural use.

Item	Limit	Item	Limit
pH	6.5-8.5	Total Pb (mg / kg)	<100
Total K_2O (%)	>1.0	Total Hg (mg / kg)	<5
Total P_2O_5 (%)	>0.3	Total Cd (mg / kg)	<3
Total N_2 (%)	>0.5	Colitises	10^{-1}-10^{-2}
Organic matter as C (%)	>10	Askaris ova death rate (%)	95-100
Total As (mg / kg)	<30	Size (mm)	<12
Total Cr (mg / kg)	<300	Miscellaneous (%)	<3
Moisture Content (%)	25-35		

Table 32: Fertilizer situation in China (1992 million ton).

Items	N	P_2O_5	K_2O	Total
Organic matter	8.0	5.0	8.0	21.0
Nightsoil resource , potential	2.0	1.0	1.3	4.3
Nightsoil fertilizer, utilized	0.8	0.5	0.7	2.0
N-F/O-M				9.5%
Mineral fertilizer	17.3	5.0	1.7	24.0
Import	4.4	1.5	1.7	7.6
Organic fertilizer / mineral fertilizer				72.8%

CONCLUSION

Adoption of IPNS has many advantages such as, it helps in maintaining environmental health by reducing the level of pollution; it reduces human and animal hazards by reducing the level of residue in the product; it helps in keeping agricultural production at a higher level and make it sustainable; it reduces the cost of agricultural production and improves soil health, it ensures optimum utilization of natural resources for short term benefits and helps in conserving them for future generation. Hence there is a need for world wide popularization of IPNS by way of adaptive research, field demonstrations and training programs.

RESURGENCE OF MALARIA IN JAFFNA

*DR. N. SIVARAJHA

Malaria is a disease of the tropics and subtropics, and has dominated the morbidity pattern of Sri Lanka for centuries.

Malaria is usually spread by mosquito bites. But persons could be accidentally infected by

- ***blood transfusion***. Unfortunately refrigeration of stored blood does not eliminate malarial parasite since they can remain viable for indefinite periods even at -70 degrees C. *[Wilcocks & Manson-Bahr, 1972].*
- ***infection from person to person*** can also occur in drug addicts who borrow unsterilized syringes and needles.
- ***intrauterine transmission*** from mother to fetus. This is possible, sometimes without demonstrable damage to the placenta.

FEATURES OF MALARIA

Clinically malaria is characterized by intermittent fever occurring every other day or every third day, depending on the species of the parasite.

The malarial parasite belongs to the genus *Plasmodium.* There are four species which commonly cause malaria is humans. They are

- *Plasmodium vivax*
- *Plasmodium falciparum*
- *Plasmodium malariae*
- *Plasmodium ovale*

The common parasites in Sri Lanka at present are *Plasmodium vivax* and *Plasmodium falciparum*. *Plasmodium malariae* was present during the epidemics in the first half of this century.

All species of plasmodium have a life cycle in man and in an anophlene mosquito. There are hundreds of species of anophelenes that spread malaria *[Wilcocks and Manson Bahr, 1972*]. However the commonest vector of malaria in Sri Lanka is Anopheles culicifacies But other anophlene species have also been incriminated *[Ranjan Ramsamy, 1993].* Other anophelenes which have been shown to support the development of malarial parasite and are therefore considered to be potential malaria vectors are

- *Anopheles Subpictus*
- *Anopheles tesellatus*
- *Anopheles aconitus*
- *Anopheles annularis*
- *Anopheles hyracanus*

* Chairman, Section C of Jaffna Science Association

- *Anopheles pallidus*
- *Anopheles vagus*
- *Anopheles varuna*

Mosquito collection by the Anti-malaria Campaign has shown that *Anopheles subpictus* is the most prevalent man biting anophelene in this country. But probably because of its less efficient parasite *development Anopheles subpictus* shows lower sprozoite rates. This makes the *Anopheles subpictus* a less significant vector of malaria.

INCIDENCE OF MALARIA SINCE THE BEGINNING OF THIS CENTURY

The incidence of malaria by 5 years intervals is given in table 1

The malaria epidemic of 1934 - 35 was the worst in recorded history of this country. The epidemic of malaria which commenced in Kurunegala & Kegalle district in 1934 spread rapidly to other districts affecting a third of the people and killing an estimated 80,000 people. The highest incidence was in December 1934 and January 1935.

The indoor spraying of DDT was introduced in Sri Lanka in 1946. This was an important milestone in the history of malaria control. The introduction of residual spraying and other measures resulted in a drastic fall in the incidence of malaria to 17 cases in 1963.

However, by the end of the 1960's, the incidence increased to epidemic proportions.

MALARIA IN NORTH-EASTERN PROVINCE

The North -Eastern Province (NEP) of Sri Lanka which is engulfed in a civil war since 1983, has been severely affected by malaria.

According to the Director, Anti-Malaria Campaign (Lionel Samarasinghe, 1990) 'The North -East provinces were devoid of malaria control for several years'.

In 1996, 41% of the total malaria cases in Sri Lanka was from the North-Eastern Province (Figure 1)

In 1995, 31% of the malaria cases was from the North-East Province. This had increased to 41% in one year. (Figure 2). Between 1995 - 1996 the incidence of malaria has decreased in all provinces except NEP & western Province.

It should be noted that these are all cases where the blood film was found to be positive. The count does not include those who have not been blood filmed especially in the Vanni District where there is probably a very high prevalence of malaria.

MALARIA IN JAFFNA

With the resurgence of malaria in 1967 there were sporadic outbreaks of malaria in the Jaffna District and more so in the Kilinochchi area. Most of the cases of malaria detected in the Jaffna district at that time were imported from Kilinochchi. Local transmission was also detected in the areas of MOH, Kayts, Chavakachcheri, Kopay and Point Pedro. Focal spraying with DDT was under taken in these areas.

By 1968, the situation worsened and all MOH's areas in the Jaffna district were brought under perennial spraying (spraying throughout the year). This operation was successful and transmission was arrested. The spraying units were reduced and transferred to malarial areas outside the peninsula. However, strict vigilance was observed throughout the district.

