

Natural Resources, Energy & Science  
Authority  
47/5 Maitland Place  
Colombo 7.

23 March 1992.

Hon. Minister of Industries Science & Technology  
Ministry of Industries, Science & Technology  
73/1, Galle Road  
Colombo 3.


Dear Sir,

**Annual Report of the Natural Resources, Energy &  
Science Authority of Sri Lanka for the period  
1st January to 31st December 1990**

In terms of Section 16 (111) of the Natural Resources,  
Energy & Science Authority of Sri Lanka Act No. 78 of 1981,  
I have the honour to submit the Annual Report of the  
Natural Resources, Energy and Science Authority of Sri  
Lanka for the period 1st January to 31st December 1990  
together with -

- (a) A copy of the Audited Income and Expenditure Account
- (b) A copy of the Audited Balance Sheet
- (c) Auditor General's Report

Yours truly



Dr R.P. Jayewardene  
Director General  
**NATURAL RESOURCES, ENERGY &  
SCIENCE AUTHORITY OF SRI LANKA**

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## ANNUAL REPORT 1990

### 1.0 MEMBERS OF THE NATURAL RESOURCES, ENERGY & SCIENCE AUTHORITY OF SRI LANKA DURING THE YEAR

#### 1.2 Board Members from 01st January 1990 - 31st December 1990

Dr R.P. Jayewardene  
 Prof S. Balasubramaniam  
 Prof V. Basnayake  
 Prof W.R. Breckenridge  
 Prof P.C.B. Fernando  
 Prof S.A. Gunasekera  
 Dr S.D.I.E. Gunawardena  
 Dr E.R. Jansz  
 Prof N.S. Karunaratne  
 Dr A.M. Mubarak  
 Prof H. Sriyananda

### 2.0 PRINCIPAL STAFF

<b>Director General</b> Dr R.P. Jayewardene	M.D., F.R.C.P. (Lond), D.Sc.
<b>Additional Director General</b> Mr L.C.A. de S. Wijesinghe	B.Sc (Cey), M.A. (Oxon)
<b>Deputy Director General</b> Mr M.A.T. de Silva	B.Sc. (Lond), M.Sc. (Lond)
<b>Director Scientific Affairs</b> Mr D.E.F. Ferdinandez	B.Sc. (Lond), M.Sc. (Wales)
<b>Asst. Directors Scientific Affairs</b>	
Mrs S.P. Prelis	B.Sc. (Hons)(Cey), M.Sc. (Sri Lanka)
Mr M. Watson	B.Sc (Cey), M.Phil (Lond)
<b>Scientific Officers</b>	
Mr D.P. Athulathmudali	B.Sc (Sri Lanka), M.Phil (Sri Lanka)
Mr R.M.W. Amaradasa	B.Sc (Sri Lanka), M.Sc (Sri Lanka)
Mr B.M.C.K. Basnayake	B.Sc. (Sri Lanka)
Miss H.A.U. Amarasinghe	B.Sc (Sri Lanka)
Mr J.A. Chandrasiri	B.Sc.(Sri Lanka), Dip. Stat.
Miss J.D.S. Dela	B.Sc. (Sri Lanka)
Miss C.G. Perera	B.Sc. (Hons) (Sri Lanka)
Mrs W.R.M. Sandanayake	B.Sc. (Sri Lanka), M.Sc. (Sri Lanka)
Mrs S.L. Tillekaratne	B.A. (Cey)

**Staff Assistants (Scientific)**

Mr A.W.J. Karunasinghe B.Sc. (Sri Lanka) (on study leave)  
Mr W.B. Yapa B.Sc. (Sri Lanka) (on study leave)

**Director Information**

Mr N.U. Yapa B.Sc.(Cey), A.L.A., A.S.L.L.A.,  
M.L.S. (W.Ont)

**Asst. Director (Publications)**

Mrs N.R. Amarasooriya B.Sc. (Cey), A.L.A.

**Documentalists**

Mr W.R. Jayakody B.Sc. (Cey)  
Mr B.G.N. Kumarasinghe B.Sc. (Cey)  
Mrs S.R. Sri Nammuni B.A. (Cey), A.S.L.L.A.  
Mrs W.G.S. Wimalasena B.A. (Sri Lanka), A.S.L.L.A.

**Administrative Secretary**

Mr M.A.P. Mudannayake

**Asst. Administrative Secretary**

Mr S.P. Dissanayake B. Adm. (Sri Lanka)

**Accountants**

Miss K.C.J.T.K. Fernando  
Mr M.H.M.S. Hameed  
Mrs K. de Silva  
Mrs S. Udugama

**Graduate Translator**

Miss N.C. Peiris B.A. (Cey)

**Confidential Secretary**

Mrs S. Ratnayake

**Repographic Technician**

Mr S.R.U. Silva

**Establishment Assistant**

Mr S. Galketiya

**Printing Superintendant**

Mr A.A.A. Ranasinghe

When more than one officer is listed under a designation, the names appear in Alphabetical order.

### 3.0 MEASURES FOR ENHANCING SELF-RELIANCE IN SCIENCE AND TECHNOLOGY

#### \* Avenues for training in scientific research

Under the NARESA research grants scheme 13 young graduates were awarded Research Assistantships to obtain research training in fields such as Agriculture and Animal Husbandry, Biological Sciences, Chemical Sciences, Physical and Engineering Sciences and Social Sciences. 24 graduates were awarded research assistantships on grants funded by foreign agencies. During the year 1990, 09 research assistants registered for higher degrees in the Universities. Post graduate degrees were awarded to 09 students in the fields of Chemical Sciences, Physical & Engineering Sciences, Social Sciences and Buffalo Research.

#### \* Training of technicians

(1) NARESA has been associated with the British Council and the CISIR in organising training workshops under the British ODA- funded programme of in-country training of science laboratory technicians. The final workshop under this programme of training in use, maintenance and repair of analytical instruments was held at the CISIR from 7 - 24 August. The programme was conducted by a team of specialists from UK assisted by local counterparts. Twenty four participants from universities, research institutions and government departments attended the workshop which dealt with the use, diagnostic fault finding and preventive maintenance in Atomic Absorption Spectrophotometers and High Pressure Liquid Chromatographs, and with advanced electronics.

(2) NARESA assisted the Sri Lanka Association of Technicians in Analytical Instruments to organise a workshop on use, maintenance and repair of pH meters. The workshop was held at the CISIR on 3 May and conducted by experienced laboratory technicians. Eighteen participants attended this one day workshop.

#### \* Seminars and Workshops

Following workshops and seminars were held during the year 1990 in order to share and update new findings and enhance self-reliance.

- \* A progress review seminar was held on 30/11/90 for grantees of Physical, Engineering and Architectural grants. 7 grantees presented papers at this seminar. 2 of the papers were from grantees who had submitted Ph.D theses to the University based on the work of their respective grants.