Table 1 : Malaria incidence by 5 year intervals 1910/11 to 1995

Year	Cases of malaria	Deaths due to malaria
1910/11	515 590	
1915	485 082	
1920	505 370	
1925	808 638	
1930	1 759 648	
1935	5 459 539	47 326
1940	3 413 618	9 169
1945	2 539 949	8 539
1950	23 370	1 903
1955	422	268
1960	308	0
1965	468 202	1
1970	400 777	12
1975	n.a.	
1980	47 949	
1985	117 816	
1990	279 172	
1995	142 294	

Source: C G Uragoda. History of Medicine in Sri Lanka
Annual Health Bulletin 1996, Ministry of Health

Figure 1

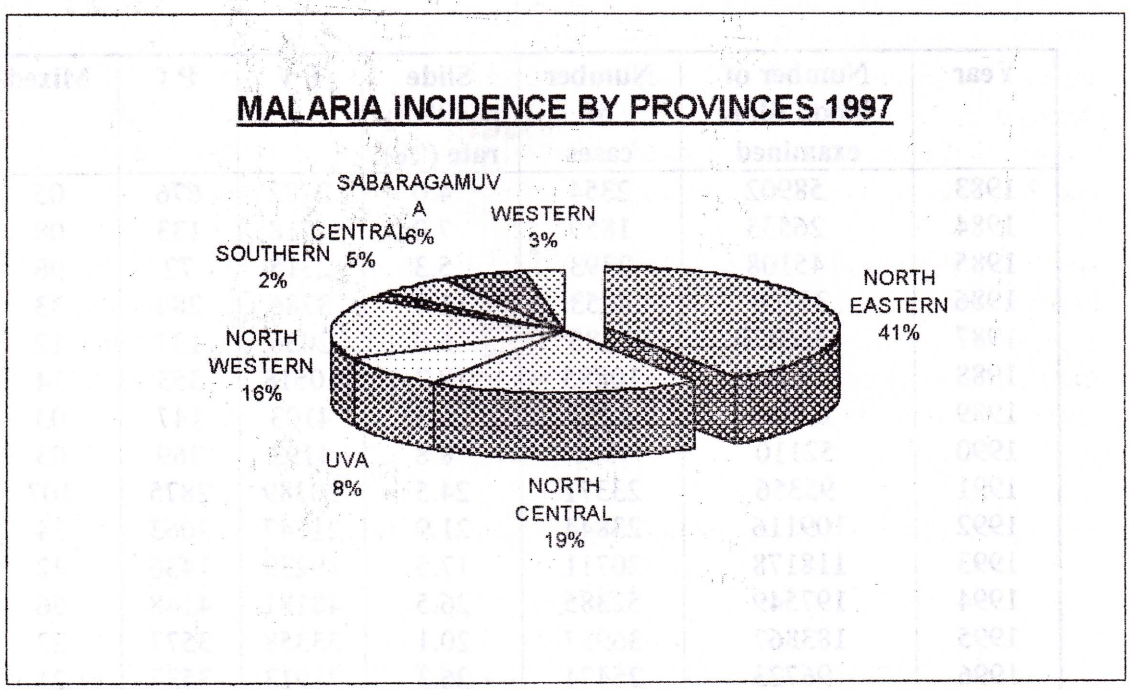
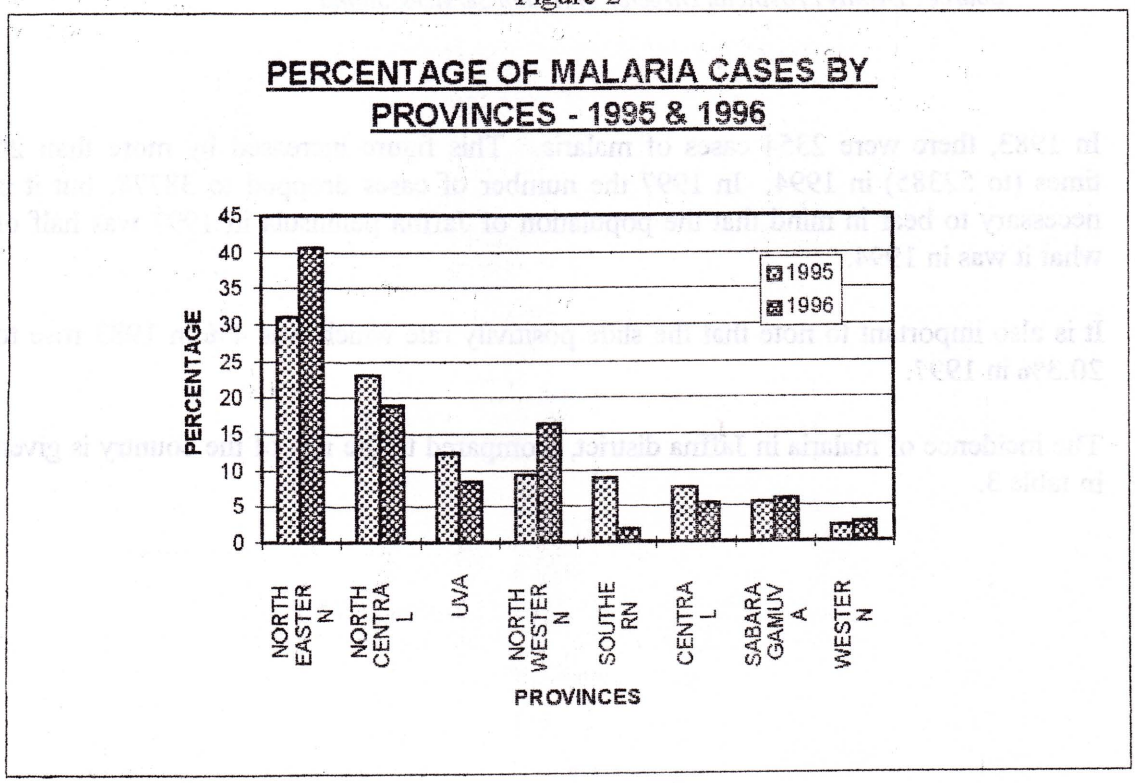


Figure 2



With the steady increase of malaria throughout Sri Lanka, malaria cases were reported among the persons who had returned from Vanni.

The number of cases of malaria reported is given in table 2.

Table 2 : Incidence of Malaria - Jaffna District , 1983 - 1997

Year	Number of blood films examined	Number of cases	Slide positivity rate (%)	P v	P f	Mixed
1983	58902	2354	4.0	2282	676	05
1984	26533	1859	7.0	1718	133	08
1985	45108	2393	5.3	2315	72	06
1986	35700	4053	11.4	3786	284	33
1987	36647	2185	6.0	2036	137	12
1988	59661	10885	18.2	10518	353	14
1989	67446	4253	6.3	4103	147	03
1990	52110	4565	8.8	4193	369	03
1991	95356	23371	24.5	20389	2875	107
1992	109116	23844	21.9	21747	2063	34
1993	118178	20711	17.5	19239	1430	42
1994	197549	52385	26.5	48181	4148	56
1995	183867	36957	20.1	33358	3577	22
1996	96723	25474	26.3	21913	3537	24
1997	191038	38778	20.3	36506	2229	43

Source : Deputy Provincial Director of Health Services, Jaffna.

In 1983, there were 2354 cases of malaria. This figure increased by more than 20 times (to 52385) in 1994. In 1997 the number of cases dropped to 38778, but it is necessary to bear in mind that the population of Jaffna peninsula in 1997 was half of what it was in 1994.

It is also important to note that the slide positivity rate which was 4% in 1983 rose to 20.3% in 1997.

The incidence of malaria in Jaffna district, compared to the rest of the country is given in table 3.

Table 3 : Incidence of Malaria (1990 - 1997)in Sri Lanka & Jaffna District

Year	Sri Lanka (including Jaffna District			Jaffna District		
	Estimated Population (in ' 000)	Cases	Incidence (per '000 population)	Estimated Population (in '000)	Cases	Incidence (per'000 population)
1990	16,993	279,172	16.4	863	4,565	5.3
1991	17,247	n.a.	n.a.	871	23,371	26.8
1992	17,405	399,349	22.9	875	23,844	27.3
1993	17,619	376,736	21.4	879	20,711	23.6
1994	17,865	273,460	15.3	896	52,385	58.5
1995	18,112	142,294	7.8	905	36,957	43.5
1996	18315	184,320	10.1	400	25,474	63.7
1997		n.a.	n.a.	475	38,778	82.5

n.a. : Not available

The incidence of malaria in Jaffna is increasing while its decreasing in the rest of the country other than North East Province.

It is also important to note that the incidence of malignant malaria (Plasmodium falciparum) has also increased from 676 in 1983 to 4148 in 1994.

The incidence of malaria per 1000 population is given in Figure 3. Which gives a clear picture of the steady increase in the incidence of malaria.

The increase in incidence of malaria was sudden. Between 1990 & 91 there was a five fold increase, and since then there was a steady increase.

The increase in incidence of malaria has not been uniform throughout the country as shown in table 4.

In 1984, only 1.2 % of the total malaria cases in Sri Lanka was from the Jaffna district. In 1995, 26 % of the malaria cases were from the Jaffna district.

During 1995 & 1996 there was probably some degree of under reporting as the entire population was displaced from 30th October 1995 to end of April 1996.

The sudden increase in 1991 coincided with the complete closure of the land route through Elephant Pass and the 'economic blockade' in 1990. The closure of the land route made it necessary for people traveling between Colombo & Jaffna to stay overnight (sometimes several nights) at Nallur in Vanni District (on the Southern bank of the Jaffna Lagoon). It is likely that a large percentage of travelers were infected at this point on their return to Jaffna. They brought the malarial parasite in large numbers into the peninsula.

Figure 3

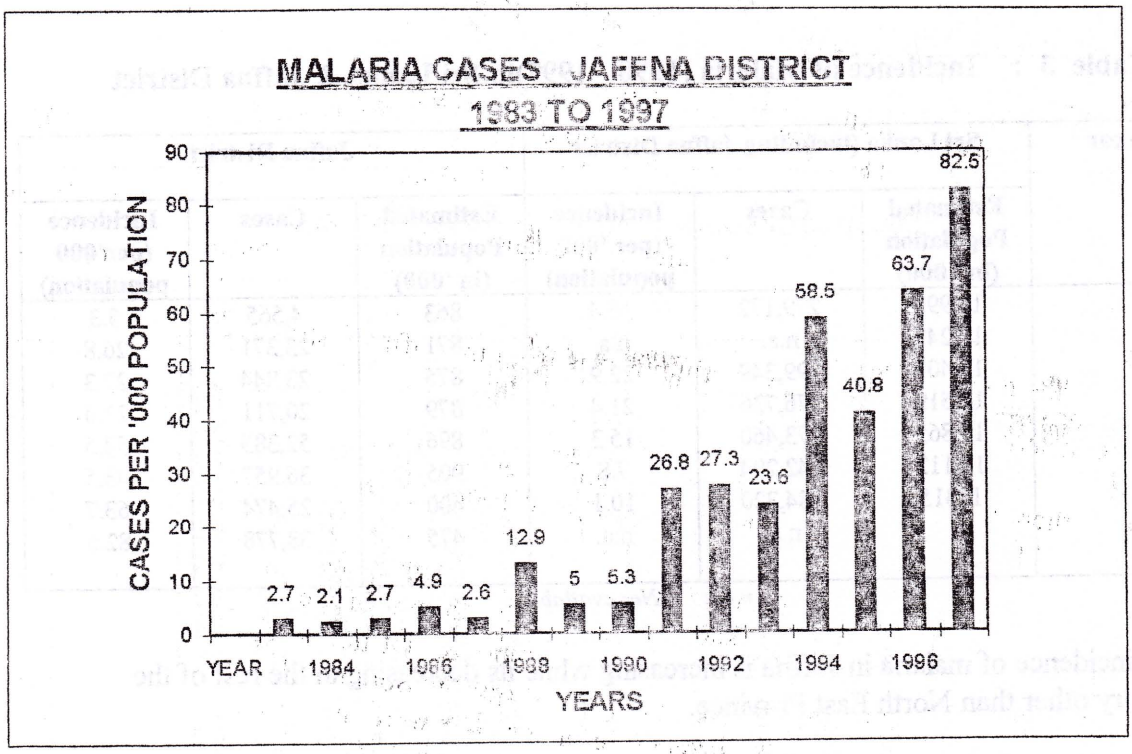


Table 4 : Malaria cases in Sri Lanka and Jaffna District . 1984 to 1995.

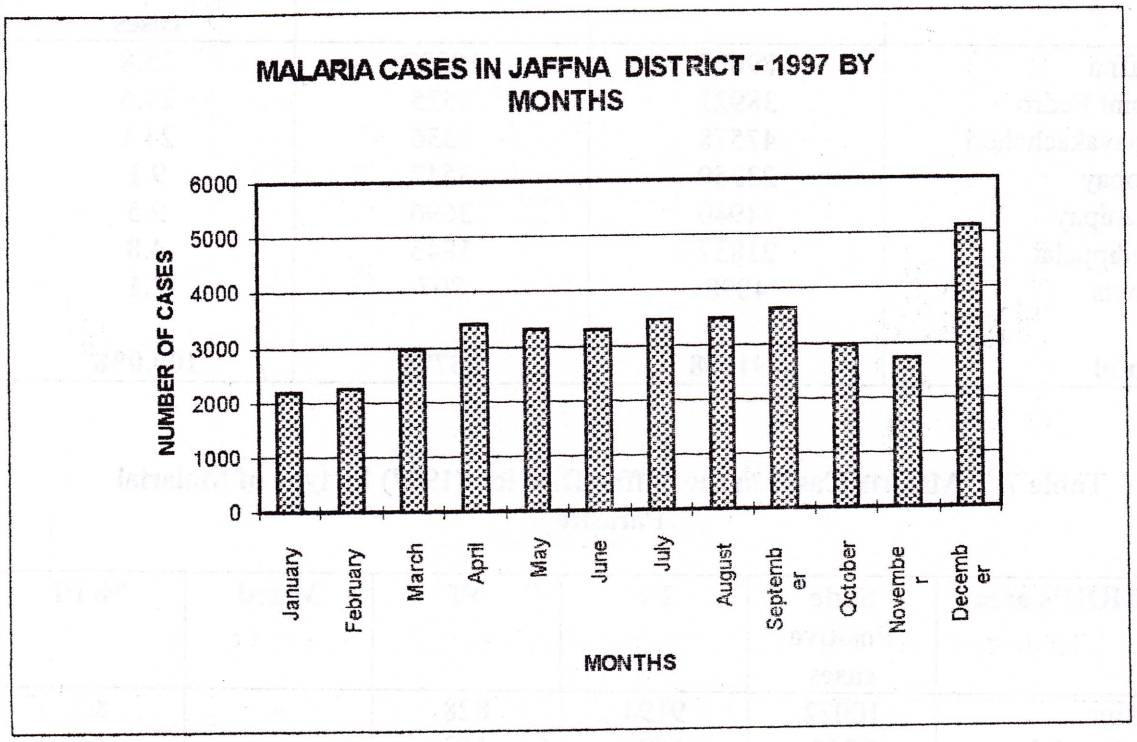
Year	Total number of cases		Percent of Total cases in Jaffna District
	* Sri Lanka	# Jaffna District	
1984	149,470	1,859	1.2
1986	412,521	4,053	1.0
1988	383,294	10,885	2.8
1990	279,172	4,565	1.6
1992	399,349	23,844	6.0
1994	273,460	52,385	19.2
1995	142,294	36,957	26.0
1996	184,320	25,474	13.8