- \* A progress review seminar was held on 26/10/90 for grant recipients in the field of Chemical Sciences. 9 grantees presented papers at this seminar. The Working Committee was able to review the progress of these projects, based on the presentations.
- \* A one day seminar sponsored by NARESA was held in collaboration with the Faculty of Education, University of Colombo, on "Problems and Issues in Higher Education" on 04th August 1990. 50 educationists in the country, participated in this seminar at which papers were presented and panel discussions were held. The proceedings have been published.
- \* A grantees Progress Review Seminar in the fields of Medical and Veterinary Sciences was held on 24 August 1990. Ten grantees presented papers on the work carried out under their projects. The abstracts of presentations were bound for future reference.
- \* A seminar was held on 2nd February 1990 for Senior Officers of the Departments of Agriculture, Irrigation and Agrarian Services, for interested members of the public and the media to provide factual information on the project of Biological Control of Salvinia, its background and current level of success and also to highlight the importance of this project being carried on by the Agriculture Department in collaboration with the Department of Irrigation.
- \* A seminar on research projects completed in the field of Education was held on 19th February 1990. 7 papers were presented.
- \* A seminar on research projects completed in other fields of Social Sciences was held on the 26th of February 1990. 7 papers were presented.
- \* A seminar was held on the 28th and 29th of April 1990 on "Social Change in Sri Lanka during the past two decades". 60 leading social scientists participated in this seminar. 14 papers were presented. The proceedings will be published in the Sri Lanka Journal of the Social Sciences.
- \* A conference on the use of organic matter in agriculture in Sri Lanka was held on 28th and 29th of June 1990 at the Agricultural Research Centre, Bandarawela. About 50 senior scientists who are engaged in this field participated in this conference. The main objectives were to discuss their experiences in the use of organic matter and to prepare a programme of research and extension in the use of organics as a substitute for inorganics in the context of the recent price

hike in imported fertilizers. The conference was funded by FAO fertilizer project and GTZ conservation farming project and sponsored by NARESA.

- \* A meeting was held at Kurunegala in August 1990 between the Working Committee on Science Education and Science Teachers in the Kurunegala District. The objectives of the meeting were to identify problems of science education in the district particularly in the rural areas and to devise ways of tackling them and to promote science education research among teachers. The meeting was attended by the provincial director of education and about 30 science teachers.
- \* A seminar on Biomass gasification was held from 10-13 July at the NERD Center, Ja-Ela, organized jointly by NARESA and the NERD Center under the programme of activities of the SAARC Technical Committee on Science and Technology. The seminar was attended by 6 foreign delegates and 14 local participants. Theoretical and practical aspects of biomass gasification were covered during the seminar, which included field visits to a foundry at Ekala, and a tea factory at Morawaka, where participants were shown viable applications of gasifier technology in industry.

Other workshops and seminars are included under appropriate headings.

#### 4.0 SPONSORSHIP FOR SCIENTIFIC RESEARCH & SIGNIFICANT RESEARCH FINDINGS

In accordance with the normal practice, applications were invited for Research Grants, by advertisements in the National Press. Details regarding these and the present status of the research grant scheme is given in Tables 1, 2, 3 & 4.

- \* A project titled "An addendum to Ayurvedic Pharmacopoeia" was carried out to write monographs for selected plants of Ayurveda Pharmacopoeia, in English. Each monograph contains the following details of plants.

1. Name
2. Distribution and habitat
3. Parts used in Ayurvedic medicine
4. Description
  - i. External Morphology
  - ii. Histology
  - iii. Powder Microscopy
5. Chemical Screening Tests
6. Identification
7. Chemical constituents so far reported

This would be useful in the identification, quality control, and standardisation of the plant parts and their preparations. In this study monographs on 10 medicinal plants were completed (Prof K.T.D. de Silva).

- \* A study was carried out for the isolation and characterization of antibiotics from local fungi. Thirteen fungi were isolated from the seeds of *Oryza sativa* var. BG 94-1 and the filtrates of five of them *Curvularia affinis*, *Bipolaris oryzae*, *Alternaria padwickii*, *Aspergillus wentii* and *Stachybotrys bisbyi* showed activity. The chemical investigations carried out on these fungi led to the isolation of several active compounds. The compound isolated from the active fraction of *Stachybotrys bisbyi*, was a novel rearranged carbohydrate, bisbynin. In the absence of anti-tumour screening facilities, the grantees selected plants for their chemical investigations on the basis of chaemotaxonomy. Micromelin, a coumarin which displays *in vivo* activity in P-388 lymphocytic leukemia test system, which has been isolated from the bark of *Micromelum zeylanicum*, was isolated from the fruit of the same plant. Studies indicate that its structure should be revised (Dr L.B. de Silva, Dr W.H.M.W. Herath).
- \* A study was carried out to investigate the antifungal (*Cladosporium cladosporioides*), antibacterial (*Staphylococcus aureus*, *Escherichia coli*, and *Mycobacterium fortuitum*) and insecticidal (*Aphis craccivora*) activity of 121 plant extracts/leaf distillates derived from 65 medicinal plants, in Sri Lanka. The results are given in the final report of grant RG/86/C/04 of Dr N.L.V.V. Karunaratna.
- \* Chemical studies were carried out on *Horsfieldia irya* and *Wal-idda antidysenterica*. In this study trimyristin (1), myristic acid (2), 1-(2,6-dihydroxyphenyl) dodecan-1-one (3), asarin (4) and horsfieldia (5) were isolated from *Horsfieldia irya* seeds and characterised using spectral data. *Horsfieldia irya* leaves were found to contain trimyristin, myristic acid and asarin. 1-(2,6-Dihydroxyphenyl) dodecan-1-one has not been previously reported from any member of the plant kingdom nor has been synthesised. The seeds did not contain any volatile oils.

Antibacterial studies revealed that all compounds tested inhibited the growth of *Escherichia coli*. Two unidentified compounds inhibited the growth of *Pseudomonas aeruginosa*. The methanolic extract 1-(2,6 dihydroxyphenyl) dodecan-1-one and two unidentified compounds inhibited the growth of *Bacillus subtilis*. The studies on *Wal-idda antidysenterica* revealed that it does not possess any alkaloids unlike most members of the apocyanaceae. Identification of the isolated compounds from this plant could not be made as the compounds were not stable (Mrs S. Wimalasena).

\* **Experimental studies on the mangrove based brushpile fishery**

The two major objectives of the research project were (i) to improve yield from brush piles to an extent where, brush pile owners would pay prices for mangrove branches that would encourage owners of mangrove areas to maintain them for the continuous sale of mangrove branches, and (ii) to determine if transformation of a brush pile from its role as a fish aggregating device to a fish culture device would significantly increase fishery productivity. Relevant data were collected by manipulating the main characteristics of a brush pile that were known to influence the fish aggregating capability of a brush pile viz. density of mangrove branches, and interharvest interval. The data support that brush piles function as fish aggregating devices. Brush piles were transformed into aquaculture devices by enclosing the brush pile within a netlon encirclement. The brush pile-mini pen (BP-MP) stocked with *Penaeus monodon* juveniles, at a density of 20/m<sup>2</sup>, and fed with formulated feed yielded 19 kg/BP-MP. This yield from a 50 m<sup>2</sup> BP-MP is equivalent to 11, 352 kg/ha/yr. Whereas the highest yield of shrimp obtained from previous experimental pen culture in Sri Lanka is about 1800 kg/ha/yr. In the present experiment the BP-MP operation did not become profitable. However, with some improvements in the shrimp rearing programme it is expected that profitability could be ensured (Dr J.I. Samarakoon).

\* **In-depth Survey of Technology Information Resources**

The objective of this survey was to examine the present information transfer mechanism in the Scientific and Technological libraries in the country whose collection fall within the spectrum of 'Technology' with a view to enrich, exploit, and mobilise the existing resources to meet the demands of industry and technology. The data collected are available in the final report. The recommendations for the short and medium-term infrastructure development include the following :

1. A user survey to be conducted to determine the exact needs of the industry at all levels. The survey should encompass the needs at all grades from the point of view of the technologies.
2. To examine the needs of the export/import trade simultaneously.
3. A database to be developed on the line of the data files at the Sri Lanka Design Centre.
4. NARESA should develop a national consultants register in all fields of expertise.