*Source: * Annual Health Bulletin 1995. Ministry of Health Colombo p.92*
 # Deputy Provincial Director Of Health Services. Jaffna.

The shortage of drugs, displacement of people and closure of hospitals all contributed to partial and incomplete treatment of malaria.

SEASONAL VARIATION

The incidence of malaria in Jaffna by months for 1997 is given in table 5.



There appears to be a peak in December. The peak in December is probably the usual peaks following the monsoon rains.

GEOGRAPHICAL DISTRIBUTION

The 38778 cases of slide positive malaria cases identified in 1997 have been distributed as in table 6.

74% of the cases have been from the MOH's areas of Jaffna (25.8%) Point Pedro (24.6%) and Chavakachcheri (24.1%).

The proportion of malignant malaria among the slide positive cases also varies between the MOH's areas as shown in table 6. 8.3% of the malaria cases in Jaffna were of the malignant type while only 0.7 % were malignant in the adjoining Kopay MOH's area.

Table 6 : Malaria slide positivity by MOH areas - 1997

MOH Area	Total fever cases	Malaria cases	% of Total Malaria cases
Jaffna	29605	10022	25.8
Point Pedro	38921	9525	24.6
Chavakachcheri	47578	9336	24.1
Kopay	23259	3547	9.1
Manipay	24940	3696	9.5
Tellippalai	21837	1845	4.8
Kayts	4898	807	2.1
Total	191038	38778	100.0%

Table 7. : Malaria Cases in the Jaffna District (1997) by type of Malarial Parasite

MOH's area	Slide Positive cases	Pv	Pf	Mixed	% Pf
Jaffna	10022	9194	828	-	8.3
Tellippalai	1845	1692	153	-	8.2
Chavakachcheri	9336	8732	584	20	6.5
Manipay	3696	3478	218	-	5.9
Point Pedro	9525	9089	413	23	4.6
Kayts	807	800	07	-	0.9
Kopay	3547	3521	26	-	0.7
Total	38778	36506	2229	43	5.7

Malignant type of malaria appears to be more prevalent in areas where refugees who have recently returned from Vanni are setting down.

MORTALITY

The exact mortality in Jaffna district due to malaria is not available.

However the recorded deaths due to malaria at Teaching Hospital Jaffna (THJ) during 1997 and January - March 1998 is given in table 8.

MALARIA IN CHILDREN

During the period January to March 1998 1378 children under 12 years were admitted to Teaching Hospital Jaffna. Out of them 392 (28.4%) had malaria, and 3 of them died

Table 8 : Deaths due to malaria at Teaching Hospital Jaffna.

Year	Quarter	Cases	Deaths	Case fatality rate
1997	1	472	10	2.1 %
	2	568	07	1.2 %
	3	495	-	0.0 %
	4	846	14	1.7 %
1998	1	255	21	8.2 %

Source : Director Teaching Hospital, Jaffna

ACTION TO BE TAKEN

According to the WHO's " New Global Malaria Control Strategy" the undermentioned activities should be undertaken to control malaria.

- Early detection & prompt treatment of cases
- Application of selective and sustainable control methods, including vector control
- Development of mechanisms to forecast outbreaks and epidemics early
- Regular reassessment of control programmes in keeping with the changing socio economic environment of the country.

The objectives of the Anti-malaria Programme of the Health Ministry is given in table 9.

In order to control malaria in Jaffna, the following steps should be taken.

1. **Decentralization of Malaria activities.**
The Jaffna district which has the maximum number of malaria cases does not have an officer in charge for malaria control activities. An experienced officer with expertise in implementing, monitoring and continuous evaluation of malaria control measures should be appointed. As far back as 1990 the Director Anti-malaria Campaign lamented " although the concepts and objectives of devolution are undoubtedly laudiable and effective if so carried out, a lack of clear understanding in its principles has, very often, led to serious practical problems being artificially (and sometimes) knowingly created in the provinces which have had serious consequences on the status of the disease. Not the least of these has been the lack of participation of the primary health services in malaria control, which ironically was the very void which devolution was meant to fill".

Table 9 : Objective of the Anti-malaria Programme and present status in Jaffna

* OBJECTIVE TO BE ACHIEVED BY 2001	PRESENT STATUS IN JAFFNA
Reduce incidence of malaria to a level that the animal parasite index would not exceed 10 per 1000 population. (The population refers to those living in areas at risk of malaria)	The incidence of malaria in Jaffna in 1997 is 82.5 per 1000 population.
To minimize the population of Pl. facliparum infection.	The Pl.falciparum infection has increased from less than 500 in 1990 to over 3500 in 1996.
To prevent malaria epidemics	Epidemic of malaria is occurring in Jaffna
To prevent malaria in pregnant mothers	District wise data is not available, but clinicians observe several cases of malaria among pregnant women & congenital malaria

Source : Annual Health Bulletin - 1996, Ministry of Health, Sri Lanka. P. 41

2 **Staff and spraying equipment.**
At the moment Jaffna district has only 10 walking units. Jaffna District needs 30 walking units and 2 mobile units to cover the present population of 475,000. The vehicles, sprayers and insecticide for these teams should be regularly supplied. The annual requirement of malathion is 180,000 kg. (At 18 kg per 30 houses).

3 **Establishment of mobile malaria treatment centres in villages** where there is high incidence of malaria. This activity could be undertaken by NGOs. The mobile teams should carry out Blood filming and treatment for malaria.
The Family Health Worker & Public Health Inspectors should be trained to detect and treat cases of malaria.

4 **Improvement of case detection facilities.**
There are only 8 microscopists in the Health Department to identify malarial parasites in the blood films. One microscopist could examine only about 60 slides a day. Any excess slides received are left aside to be examined when the 'slide load' is low. Invariably these slides (in thousands) are washed away unexamined when shortage of slides arise. It is suggested that more microscopists are trained locally and be employed to do this activity.

5 **Regular supply of anti-malarial drugs is essential.**

6 **Health Education of people to ensure that complete treatment is taken by patients.**

7 **Research**

The malarial vector mosquito breeds in stagnant pools of clean sunlit water, and the river and irrigation system in Sri Lanka provided ideal breeding grounds.

In the absence of such rivers and irrigation channels in Jaffna, the perennial maintenance of the spread of malaria needs investigation and research especially regarding drug resistance and insecticide resistance.

Further research and action is also necessary to identify and introduce other malaria prevention methods such as

- the introduction of insecticide impregnated nets
- biological control of mosquito larva using larvivorous fish

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SOCIAL SCIENCES AND MODERN TAMIL FICTION

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1. INTRODUCTION

Modern Tamil fictions are written by authors who have varied experiences. Political, social, cultural and religious movements that originate from time to time in a society always influence the creative literary works. Various thoughts, concepts and styles that originate in one part of the globe are now speedily passed on to other parts of the world through mass communications, namely, radio, television, newspapers, magazines, Internet, etc. In this situation, literature cannot stand alone depending only on grammar, logic, rhetoric and prosody. Any writer who strives to portray the current situation in his literary compositions should now be aware at least the broad outlines of various disciplines in science. A knowledge of pure or natural science is essential for a writer of science fictions. But for a literary writer, a knowledge of various aspects of social sciences will definitely be useful for his creative works. Social sciences that would be useful to him are: sociology, anthropology, psychology, political science, linguistics, geography, etc. This paper inquires into the usefulness of these sciences to a writer of modern Tamil fiction and surveys how Tamil fictions written so far have made use of these disciplines.

2. MODERN TAMIL FICTION

Though _story-telling_ has been there from early times, the modern literary forms like novel and short story were introduced to Tamil by the westerners. V.V.S. Iyer_s **Kulattanakarai Arasamaram** is said to be the first collection of short stories published in Tamil. The first novel was written in 1879. **Piratapa Mudaliyar Carittiram** written by Vedanayakam Pillai is said to be the first novel written in Tamil.

Both novel and short story have been developing steadily in Tamil. Tamil is credited with a number of famous short stories and novels. These literary works, on the one hand, show that not only the experiences of day to day life, but also a conscious attempt to know certain details about politics, economics, society and culture of the people help in a big way in producing better fictions, but on the other hand, the works of certain other writers do not reach high standard due to lack of knowledge in various social sciences. A novelist like Rajam Krishnan is aware of this fact. She, like a sociologist or anthropologist, first studies the location that is going to be the center of her story. In her introduction to **Karippu Manikal**, she has shown how she had been living in Tuttukkudy and observing the actual life of the people who work in salterns.

It is now inevitable for a modern Tamil creative writer, especially a fiction writer, to get himself or herself oriented with the basic concepts of certain social sciences. No doubt that there are some writers of fictions who do not know any of these basic concepts. They are definitely a few. Majority of the writers will certainly create better novels and short stories if they come to know these concepts. Like a case study of a sociologist, a novelist looks at a particular problem of a society. The former will approach it purely on a scientific basis but the latter will have his artistic view on it. An interaction between the two approaches may perhaps yield a better understanding of the problem and would help to produce not only better literary works but also a better and suitable solution to the problem.

*Chairman Section D of Jaffna Science Association

3. SOCIOLOGY AND TAMIL FICTION

Among various social sciences, sociology has closer ties with literature. Sociology studies man and society. Literature too, from ancient time onwards, has been portraying men and society. A study on Sociology and Tamil Novels by Muttuc Canmukan (1985) points out a number of interesting aspects on the interaction between sociology and literature. Kailasapathy (1977 & 1979) was a pioneer in this type of study. Muttuc Canmukan in his study reminds the sociologists and the novelists that hey would benefit much if they could compare notes. Certain problems relating to love and marriage have been portrayed in the novels written by Lakshmi and Cudamani. Muttuc Canmukan compares the reports of the sociologists on these problems and how those problems are portrayed in literary compositions of those novelists. He points out that the sociologists have missed certain finer points about those problems and whereas the novelists have included them in their novels. I would like to cite an example from Sri Lankan Tamil writings. Caste is an aspect on which sociologists have shown much interest. David (1977), Pfaffenberger (1977), Perinbanayagam (1982), etc., have studied the Jaffna (Sri Lanka) caste system from a sociological point of view. But their studies could not bring out certain peculiar aspects of the system; and whereas the Sri Lankan Tamil novelists like K. Daniel (**Pancamar, Kovintan, Atimaikal**, etc.), S. Kanesalingam (Catanku), etc. have portrayed those aspects in their novels. Yasumasa Sekine (1984) was able to view correctly the cast structure of Jaffna because he drew some of his data from the above novels. Daniel was a person who did not have a formal education. But he was actively engaged in progressive movements in Sri Lanka. It helped him to have a knowledge of some of the basic concepts of Marxist sociology. This knowledge had helped him a lot in his creative activities. Similarly, novelists like T.M.C. Ragunathan(**Pancum Paciyum**), Rajam Krishnan (**Alaivayk Karaiyil**), Ponnilan (**Karical**), K. Cinnappa Parati (**Takam**), T. Selvaraj (**Malarum Carukum**) and others in Tamilnadu have excelled in their portrayal of the class struggle, the social values and relationships in Tamil society. A doctoral dissertation by S. Cetumani (1985) on Values in Tamil Novels makes a thorough and closer study of the sociological concepts on values and their reflection in novels written by the above authors and some others like Inthira Parthasarati, Neela Pathmanaban, Na. Partacarati, T. Jeyakanthan, T. Shanmugasuntharam, Nallaperumal, and others.

Recently, Indian sociologists are interested in Dalit movement. The Marathi word dalit refers to broken people which means the people who have been economically, politically and culturally broken down. A number of studies are going on this subject. These studies have helped a number of Tamil fictions, namely, **Karuku** and **Cankati** by Pama, **Palaiyana Kalitalum** by Civakami, **Koveru Kalutaikal** by Imayam. Studies on Feminism or women development have also helped fiction writers to produce some fine novels and short stories. **Cirakukal Muriyum** and **Vittin Mulaiyil** by Ampai could be cited as examples.