5. The possibility of providing data processing facilities to centres within TECHNINET and the possibility of linking the databases in order to maximise the use of information therein.
6. Libraries should develop market strategies whereby their resources and services are published and brought to the notice of the user.
7. Since the success of any activity depend on the staff assigned to the tasks, human resources to be developed in order to provide meaningful service to end user (Mrs S.M. Wijewansa).

\* **Promoting *Jatropha curcas* (Rata Endaru) oil as a Substitute**

The main objective of this project was to study the feasibility of using oil derived from seeds of the plant *Jatropha curcas* (rata endaru) as a substitute for diesel in engines. Trials carried out using a Lister engine showed that a blend of jatropha oil and diesel with more than 50% diesel performed satisfactorily when tested under a range of loads from 100-900 watts. The blend of diesel and jatropha oil could be used in direct injection diesel engines without any modifications to the engine. *J. curcas* is not grown in any organised scale at present and therefore the cost of collection of seeds and oil extraction would be high. Though the results show that substitution of diesel with jatropha oil is technically feasible, it is not economically viable under the present conditions.

This project was done jointly by the Depts. of Agricultural Engineering and Mechanical engineering at the University of Peradeniya (Dr S.G. Illangantilleke, Mr S.K. Seneviratne).

\* **In vitro Propagation of Nutmeg (*Myristica fragrans*) and clove (*Syzygium aromaticum*)**

*In vitro* culture of explants taken from shoot tips from juvenile and adult plants, axillary buds, leaves, ovules, and the embryo endosperm of clonal selections of nutmeg and clove was studied.

It was found that actively growing shoot tips from juvenile stages of nutmeg are amenable to *in vitro* culture and about 3000 plants can be regenerated within an year from a single shoot culture. Shoot tip explants taken from juvenile plants of clove also established successfully in culture. Optimum media compositions and other details for the various stages of tissue culture were worked out for both nutmeg and clove.

As a result of these studies a protocol for *in vitro* mass propagation of nutmeg and clove, and a technique for nodal culture establishment of clonal selections of both species are available. This project was carried out at the Dept. of Minor Export Crops Research Station (presently Dept. of Export Agriculture) at Matale (Mr Y.M.H.B. Yapabandara, Prof M.D. Dassanayake).

**Suitability of Jatropha seed oil as a substitute for Kerosene for lighting**

Previous studies on this project has shown that, while solvent extracted Jatropha seed oil burnt smoothly giving a flame comparable to that of coconut oil, mechanically expelled oil produced tarry deposits on the wick which impeded the flow of oil to the wick reducing the luminescence of the flame before it extinguished. In the final phase of the investigation a study was done to determine the origin of the tarry matter and to recommend a method for its removal. It was found that the tarry deposits were not due to gums or other polar lipids, but probably the result of particulate matter present in the crude oil, which could be removed by filtration. The results showed that Jatropha seed oil can be efficiently produced by mechanical expelling of whole seed in a screw press; the oil performs at least as good as coconut oil when used in a specially designed lamp; the only purification needed for this is filtration, which can probably be achieved on a commercial scale using a standard filter press. The project was carried out by the CISIR (Dr A.L. Jayawardena, Dr R.C. Wijesundera).

\* **A comparative study of Incidence and Etiology of Mastitis among Buffaloes and cattle in Sri Lanka**

Separate quarter milk samples from 493 buffaloes (1972 quarters) and 240 cows (960 quarters) were examined by the California Mastitis Test (CMT) and bacteriologically for evidence of mastitis and udder infections. The results showed that 5% of the buffalo quarters and 6% cow quarters were non functional, due to mastitis during previous lactations.

On bacteriological examination of the milk samples 12% of the buffalo quarters were found to be infected with mastitis pathogens, when compared with cattle it was 30% of quarters. It was seen that the infections due to staphylococci were remarkably low (1%) in buffaloes compared to cattle which was 7% total infections. Eleven percent of buffalo quarters were infected with streptococci spc. while in cattle 23% quarters were positive for the same organism.

Mastitis as judged by the CMT was low in buffaloes (20% quarters) compared to 44% quarters in cattle. When the bacteriological status of the CMT positive quarters were considered it was seen that only 13.9% CMT positive buffalo quarters yielded mastitis pathogens. Whereas 42.9% of such cattle samples yielded mastitis pathogens. Considering the low incidence of mastitis in buffaloes, and the practise of suckling before and after milking, a simple mastitis control programme consisting of improving milking hygiene is recommended (Dr D.D. Wanasinghe).

- \* The results of a study of the composition, physico-chemical properties, and variation of composition of buffalo milk due to different factors revealed that the composition of indigenous buffalo milk indicated that the composition of indigenous buffalo in Sri Lanka is similar to that of the Indian Murrah buffalo which is a medium testing breed. The variation in the composition due to the factors such as stage of lactation, time of the day, age and number of lactations showed a similar pattern to that of neat cattle (Dr C.P. Kodikara).
- \* A study into the feasibility of reconstructive arterial surgery in Sri Lankan patients revealed that based on pressure profiles of lower limbs in patients with chronic occlusive arterial disease of limbs in Sri Lanka, reconstructive arterial surgery could be embarked upon with a reasonable guarantee of success (Prof P.C.A. Ratnatunge).
- \* A study on "Traditional Therapists - Evaluation of present role and potential usefulness revealed that there is a strong preference for "Western" medical treatment for mental illnesses. It was also revealed that certain types of problems for which Western Psychiatry has effective treatment are not known by the public. In the Ayurvedic medicine also there is no model for understanding physical symptoms as arising from psychosocial distresses and problems are conceived of as arising from an imbalance of the humors (Dr D. Samarasinghe).
- \* A study on the biology and control of local couch grass revealed that fluazifop - p - buty has a high potential for use as an effective weapon against torpedograss (Dr J.P.N.R. Chandrasena).
- \* The study on "Biology and Fishery of the Pony Fishes of the Bolgoda Lagoon, Sri Lanka" revealed that there are nine species of pony fishes in the lagoon. They belong to three genera. The most common species is *Leiognathus dussumieri*. Their diet composed of Copopods, Blue-green algae, Green algae, Diatoms, Polychaetes, Amphipods, Gastropods, Eggs and Decapods. They grow at an average of 6mm/month during 1st year, 3mm/month during 2nd year and 1.2 mm/month during 3rd

year. The life span is about 3 years in the Bolgoda Lagoon. They spawn at the end of 1st year. The fecundity is 195275. The peak spawning periods are May/June and November/December. They are commercially caught almost throughout the year. The annual production of Pony fishes is about 9.4% from the total fish catch (Dr J. Jinadasa).

\* **Inventory of plants at Sinharaja MAB Reserve**

The studies carried out show that there are 457 species of flowering plants at Sinharaja. These have been classified in 289 genera and 92 families. In addition to this 40 species of ferns and fernallies also have been recorded. These have been classified under 23 genera. This study also indicated that out of the 457 species of flowering plants, 177 are endemic to Sri Lanka indicating a 38% endemism (Dr M. Jayasuriya, Prof S. Balasubramaniam).

\* **Demographic studies of some Dipterocarp Species in the Sinharaja forest**

Dipterocarpaceae is the dominant family at Sinharaja. This family contains a large number of species of economic value both for timber and resin. Some of the species also provide edible sources of carbohydrate. The study of demography of dipterocarp species elucidating the distribution of the different species within the MAB reserve of Sinharaja was completed. It also studied the factors that are responsible for the dynamics of population of this plant species (Prof C.V.S. Gunatilleke).

\* **Medicinal Plants at Sinharaja**

This study indicates that there are 54 species at Sinharaja which are known to have medicinal properties. These are distributed among 50 genera and 39 families. Some of the species are very rare, and have been categorized as threatened species of plants. A list of medicinal plants has been prepared (Dr M. Jayasuriya, Prof S. Balasubramaniam).