4. ANTHROPOLOGY AND TAMIL FICTION

Anthropology is another discipline that belongs to social sciences that influence the modern Tamil creative writings. Sociology mainly studies the modern society. But anthropology includes within its scope of study savage, primitive, tribal and traditional

societies. Cultural anthropology has influenced the creative literary works in two ways (Shanmugalingam, 1977):

(a) Human life is the subject of literature. Studies on primitive and tribal societies have helped to originat a number of short stories and novels.

(b) Literary criticism is a part of creative literature. Anthropological studies have widened the horizons of literary criticism. They have influenced particularly the studies on old Tamil literary works.

Fiction writers usually consult the anthropologists when they write on tribal societies. Some would go to the extent of living with them to get first hand information about their life. Rajam Krishnan's **Kurincit Ten** and Kalyanacuntaram's **Irupatu Varucankal** are two Tamil novels that portray the life patterns of tribal societies. Anthropology studies not only the tribal societies but all that have not been influenced by the modern industrial societies. About 80 per cent of the people of India and Sri Lanka are still living in villages. Creative writers who like to portray these villages in their novels need to have clear understanding of our rituals, beliefs, marriage, family, etc. Neela Padmanaban.s **Talaimuraikal**, Daniel's **Pancamar**, Kanecalingan's **Catanku**, etc. have been written with this understanding. A doctoral thesis from Madurai Kamaraj University studies in detail the village novels written in Tamil (Mangayarkkaraci, 1985). More and more writers now realize that at least a little acquaintance with certain facts relating to anthropological studies would help to enrich their writings. This discipline is comparatively new to Tamil. But Universities and other Institutions in Tamilnadu are now devoting their attention to this study.

5. PSYCHOLOGY AND TAMIL FICTION

Psychology is a study of human behaviors. Fiction mostly portray human beings. A novel will never be a complete one unless the novelist while creating his characters express their psychological conditions and feelings through variuos incidents in it. Jeyakantan has succeeded in creating such characters in his novels and long stories. Intira Partacarati in his **Tantira Pumi** is able to create certain situations and characters that form the best exemplifications of some of Jean-Paul Satre's philosophical and psychological statements. He has correctly expressed the psychological conditions that are responsible for certain qualities of the middle class educated people. Stream of consciousness is a technique that is employed in fiction due to the impact of psychology on literary compositions. La. Sa. Ramamamirtam has successfully employed this technique in some of his novels and short stories. Kiruttikas novels like **Vacaveccaram**, **Putiya Konanki**, and **Nerriruntom** can be considered as good exemplifications of certain psychological concepts. According to Krishnamurti (1977: 192), psychological concepts like Freudism, Neo-Freudism and Nitezcheism have heavily influenced Kiruttika's novels. Like understanding the psychological conditions of an individual, it is also necessary to understand the psychology of a society. Only a few writers of Tamil fiction have understood this aspect.

6. LINGUISTICS AND TAMIL FICTION

It was at the Conference on Style held at the University of Indiana in 1958 that Roman Jacobson made the following statement:

> The poetic resources concealed in the morphological and syntactic structure of language, briefly the poetry of grammar, and its literary product, the grammar of poetry, have been seldom known to critics and mostly disregarded by linguists but skillfully mastered by creative writers..... All of us here, however, realize that a linguist deaf to the poetic function of language and a literary scholar indifferent to linguistic problems and unconversant with linguistic methods are equally flagrant anachronisms."

Scholars have now accepted the fact that the application of linguistic methods to the study of literature would yield much benefit to both fields. Stylistics that relates literature to linguistics is a developing field in Tamilnadu and Sri Lanka. In India, several publications have been made on the study of linguistics and literature (Cenpakam, 1971; Meenakshisundaram, 1972; Muttuc Canmukan, 1974 and 1976; Gnanasundaram, 1974; Muttaiya, 1975 and 1976; Cetuppillai, 1976; Nitivanan, 1979 and Mokan, 1975) In Sri Lanka, Sanmugadas wrote three papers (1976, 1977 and 1979) in Tamil and one(1985) in English on this subject. Nuhman (1977) published a paper in Tamil on stylistics. Vanniyakulam (1986) studied in detail the use of spoken dialects in Sri Lankan Tamil fiction.

A knowledge of certain linguistic concepts will be of much use to the creative writers. For example, a Tamil fiction writer should have a clear understanding of the diglossia (see, Ferguson, 1964 for details) situation in Tamil. Both the formal or literary Tamil and spoken Tamil are used in Tamil fiction. Unless the writers know the correct situations in which literary and spoken forms are used, they may not be able to present anything realistically. Tamil fiction writers should also be aware of various types of dialects in Tamil. Linguists have presented scientific studies on various Tamil dialects. If the fiction writers get themselves acquainted with the ideas expressed in those studies, then their creative witings will definitely have new dimensions. Sanmugadas (1977) and Vanniyakulam (1986) have pointed out that some of the Sri Lankan Tamil fiction writers failed to make use of the regional dialects correctly in their writings.

7. GEOGRAPHY AND TAMIL FICTION

Most of the fiction writers sometime give a vivid and colourful description of a place. A good knowledge of the landscape, vegetation, flora and fauna would definitely help a writer to give a true picture of a place. Cenkai Aliyan (Dr.K.Kunarasa) is a geographer who had an academic training in that subject. He was working as an administrative head in Vanni region for sometime. When he was there, he wrote a novel basing on an incident when there was a big flood in that region. Since he was a trained geographer, he was able to give a correct and beautiful picture of that region. No one else could have rendered such a writing. It was a marvelous piece of writing. His works such as **Kattaru** and **Yanai** should be mentioned in this connection.

8. CONCLUDING REMARKS

The growth and development of Tamil is intrinsically bound up with the growth and development of Tamil people. The contemporary knowledge in science, philosophy, art, literature, etc., should freely flow into Tamil and this should give new strength and vigor to the language. New words and new ideas should enrich Tamil to make it equal to the most advanced languages of the world. In this background, we have to consider the impact of contemporary knowledge of social science in Tamil fiction. Vanamamalai (1977) in Tamilnadu and Kailasapathy (1977) in Sri Lanka have been stressing the need for a healthy marriage between social science and literature. Those literary works that have been influenced by various studies on social sciences have excelled in their forms and contents. A number of Tamil novels and short stories have benefitted by such influence. Every Tamil fiction writer must come to know at least some concepts of different social sciences. This could be achieved only by a healthy cooperation between the social scientists and the creative literary writers.