\* **Manual of rice field weeds**

The manual prepared has listed all species of plants which are found in paddy fields and their environs which can be listed as weeds in paddy fields. The manual gives the botanical names of the weeds and also indicates the Sinhala and Tamil names where available. The description of agronomy of the weeds and their methods of controls are also given. The manual can be used as a text book as well as a guide to the identification of the rice field weeds by field extension workers. All plants listed in the manual are illustrated (Prof N. Chandrasena).

\* **Effect of potash fertilizer on the yield and quality of pineapple, banana and papaw grown as intercrops with coconut**

A series of experiments were conducted to study the optimum dosage of potassium and other nutrients needed to get the optimum yield and quality of pineapple grown under coconut. The variety of pineapple grown was Mauratious which is the main table variety grown in Sri Lanka. The results obtained indicates that the application of 16.8 gms of nitrogen, 54.0 gms  $K_2O$  and 9.4 gms of  $P_2O_5$  can be recommended as the optimum rate of NPK per plant to obtain the best results. The data collected from the other experiments indicates that mixing banana and papaw with pineapple in the intercropping mixture brings higher profits than when intercropped with pineapple only. The trials were conducted in the coconut triangle of Sri Lanka (Dr K.P. Premaratne, Prof H.P.M. Gunasena, Dr U.R. Sangakkara).

\* **Effect of Nitrogen, Phosphorous, Potassium and Magnesium on the establishment and growth of *Pueraria phaseoloides* as a cover crop under coconut**

Growing of cover crops under coconut serves a number of purposes. They enrich the soil by adding nitrogen to the soil and also by contributing a large volume of organic matter to the soil. The soil micro fauna and flora are also enhanced resulting in better utilization of added fertilizers to the coconut. The study indicates that within the coconut triangle, for the successful establishment and maintaining of cover crops of *Pueraria phaseoloides* application of fertilizer at the rate of 35 kgs of nitrogen per hectare, 80 kgs of  $P_2O_5$  per hectare, 60 kgs of  $K_2O$  per hectare and 25 kgs of  $MgO$  per hectare could be recommended (Mrs L.V.K. Liyanage).

\* **The role of potassium fertilizer in stabilizing upland rainfed farming in the dry zone of Sri Lanka**

This study was conducted in the Hambantota District at Kurudana. Trials were carried out,

(a) to find out after how many cropping seasons, does the soil potassium become limiting in different land elements that make up the shifting cultivated landscape, with a view to developing fertilizer management methodology.

(b) to study and develop fallow genetic stock management methodology to improve its efficiency of recycling potassium.

(c) to identify land elements with better potassium management efficiency.

The study indicated that in a soil conserved and residue recycled dryland catchment, land elements showed no limitations of potassium to crop production upto the third year from land clearing (Dr J. Handuwala).

\* **Studies on Rhizobium inoculation and nutrient requirements of some unexplored legume crops**

A series of experiments were conducted to ascertain the effect of rhizobium inoculation and nutrient application on modulation, shoot dry weight and N,P, and K contents of the shoot of *Crotalaria anagyroides/Stulosanthes guianensis* and *Vigna sequepedalis*. In all cases inoculation enhanced nodule formation. However, this was suppressed by the addition of nitrogen fertilizers. The nutrient requirements of the legume crops studied have been worked out (Mrs S.F.B.N. Gunawardana, Prof M.A. Pemadasa).

\* In a study on the "Type specificity and duration of actively and passively acquired immunity to Rotavirus" active and passive immunity to Group A Rotaviruses was studied. The study revealed that susceptibility to rotavirus infection was not related to nutritional status, passive immunity, levels of trypsin in the gut, or economic status. The proportion of post infection seroconversions and coproconversions increased to 100% after tertiary and quaternary infections respectively. Repeated infection enhanced the Geometric mean titre of virus specific serum IgG from 1 : 327 following primary infection to 1 : 900 following tertiary infection. However, neither the quantity nor duration (6 months) of IgA coproantibody increased with repeated infection. The duration of the serum IgG response increased from 6 months after primary infection, to 9 months after tertiary infection. A primary serum as well as coproantibody response was observed following rotavirus infection in the neonatal period despite the cover of high levels of maternal antibody (Dr (Mrs) L.N. Mendis).

\* A study was carried out on the "Ecology of commercially exploitable holothuroids on the Northwest coast (Puttalam District) with particular emphasis on conserving and rehabilitating the fishery already existing there". The study revealed that although the male to female sex ratio was close to one, more females were found annually and on monthly analysis. Neither the annual nor the monthly ratio varied significantly during any period of the study. Nothing is known of the sex ratio of any holothuroid or of any species of other echinoderm classes from the literature. Also, the observation of the two peaks in the graphical plot of the gonad index indicate that the animal breeds twice a year. However, the observation of maximum peak in the month of

March/April shows that although the animal breeds bi-annually, its the highest during the period of March/April. The results of the study on length at maturity reveals that the animal begins to mature and enter into reproduction after attaining a certain length size. This size could be around 29.0 cm for females and 26.5 cm for males in the study area. Increase in size have always been observed in the months of peak harvest periods i.e. March/April and October/November. This implies that the rains in December and August brings in large amounts of nutrient material to the environment, which are consumed lavishly during the subsequent months to increase in size and maturity and then enter into reproduction (Mrs B.D.L. Joseph, Mr M.N. Moiyadeen).

- \* A study carried out on Current Judicial Trends in South and East Asia has focussed on illustrating the fact that legal precepts which are to protect the basic fundamental rights and liberties of an individual must be laid down not only for the present but for all times and all conditions (Prof G.L. Peiris).
- \* A Linguistic analysis of the Tamil used in the upcountry plantation areas in Sri Lanka was carried out. This focusses special attention on the phonology and morphology of the estate Tamil language, makes a valuable contribution to the knowledge of Sri Lankan Tamil while compiling a considerable amount of socioeconomic information relating to the estate Tamil community (Ven. Kadurugamuwe Nagitha).
- \* A study on Occupational Aspirations and Attitudes Towards Agricultural Employment Among Youth in Sri Lanka concentrated on students' awareness of occupations existing in the agricultural sector, their preferences and attitudes. The strong need for a career counselling service, for information dissemination, for developing motivation to take up challenges inter-alia, has been identified (Mr W.A.P. Jayatilleke).
- \* A study has also been made into the possibility of integrating folk media with massmedia for the purpose of development communication (Mr M.J.R. David).
- \* Through an investigation on the "Nature of Neurotic Disorders found in Secondary School Children in Sri Lanka and the Effect of such Disorders on their Educational Performance", the nature, severity and duration of such disorders, causative factors and impact on education have been studied and remedial and preventive measures that would minimize the damage caused by such disorders have been presented (Mr K.A.G. Jayatilleke).
- \* "Application of linear programming techniques to the Resources Allocation Problem of Public Universities in Sri Lanka. A case study" with special reference to the University of

Kelaniya", discusses the problem of allocation of resources within a University. A model has been developed considering the university as an entrepreneur having the objective of maximizing the worth of the output subject to various constraints (Mr D.U.A. Galagedara).

- \* A comparative study of drug control legislation of Sri Lanka, Singapore, Hongkong and Canada examined the structural framework and the component elements of drug offences are differently conceived in these jurisdictions. The differences have significant implications. The report focusses on these issues and assesses lines of development of the modern law in the light of policy objectives (Prof G.L. Peiris).
- \* A study of the educational problems of mentally handicapped children in Sri Lanka and the development of their motor ability- focusses attention on the fact that an attempt should be made to make their lives more meaningful. Ways in which this can be achieved are discussed (Mrs N.P Sendanayake).

#### 5.0 RESEARCH AND CO-ORDINATION IN THE NATURAL RESOURCES

##### \* Natural Resources Profile of Sri Lanka

The preparation of a Natural Resources Profile of Sri Lanka has been undertaken by NARESA with financial support and collaboration from USAID. The project commenced in November 1989. The Natural Resources Profile will provide factual information on the trends in the management of the natural resources, the environmental effects of past and present practices in the use of natural resources, and the sustainability of present forms of resource use. The main purpose of the profile is to help Sri Lanka develop environmentally sustainable programmes of development and to indicate whether the present forms of resource use are economically sustainable or, if not, to point out what changes are required. The profile will include chapters on population, economy, energy, land resources and use, land degradation, water resources, mineral resources, forest resources, biological diversity resources, coastal resources, inland aquatic resources, water pollution and air pollution, together with several topical boxes. During the year 1990, the papers submitted by the writers, commissioned by NARESA, were reviewed by the steering committee and through a workshop to which experts in relevant fields were invited. The papers were amended in the light of the reviewers' comments, edited and prepared for publication.

## \* Genetic Conservation

(1) The Technical Committee on Genetic Conservation commissioned Miss U. Hettige to carry out a Commonwealth Science Council funded study of 'Priority Key Tree Species in Sri Lanka' for preparation of a document. The guidelines for the document were sent by CSC. The final report is being finalized by Miss Hettige for publication by NARESA.

(2) The preparation of a booklet on Some Common Vegetables of Sri Lanka by Dr Tissa Herath for publication by NARESA was initiated by the Technical Committee on Genetic Conservation. Preparation of the booklet is in progress.

(3) A project on Conservation and Utilization of Plant Genetic Resources for Medical Uses was initiated in collaboration with the Commonwealth Science Council. The project was initiated after a discussion with Mr Gunaratne de Silva of the Ayurvedic Research Institute.

(4) Printing of two posters in Sinhala, English and Tamil on an endangered habitat (Rain Forests) in collaboration with March for Conservation and funded by USAID under the Natural Resources Profile Project, for (a) distribution to schools (b) to increase conservation awareness among the general public, was in progress.

## \* National Land Utilization and Distribution

In view of the appointment of the Task Force on National Land Utilization and Distribution, by the President, for formulation and implementation of a nation-wide programme of land alienation, the criteria used for alienation of land were studied jointly by Natural Resources and Man and Biosphere Committees. A Committee was appointed to draft guidelines for land use, and two submissions were made by NARESA to the Chairman, Presidential Task Force on National Land Utilization and Distribution, in this regard.

## \* Man and Biosphere programme

1. An international symposium on "Ecology and Landscape Management in Sri Lanka" was held during 12-26 March 1990. Over 200 scientists both local and foreign attended the symposium which consisted of a conference where a large number of technical papers were presented and a field tour. The symposium was co-sponsored by NARESA and the proceedings are being published.

2. A manuscript on Marine Angiosperms was accepted for publication.
3. An illustrated manuscript of Rice Field Weeds of Sri Lanka was prepared.
4. The final report on Dipterocarp species of the Sinharaja Forest was completed and will be published as a MAB publication.
5. A Floristic Inventory of the Sinharaja Forest was prepared.
6. The final report on the Medicinal plants of the Sinharaja MAB Reserve was prepared.
7. A contribution of Rs.100,000 from NARESA towards the construction cost of a new research hut to be built at Horton Plains Wild Life Reserve was made available to the Department of Wild Life.

#### **6.0 ACTIVITIES RELATING TO SCIENCE INFORMATION**

##### **\* Training workshop on CDS/ISIS Library Software**

A 5 day Training Workshop on CDS/ISIS library software was held in May 1990 for users of the software. Computer facilities and the auditorium were provided by the Computer and Technology Council of Sri Lanka (CINTEC) at the BMICH.

The main objective of the Workshop was to provide the participants, the experience and the knowledge to use the CDS/ISIS mini-computer database management system which is being developed by UNESCO and distributed by NARESA among the libraries in Sri Lanka. Chief resource persons were from NARESA. Twenty persons participated in the Workshop.

##### **\* Consultancy and Training on micro CDS/ISIS**

1. In service training - A programme of ten half-day sessions was provided to 3 officers from the Labour Department library.

2. The following institutes were visited for training and consultancy.

National Water Supply & Drainage Board  
Peoples' Bank  
University of Colombo  
Department of Labour  
Agrarian Research and Training Institute  
Centre for Housing Planning & Building

3. Routine consultancy services at NARESA

\* **Agricultural Information Network (AGRINET)**

**Selective dissemination of information**

This is a specialized information service for Agricultural information users. 915 contents pages of periodicals received by the member libraries during the year 1990 were sent to the relevant users.

\* **Documentation**

Entry of data to UNICAST (Union Catalogue of Scientific and Technical Books) - 1640 entries were added.

National Scientific Reports collection - 141 reports were added.

Sri Lanka Science Index - 97 Journal issues were indexed.

\* **Distributions**

Science Index Vol. 10 (1&2) - To local Libraries - 106  
To foreign Libraries - 23

CDS/ISIS package - copied to be sent to 13 Institutions/ Departments

\* **Sri Lanka Scientific and Technical Information Network (SLSTINET)**

Co-ordination with scientific and technical libraries was continued with the aim of resource sharing, information exchange and co-operative acquisition plans.

\* **Bibliographic Data Bases**

1. **UNICAST 2** - Building up of a database on scientific and Technical books available locally based on micro CDS/ISIS, was initiated. 4 institutions participated in sending data in diskette form.

2. UNILIST - Building up of a data-base on scientific and technical periodicals available in Sri Lanka, continued. Over 6000 entries are now included in the data base.

## 7.0 PROGRAMMES AND REPORTS OF NATIONAL INTEREST

### \* Improved Domestic Fuelwood Cookers

Scientific tests were carried out under NARESA's Working Committee on Energy to evaluate the efficiency of improved domestic fuelwood cookers and to compare with traditional cooking methods. In a field evaluation done by the Energy Unit of the CEB, the NERD Centre cooker and the IDB cooker, both single pot models, gave fuelwood savings of 38% and 35% respectively. (The NERD Centre has since then developed a better model). On the basis of these results NARESA has recommended to the Ministry of Power & Energy that a programme be launched to commercialise and propagate the use of these improved cookers.

### \* Publication of a Science News Magazine for the Poverty Alleviation Programme

The first issue of "*Vidyawen Apata*" a news magazine meant to disseminate information on basic technologies which could be adopted by "*Janasaviya*" beneficiaries was published. Copies of this news magazine in both sinhala and tamil were distributed through the Janasaviya Commissioner, and also at the Gam Udawa Exhibition.

### \* Models of Salvinia Control Project

Three models of the Salvinia Control Project were prepared. Two were of Gammanpila Tank, before and after salvinia control (ie. introduction of the weevil) and the third, a map of field sites of the salvinia control project, lighted up in chronological order of introduction of weevil. These were exhibited at an environmental exhibition in Kandy and at Gam Udawa 1990.

### \* Environmental Education

- (1) The second and third in the series of workshops to Identify Problems and Constraints to Environmental Education at School Level was held in collaboration with March for Conservation in consultation with the National Institute of Education. It was funded by a USAID grant to NARESA under the Natural Resources Profile Project. The workshops were held in Galle on the 20th of October 1990 at St. Aloysius College for teachers within the

Southern Province and in Badulla on 3rd of November 1990 at Dharmadutha College, for teachers within the Uva Province. (The first workshop was held in Colombo in December 1989 for schools within the Western Province).