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CEREBROSPINAL FLUID CIRCULATION REVISITED

PROF. V. KUNANADAM

Brain is a fascinating organ in our body. It, together with the spinal cord forms the central nervous system that controls the functions of the body through its peripheral nervous connections. It has cavities called ventricles. It has a tough membranous covering known as dura mater and two flimsy coverings known as arachnoid and pia mater. The ventricles contain a fluid known as cerebrospinal fluid (CSF). The CSF is also found within the coverings of brain enclosed in a meshwork under the arachnoid mater, known as subarachnoid space (SAS). The CSF in the SAS forms a bag of fluid surrounding the brain. The CSF within the ventricles forms an internal component and that within the SAS forms an external component.

Cotugno in 1764 discovered the existence of ventricles within the brain, containing fluid (Milhorat, 1975). This fluid ever since its discovery has generated great enthusiasm amongst researchers in many fields of medicine, anatomists, physiologists, pathologists, radiologists and neurosurgeons to name a few. Hippocrates, popularly known as the Father of Medicine, was an early researcher. He described hydrocephalus, a condition in which there is an excess of CSF within and around the brain. He also described the leakage of a fluid from brain following head injury. He thus knew the existence of CSF.

Anatomy was well established as a science during Galen's time after Hippocrates. He envisaged the fluid within the brain to be static. William Harvey in 1628 described the first circulating fluid in the body. This was blood, which he described as having a circular motion. The discovery of circulation of blood no doubt set the stage for an era of awakening of medical science after its dark period.

Harvey's friend Jean Pecquet in 1651 described another fluid circulation, the lymphatic circulation. Lymph is a fluid formed from the blood in the tissues and is returned to blood through the lymphatic pathway. Bartholin should be also given the credit for the discovery of lymphatic circulation along with Jean Pecquet for his independent, but similar findings on lymph flow. Magendie in 1825 published his views on the CSF. He noted an ebb and flow movement of the fluid.

Exactly 100 years after Magendie's observations, Harvey Cushing, a renounced neurosurgeon, changed all the previous views on the CSF movement and described the circulation of the CSF as the third circulation of a fluid in the body, the blood and lymph being the first and second. Walter Dandy, Cushing's student and associate demonstrated that CSF was formed in the ventricles. A series of investigations by many researchers that followed clearly established various aspects of the CSF circulation.

Let us examine briefly the circulation of the CSF. This fluid is formed in the ventricles from blood through choroid plexus. There are four ventricles within the brain. A lateral ventricle is seen in each of the two cerebral hemispheres of the brain. Each lateral ventricle communicates with a common third ventricle in the midline through a foramen (the Foramen of Monro). The third ventricle leads through a narrow aqueduct into the fourth ventricle. Choroid plexus is seen in all the four ventricles. The CSF in the ventricles shows a bulk flow from the lateral ventricles, through the third ventricle and

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aqueduct into the fourth ventricle. The CSF then from the fourth ventricle exits into the subarachnoid space. The CSF in the SAS shows further, but complex bulk flow and it finally drains back into the blood in the large venous sinuses on the surface of the brain through specialized structures known as arachnoid villi.

Choroid plexus are villous structures that project into the ventricles from the ventricular wall. These form the sites of secretion of CSF from blood. Arachnoid villi are villous structures formed by the arachnoid mater into the venous sinuses. These form the sites of absorption of CSF into blood. The anatomy of bulk flow pathways of CSF that lead from the sites of secretion, through the ventricles and then through the SAS, to the sites of absorption, is now clearly established (Davson, 1996).

What were the ideas regarding the function of CSF amongst the earlier researchers? Brain as alluded to is a peculiar organ. Blood takes nutrients and oxygen to all tissues and removes waste material and carbon dioxide from the same. This exchange of material between blood and tissues occurs at capillaries, somewhat freely, which results in a fluid formed from the capillaries in the tissues referred to as interstitial fluid (ISF). A further exchange occurs between the ISF and the cells of the tissues. The cells themselves finely control this exchange. In brain, the fine control is applied in the exchange between the blood and the neural tissue at the capillaries, and not at the cellular level. There is a barrier for exchange at the capillaries known as blood-brain barrier (BBB). Thus, the ISF formed from the brain capillaries (i.e. at the BBB) shows a tightly regulated composition, which is essential for electrical functions of the brain neurons. Cerebrospinal fluid was initially regarded as a medium that provided a route for entry of substances into brain from blood when the BBB imposed restriction for such entry from blood.

It was soon realised that the CSF actually provided a route for substances to leave the brain: thus, substances from the ISF moved into the CSF and whence returned to the blood. This excretory role of the CSF is important if we reflect a moment on the nature of BBB. The BBB controls the formation of ISF, but it will not allow re-entry of ISF back into blood because of its polarized nature. Thus, substances from the ISF move into the CSF for their clearance. The excretory role of the CSF is clearly evident if we examine the evolution of the CSF system through the animal kingdom. In most of the invertebrates there is no CSF system and the ISF drained back into the venous blood. CSF system made its appearance in the complex brain of higher animals. In these animals the BBB ensures that the ISF formed from the brain capillaries does not re-enter the venous blood directly: instead, the ISF flows into the CSF for its return to blood. In lower vertebrates such as fish, only an internal CSF system is encountered and the ventricular CSF directly drained into venous blood. The appearance of the external CSF system and its communication with the internal (ventricular) system are late events in evolution and seen in higher vertebrates. In these animals the external CSF system through the arachnoid villi provided a very efficient drainage mechanism for the ISF.

In the highly evolved brains of higher vertebrates the BBB restricted the entry of substances from the capillaries into the neuronal environment formed by the ISF. The substances are cleared from the ISF by the movement of the ISF into CSF, which in turn drains back into blood. The fine regulation of the neuronal environment thus, not

only dependent upon the BBB, but also upon the efficient drainage of the ISF. The wealth of information available on the BBB shows its complex structure and its role in fine regulation of the composition of ISF. Earlier researchers such as Davson believed that substances from the ISF moved into CSF by diffusion. Many researchers, however, questioned whether or not diffusion was a satisfactory mechanism for maintenance of the composition of the ISF under both physiological and pathological conditions.

Helen Cserr and her colleagues elegantly demonstrated that the ISF showed a bulk flow, rather than diffusion, through spaces along the blood vessels that dip into the brain from the surface (Cserr, *et al.*, 1981). These spaces provide a perivascular pathway for the drainage of ISF from the brain tissue into the CSF in the subarachnoid space. They also demonstrated other bulk flow pathways for ISF in the brain tissue. These pathways all served as physiological routes for ISF drainage. It may be surmised that under pathological conditions associated with raised brain tissue pressure (BTP), these pathways may become obstructed. My research has shown that when there is raised BTP, ISF may find an alternate pathway for drainage through venules (Kunanandan, 1997). Normally, the ISF formed from the capillaries does not enter blood through the venules, as the venules also demonstrate BBB. Raised BTP presumably causes a subtle barrier alteration, which allows drainage of ISF through the venules.