- (2) A seminar was held on Conservation of Genetic Resources in Sri Lanka to sensitize high level administrators and policy planners and the media to heighten their awareness of this issue, in February 1990.

\* **Environmental Exhibition**

NARESA participated in an environmental exhibition held at Kingswood College, Kandy between 28-11-90 and 2-12-90. This exhibition was organized by "Youth Exploration Society" and gave the opportunity to reach a wide segment of the society and enabled NARESA to disseminate useful information on environmental issues carried out by NARESA particularly to school children.

\* **Biological Control of Aquatic Weeds**

The Technical Committee on Biological Control of Aquatic Weeds initiated a project to study the succession of other weeds in water bodies where salvinia is controlled and to detect a possible bio-control agent among the naturally occurring fish fauna. This Committee also successfully carried out the final phase of the project on the Biological Control of Salvinia in Sri Lanka.

\* **Conservation of endangered habitats**

A two day seminar was held on 9th and 10th of August 1990, on the Conservation/Management of Ritigala Kanda, Horton Plains and Peak Wilderness. The aim of the seminar was to : (i) collate the available information on faunal, floral, social, cultural, religious and archaeological aspects at the three sites, (ii) identify the issues and problems that should be given special consideration at these sites and (iii) consider suggestions for remedying these problems. The information obtained through the seminar will be used in the preparation of management plans for the three sites in question. Approximately 50 persons participated at this seminar which was attended by representatives of concerned ministries, key NGO's, IUCN, the plantation sector, the government agents of the areas, scientists from universities, foresters, personnel from the Department of Wild Life Conservation and Archaeologists. The seminar was organized by NARESA, with partial funding provided by the Department of Wild Life Conservation.

\* **Gam Udawa Exhibition - 1990**

NARESA participated in the Ministry of Science and Technology stall at the 12th *Gam Udawa* exhibition held in Pallekale, from 23rd June to 3rd July 1990. There were several attractive posters in the NARESA stall depicting NARESA's important projects such as Biological Control of *Salvinia*, Water Buffalo Research Programme, Conservation of Natural Resources in the Sinharaja Forest and maximum utilization of Agricultural Lands. Two informative posters showing functions of NARESA and NARESA's contributions to *Janasaviya* were also displayed. There were 3 models of the *Salvinia* Control Project on display and also a mineral block developed to overcome mineral deficiencies of buffaloes was exhibited. NARESA publications such as *Vidurava* and *Sri Lanka Water Buffalo* (sinhala translation) were sold at the stall at subsidized rates.

\* **Natural Resources and Environmental Policy Project**

NARESA is a participating agency in the Natural Resources and Environmental Policy Project under which USAID has pledged a grant of US \$ 12,000,000 over the project period of 7 years commencing 1991. The focal point for the project is the Ministry for Environment.

The NARESA component of the project, for which a grant allocation of US \$ 700,000 has been made, consists of setting up a Natural Resources Information Centre and carrying out research and related activities pertaining to the sustainable management of natural resources. The work plan for 1991 was prepared, and submitted to the Ministry for Environment.

\* Publication titled "Freshwater Fauna & Fisheries of Sri Lanka" which is a collection of published papers by Prof C.H. Fernando, University of Waterloo, Canada, during the period of 1962-1980, was completed.

\* Article on *Salvinia* Control Project in Sri Lanka, appeared in the April 1990 issue of *Asia Technology* (written by Mr Nalaka Gunawardena).

\* **Journal of the National Science Council of Sri Lanka**

Vol. 16 (2) and Vol. 17 (1) were completed and distributed locally and to foreign countries.

\* **Vidurava**

*Vidurava* Vol. 11 (1) "Pesticides" was printed and distributed to all schools with Advanced Level classes and also to libraries.

\* **Science and Technology Bulletin**

Vol. 1 (1), 1 (2), and 1 (3) were completed and sent to the Ministry of Science and Technology.

\* **Sri Lanka Science and Technical Information Network (SLSTINET), Newsletter 1990 was published.**

\* **Science Education Publications**

One book titled "Diseases and parasites of domesticated animals in Sri Lanka" was printed.

\* **Sinhala monograph on buffaloes of Sri Lanka titled "*Sri Lankawe Mee Gawayaya*" was completed as a publication under the Science Education Series.**

\* **Science investigations**

One book (No. 4) was printed.

\* **Journal of Social Sciences**

Vol 10 Nos. (1) and (2) was printed.

\* **Material collected for a "Bibliography of Social Science Publications in Sri Lanka" was handed over to the National Library Services Board to be published.**

**8.0 COLLABORATION WITH FOREIGN AGENCIES**

\* **SAREC (Swedish Agency for Research Co-operation with Developing Countries)**

**1. Water Buffalo Research Programme**

Under the above programme 35 grants were functional as at 01-01-90. During the year, 3 grants were completed while one Research Assistant was awarded a post graduate degree.

The agreement between NARESA and the National Livestock Development Board (NLDB) for the management of the Narangalla Buffalo Research Station was renewed for a further five year period, to enable NARESA and NLDB to continue construction, development and maintenance work of the farm.

**2. Coastal Ecology Programme**

NARESA initiated its second major multidisciplinary research programme titled the Coastal Ecology Research Programme, with

a grant of SEK 2,781,000 (approximately Rs.14 million) from SAREC. The programme comprising of six projects and 40 scientists from the National Aquatic Resources Agency, the University of Ruhuna and the University of Sri Jayewardenepura, will initially be implemented for two years.

### 3. Urgent Spareparts Fund

Under the NARESA/SAREC collaborative programme, a fund is maintained to enable Sri Lankan scientists to import urgently required spareparts for repair of scientific instruments in their institutions. Under this scheme, the spares are supplied free of charge to the institution concerned. Six scientists had benefited from this fund in 1990.

### 4. International Contacts Fund

Under the SAREC International Contacts Scheme, a fund is maintained to provide partial support for international contacts for Sri Lankan scientists who present papers at international seminars and conferences etc. The support will usually consist of a grant to cover any shortfall in travel and subsistence costs provided by the organizers, or other sponsors. During 1990, thirty three (33) Sri Lankan scientists had benefited under this fund.

#### \* United States Agency for International Development (USAID)

Fourteen preproposals were received for USAID grants. These were screened by the Working Committees and twelve were selected for forwarding to USAID.

#### \* International Foundation for Science (IFS)

Under the above programme, copies of 7 applications submitted to IFS, Sweden, were received.

#### \* SAARC Training Workshop

Mr K.U. Dias and Mr R.A.D.B. Samaranayake of the Inland Fisheries Division, Ministry of Fisheries and Aquatic Resources were nominated to attend the SAARC Training Workshop on "Innovated Technology for Development of Prawn Hatchery; 9-17 May; Bangladesh.

#### \* Science Statistics and Indicators

Field surveys in respect of Phase III (Constraints to Scientific Research) of the above study programme which were carried out by full-time staff of NARESA, were much restricted due to a critical shortage of staff. On the other hand work on Phase IV (Industries and Industrial Technologies) carried out by temporary research assistants, working full time on the

project covered much ground. The technology content assessment of industries at the firm level were completed in 8 industries. This project now nears completion.

\* **Visits of foreign delegates**

1. Dr Hakan Wickstrom - Institute of Freshwater Research, Sweden
2. Prof S.S.de Silva - National University of Singapore
3. Prof R.J. Soper - CIDA
4. Dr Mats Hoggren - Uppsala University, Sweden.
5. Dr Olof Linden - Swedish Environmental Research Institute
6. Dr John Daly - USAID
7. Ms Eva Rostig - International Foundation for Science

**9.0 STAFF PAPERS PRESENTED**

1. M.A.T. de Silva - "Science and Technology Indicators - an overview" Paper presented at the Workshop on Construction Industry Indicators held on 09 October 1990, at the IESL Auditorium.
2. M.A.T. de Silva - "Science and Technology Indicators as Management Information Tools for S & T Planning". Paper presented at the Seminar on Benefits from Construction Project and Industry Indicators held on 21 November 1990 at the Sausiripaya Auditorium.
3. S.P. Prelis - "National Policies and Programmes relating to S & T and their effect on the lives of women". Sri Lanka country paper presented at the Asian Workshop on Technological Change and Women - towards 21st century. New Delhi, India, February 1990.
4. W.B. Yapa - "Ecological and Ethological Studies on Cave Dwelling Bats in Sri Lanka" Zoology Institute, University of Munich, West Germany on 14th May 1990.
5. W.B. Yapa - "Factors Affecting the Flight Activity Pattern of Cave Dwelling Bats in Sri Lanka" Proceedings of the Physiological Society of Sri Lanka, Annual Meeting, 20th November 1990.

TABLE I : GRANTS SPONSORED BY NARESA

Status Summary During 1990

DISCIPLINE	Agriculture & Animal Husbandry	Biological Sciences	Chemical Sciences	Energy	Information Sciences	Medical & Veterinary Sciences	Physical & Engineering Sciences	Science Education	Social Sciences	Biological Control of Aquatic Weeds Water Hyacinth	Mangroves
Total No. of grants operating during 1990	15	18	23	1	04	24	12	5	32	5	05
Grants awarded - 1990	3	3	7	-	-	4	7	1	07	1	-
Amount allocated for 1990 (New and ongoing Rs.)	506,465	700,000	1,068,470	3,000	12,000	750,000	530,190	5,000	159,475	246,513	65,033
Grants completed - 1990	1	05	8	1	01	05	3	-	08	-	01
Grants withdrawn - 1990	-	-	-	-	-	-	-	-	03	-	-
Grants terminated - 1990	-	-	-	-	-	1	01	1	1	-	01
RA's appointed - 1990	2	-	4	1	-	-	4	-	02	01	-
Registered for PG - 1990	1	-	2	-	-	-	2	-	02	-	-
Thesis PG - 1990	-	-	4	-	-	-	2	-	02	-	-
Communications & Publications 1990	-	05	31	-	-	14	6	1	08	-	-
New Applications - 1991	6	11	4	1	02	4	10	-	16	-	-
Funds requested for 1991 (Rs.)	621,100	1.9 m	266,100	20,750	36,140	2.0 m	850,500	5,000	538,250	-	-
Grants approved for 1991	1	04	2	1	02	6	8	-	13	-	-
Amount approved for 1st year (1991) for new grants (Rs.)	103,000	274,000	115,700	20,750	36,140	262,000	409,350	-	* 265,750	-	-
Total amount approved for new grants - 1991 (Rs.)	132,000	468,000	218,900	20,750	36,140	333,000	641,350	-	* 265,750	-	-

\* Rs. 44,000 is allocated by SAREC, additionally

TABLE II : GRANTS SPONSORED BY FOREIGN AGENCIES  
Status Summary during 1990

FOREIGN AGENCY DISCIPLINE STATUS	ACIAR Bio-control of Aquatic weeds (Salvinia)	IDRC Information Sciences	CIDA Fertilizer	CSC University of Exeter	MAB UNESCO & WWF	UNESCO Mangroves	US-AID	NARESA-SAREC Research Co-operation		
								Buffalo Research Programme	Coastal Ecology Research Programme	Zoological Survey of Sri Lanka
Total No. of grants operating during 1990	03	1	29	01	04	02	6**	32	5	3
Grants awarded 1990	-	-	-	-	-	-	-	-	5	-
Amount allocated for 1990 (new & ongoing Rs.)	224,800	31,642	3,455,650	136,687	\$ 600 + Rs. 32,000	*482,573	2,900,000	*5,283,500	*2,315,000	-
Grants completed - 1990	-	-	3	-	04	-	3	03	-	-
Grants withdrawn - 1990	-	-	-	-	-	-	-	-	-	-
Grants terminated - 1990	-	-	-	-	-	-	-	-	-	-
RA's appointed - 1990	-	-	2	-	-	-	1	9	13	-
Registered for PG - 1990	01	-	1	-	-	-	-	-	-	-
Thesis PG - 1990	-	-	-	-	-	-	-	01	-	-
Communications & Publications 1990	-	-	1	-	-	-	2	04	-	-
New applications - 1991	-	-	-	-	-	-	-	-	-	-
Funds requested for 1991(Rs.)	-	## 31,642	-	-	-	-	-	## 3,810,700	## 2,485,000	-
Grants approved for 1991	-	-	-	-	-	-	-	-	## 1	-
Amount approved for 1st year (1991) for new grants (Rs.)	-	-	-	-	-	-	-	-	-	325,000
Total amount approved for new grants 1991 (Rs.)	-	-	-	-	-	-	-	-	-	325,000

\* Funds allocated for 1989/1990

## For 1990/1991

\*\* Includes one(01) US-AID/HARVARD grant

## Carry over of 1990 allocation

New Grants Awarded in 1990

Discipline - Chemical Sciences

Grant No.	Name of Grantee & Institution	Title & Duration	Total Allocation
RG/90/C/1	Dr P. de A. Gurusinghe Mrs M. Senanayake Mr A. Ravindran Dept. of Minor Export Crops Matale	"The effect of Physiological maturity and location on bark and leaf oil of cinnamon"  (3 years)	Rs. 99,200
RG/90/C/2	Prof. (Mrs) R. Mageswaran Dept. of Chemistry Univ. of Jaffna	"Preparation of metal complexes of hydroxamic acids and investigation of their structures and properties"  (3 years)	Rs. 138,200
RG/90/C/3	Dr A.S. Amarasekera Dr R.L.C. Wijesundera Dept. of Chemistry Dept. of Botany Univ. of Colombo	"Investigation of fungicidal activity of some synthetically modified natural products"  (2 years)	Rs. 107,000
RG/90/C/4	Dr K.B. Gunaherath Dept. of Chemistry Open University	"Chemical investigation of family Ebenaceae"  (3 years)	Rs. 284,475
RG/90/C/5	Mr D.T. Jayamanne Division of Occupational Hygiene	"Evaluation of occupational and environmental lead toxicity in and around a lead based industry"  (Continuation of an ongoing grant RG/89/C/5)  (6 months)	Rs. 17,500

Grant No.	Name of Grantee & Institution.	Title & Duration	Total Allocation
RG/90/C/6	Dr V. Pasupathy Dept. of Chemistry Univ. of Jaffna	"Phytochemical investigation of plants used as folk medicine in Northern Sri Lanka"  (3 years)	Rs. 170,100
RG/90/C/7	Prof. W.D. Ratnasooriya Prof. L.M.V. Tillekeratne Dept. of Zoology Dept. of Chemistry Univ. of Colombo	"Isolation and characterisation of anti-fertility agents from marine sponges"  (3 years)	Rs. 236,600