The above observations amply demonstrate that the BBB and the ISF drainage mechanisms, both under physiological and pathological conditions, ideally control the neuronal environment. The role of the CSF in this setting appears to be secondary. What is then the main role for the CSF with its elaborate system of formation, circulation and drainage in the highly evolved vertebrates?

The magnetic resonance imaging (MRI), a modern investigation, has shown light on many aspects of brain structure and function including that of CSF circulation. In this investigation, the patient is placed in a magnetic field when atoms with odd number of protons or neutrons in the nucleus will be seen to orientate along the magnetic field. A radio frequency current applied subsequently to this state will cause oscillation of these atoms, which will then return to the normal state when the current is discontinued. Signals generated during these oscillations reflect the biological nature of the tissue. Such signals give a clear picture of the brain and its fluid environment.

Using a special technique of MRI, known as phase contrast imaging, the CSF was shown to have in addition to the bulk flow, a pulsatile flow, with pulsations corresponding to the cardiac cycle or pulses (Greitz, 1993). The brain and its membranes are enclosed in a non-yielding cavity, the cranial cavity formed by the skull. When blood enters the cranial cavity with each cardiac cycle to perfuse the brain, each pulse volume is accommodated within the cranial cavity without raising the intracranial or brain tissue pressure by displacing an equal volume of CSF out of the cranial cavity. The MRI studies have shown that there is downward displacement of CSF from the ventricles and cranial subarachnoid space into the spinal subarachnoid space. When blood leaves the cranial cavity at the end of the cardiac cycle, there is an opposite, i.e. upward movement of CSF from the spinal subarachnoid space into the cranial cavity. This alternate upward and downward movement of the CSF between the cranial SAS

and ventricles, and the spinal SAS constitutes the pulsatile flow of CSF.

It is important to understand that this pulsatile flow of CSF is very essential for accommodating the normally a large brain blood flow. The maintenance of brain blood flow is in turn of paramount importance for the bulk flow of ISF along the perivascular and other brain tissue pathways under physiological conditions, and along the venular alternate pathway under pathological conditions associated with raised BTP.

Thus, the main role of the CSF appears to be in providing a bag of CSF in and around the brain to accommodate the brain blood flow and the ISF flow. This bag of CSF also provides physical protection against traumatic forces, which may move the brain within the cranial cavity (Cserr, 1971). Normally, brain floats in the CSF and this may not be apparent until one drains away all the CSF from the cranial cavity when the brain will sink and come to lie on the floor of the cranial cavity. This buoyancy provided by the CSF reduces the traumatic movement forces.

In conclusion, the CSF system has played different roles in different animal brains during evolution. In the invertebrates, it served as a venous system to maintain the brain blood flow. In the lower vertebrates, with the development of the external CSF system, the main function of the CSF was in the regulation of the neuronal environment. In the higher vertebrates including human, the pulsatile flow of the CSF played a major role in maintaining brain blood and ISF flow. The fine regulation of the neuronal environment was dependent upon this role and the BBB. In the highly evolved brain the CSF also afforded physical protection against brain movement by traumatic forces. Brain is certainly a fascinating organ for its intimate relationship with two fluids, CSF and ISF.

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12th LOK SABHA ELECTIONS

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When the second United Front government of I. K. Gujaral collapsed in February, the general calculation was that BJP would win with comfortable majority. But it did not happen. Between the fall of the U. F. government and the General Election in March 1998, Congress party regained some strength though Sonia Gandhi's entry into politics. However, the Bharathiya Janatha Party became the single largest party with 180 seats won in the February elections. Major issues 12th Lok Sabha elections put up 'Stability' issue in the forefront, people were tired with regional parties and with "disunited" united Front governments, Bharathiya Janatha Party projected stability, nationalism and strong central governments. Another view went round that the country is moving towards 2 party system and that the contest would between sonia Gandhi's Congress and Bharathiya Janatha Party. This view was more or less proved at the expense of the United Front performance.

In the 1998 elections Bharathiya Janatha Party secured 25.5% vote which is 5.2 percentage more than 1996. Number of seats won were 180, that is 17 more than 1996.

As for the votes polled, the All India tally was;

Bharathiya Janatha Party	25.52
Bharathiya Janatha Party (Allies)	11.69
Congress	25.72
Congress (Allies)	03.94
United Front	21.93
Independence & others	11.20

Thus as for the votes polled, all the three major parties secured nearly equal 25, 25 and 21%. But it was the regional parties which have side tracked.

Congress faired very much better in Maharastra, Kerala, Rajastahan, Nagaland and Delhi. Congress party's strength in the 12th Lok Sabha is 140 as against 143 in 1996. Thus one cannot speak very high of Sonia effect; her arrival might have contributed BJP ranks. Congress suffered worst defeat in Uttar Pradesh and Tamil Nadu.

United Front parties faired will in West Bengal and Tamil Nadu. samajwadi party of Mulayan Singh Jadjav was against BJP forming a government. Both Mulayan and Surgect Singh of CPI suggested joint relations with Congress. But it did not work. United Front preferred to occupy the opposition chairs.

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One main reason for BJP is success in the 12th Lok Sabha election was its Pre-election allianees with regional parties.

For several days Indian public was arguing the BJP Anna DMK hook-up, a regional party of Madras which loss the assembly election mainly on corruption issue, but you know there are strange bed-fellows in politics, other allianees refers to the Lok Sabha of Ramakrishna Hegde, Biju Janata dal in Orisa Trinamul Congress of Mamta banerji. These allianees were made on the eve of election. But there were older friends. Such as Samtha party in Bihar and, Shironmain Akali Dal in Panjab. Shivasena in Maharastra. It is interesting that one time BJP criticized United Front as 13 headed monster. But now BJP id heading a fifteen party allianee.

During the opening session of the parliament all eyes were turned to Bajpai, wondering how be was going to manage this conglomeration of regional parties. But that was mid-March Beware of I'Des of march said Julios Caesar!.

Two weeks after Bajpai Government took oath, on 7th April Bajrang Dal Organizer Surendra Kumar Jain said, 'Hindu Youth were to be trained in martial arts of Judo & Karate' through out India in 750 Districts and 7500 blocks.

Bajrang Dal volunteers and Saffron clad youths organization are part of Jan Singh. RSS and outcome of Vishva Hindu Parisad and now father of BJP. The party assumed a democratic political organization only in 1980's.

Bajrang Dal, RSS and the rest of the Hindu organization in the north India declare many such feast programs. All this of course under the patronage of BJP.

You link this with Bajpai'a Nuclear tests in Pokran on 11th and 13th April followed by several announcements. Hindu asks Bajpai's necessity of make such sudden decision, which had turned whole world against India. Bajpai wanted to make India great, Strong and leader of South Asia, South east Asia and train her hands against China. He gave substance to Hinduturva philosophy of the Viswa Hindu Parisad.

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