NEW GRANTS AWARDED IN 1990  
DISCIPLINE : SOCIAL SCIENCES

Grant No.	Name of Grantee & Institution	Title & Duration	Total Allocation Rs.
RG/90/SS/01	Prof J. Tilakasiri National Crafts Council	Study of traditional craft villages and families descended from traditional craftsmen, In Sri Lanka (2 years)	58,000/-
RG/90/SS/02	Prof G.L. Peiris Univ. of Colombo	National security: Legislation and current judicial trends in south and east Asia. (1 year)	42,200/-
RG/90/SS/03	Mr A.G. Ismail Education Unit Open University Nawala	A critical study on the "factors influencing student dropouts from the educational programmes offered by the Open University of Sri Lanka (2 years)	17,600
RG/90/SS/04	Dr (Mrs) N.A.I Sriyani Dias Dept. of Geography Univ. of Sri Jayewardenepura	The role of women in entrepreneurship development in Sri Lanka (1 year)	25,400/-
RG/90/SS/05	Mrs G. Edirisinghe Dept. of Geography Univ. of Ruhuna	Filaria: the field pattern of socio-economic and environmental determinants (1 year)	9,750/-
RG/90/SS/06	Dr P.C.H. Ranasinghe Dept. of Geography Univ. of Colombo	Recording and analysis of road traffic accidents in Sri Lanka. Application of microcomputers accepted analysis package (1 year)	25,500/-
RG/90/SS/07	Mrs Sylvie Senadheera Mahaweli College of Education Polgolla	The influences of study habits on enrichment of educational performance (1 year)	5,000/-

Discipline - Biological Control of Aquatic Weeds

Grant No.	Name of Grantee & Institution	Title & Duration	Total Allocation
RG/90/WW/01	Dr Mrs. S.M. Solangaarachchi Dept. of Botany  Prof. M.J.S. Wijeratne Dept. of Zoology Univ. of Kelaniya Kelaniya	Studies on the succession and control of aquatic flora in water bodies where salvinia has been biologically controlled  3 years	531,538.88

Discipline : Agriculture & Animal Husbandry

Grant No.	Name of Grantee & Institution	Title & Duration	Total Allocation
RG/90/Ag/1	Dr Mahinda Wijeratne Dr Oscar Amarasinghe Dept. of Agric. Economics Fac. of Agriculture Univ. of Ruhuna Mapalana Kamburupitiya	Farmer need identification - a prime factor for farming system research  2 years	Rs. 108300.00
RG/90/Ag/2	Mr H.H. Ratnayake Natural Products Section CISIR P.O. Box 787 Colombo	Incorporation of selected annual medicinal crops to the existing cropping patterns in different agroecological regions in Sri Lanka  3 years	Rs. 202000.00
RG/90/Ag/3	Dr Nimal Perera Dr H.W. Cyril Dept. of Animal Science Fac. of Agriculture Univ. of Peradeniya Peradeniya	Potential of profitable rabbit production in Sri Lanka utilizing cheap sources of feed <u>Phase I</u> Potential of substitution of leguminous tree fodder as a source of protein in profitable rabbit production in Sri Lanka <u>Phase II</u> Effect of nutrition on carcass and meat quality of rabbit  3 years	Rs. 249080.00

New Grants Awarded in 1990

Discipline: Science Education

Grant No.	Name of Grantee & Institution	Title & Duration	Total Allocation
RG/90/SE/1	Mr S.J. Perera Dept. of Education Univ. of Peradeniya Peradeniya.	Study skills of G.C.E. (A/L) science students attempt at their identification (1 year)	Rs. 5,000/=

New Grants Awarded in 1990

Discipline - Physical, Engineering & Architectural Grants

Grant No.	Name of Grantee & Institution	Title & Duration	Total Allocation
RG/90/P/1	Dr P.A.J. Ratnasiri Dr R.M. Ediriweera Dr A.M. Mubarak CISIR Colombo 7	"Survey on the utilization and management of scientific instruments in Sri Lanka"  (1 year)	Rs. 60,000
RG/90/P/2	Dr K. Premaratne Dept. of Physics Univ. of Peradeniya	"Electrical characterization of semiconductor heterojunctions using Current-Voltage and Capacitance Voltage techniques"  (3 years)	Rs. 116,600
RG/90/Ar/1	Mr. V. Sri Mammuni Architectural Research Unit Univ. of Moratuwa	"Modifications and alterations in state sponsored housing - a study of fifteen housing schemes in and around Colombo"  (1 year)	Rs. 55,650
RG/90/E/1	Mr N. Navarajan Dept. of Materials Engineering Univ. of Moratuwa	"Production of sponge iron from local iron ore by direct reduction using wood charcoal, coconut shell charcoal, coir dust and paddy hull"  (1 year)	Rs. 51,690
RG/90/E/2	Mr B.P.S. Peiris Dept. of Mining & Minerals Eng. Univ. of Moratuwa	"Heat treatment of gems with special emphasis on stones belonging to the corundum family"  (1 year)	Rs. 47,000

Grant No.	Name of Grantee & Institution	Title & Duration	Total Allocation
RG/90/E/3	Mrs L.T.M. Fernando Dept. of Electrical Engineering Univ. of Moratuwa	"The digital simulation of grid-connected and self-excited induction generators"  (2 years)	RS. 21,450
RG/90/E/4	Dr H.C. Kariyawasam Dept. of Civil Engineering Univ. of Moratuwa	"Assessment of availability and quality of ground waters in Sri Lanka"  (1 year)	Rs. 21,150

NEW GRANTS AWARDED IN 1990

Discipline: Medical & Veterinary Sciences

Grant No	Name of grantee & Institution	Title & Duration	Total Allocation Rs.
RG/90/M/1	Dr(Mrs) M.C. Attapattu Medical Research Institute	Skin test survey for the prevalence of histoplasmosis and coccidiomycosis in Sri Lanka (2 years)	159580
RG/90/M/2	Dr R.L. Jayakody Dept of Pharmacology University of Colombo	Neurogenic and endothelium mediated responses in human blood vessels in diabetes mellitus, atherosclerosis and thrombangitis obliterans (3 years)	120000
RG/90/M/3	Prof. W.D. Ratnasooriya Dr J. Welihinda Dr(Mrs) B.M.R. Fernandopulle University of Colombo	A pharmacodynamic evaluation of <u>Momordica charantia</u> (Bitter Gourd) (2 years)	25000
RG/90/V/1	Dr N.U. Horadagoda University of Peradeniya	Application of enzyme-linked immunosorbant assay (ELISA) for detecting postvaccinal antibody titres against haemorrhagic septicaemia in cattle and buffaloes (2 years)	96900
RG/90/V/2	Dr E.A. Wijewanta Dr S. Mahalingam University of Peradeniya	Studies on mycoplasmas affecting the respiratory tract of buffaloes in Sri Lanka (2 years)	115000

NEW GRANTS AWARDED IN 1990

Discipline: Biological Science

Grant No.	Name of grantee & Institution	Title & Duration	Total Allocation Rs.
RG/90/B/1	Mr L.L.S.S.K. de Silva Sri Lanka Standards Institution	Development of shrimp/animal feed with shrimp waste using Lactic Acid fermentation technique (3 years)	192500
RG/90/B/2	Dr S.C. Wijeyaratne Dept of Botany Univ. of Sri Jayawardenepura	Isolation, identification and characterization of thermophilic and thermotolerant yeast from natural habitats in Sri Lanka (1½ years)	75000
RG/90/B/3	Dr J. Jayasingam Dept of Botany Eastern University	Comparative study of forest vegetation in the Wasgomuwa National Park (1½ years)	105100

PARTICIPATION AT CONFERENCES, SEMINARS AND WORKSHOPS OVERSEAS DURING 1990

ON THE NOMINATION OF NARESA

Subject and Period	Awarding Agency	Nominee/s
<p>Seventh Meeting of the Directors of Medical Research Councils or Analogous bodies and concerned Research Foci in the relevant Ministries' 4 - 9 November 1990 Kathmandu, Nepal</p>	<p>WHO</p>	<p>Dr R.P. Jayewardene</p>
<p>Regional meeting of the MAB National Committees for South &amp; Central Asia, 13-16 October 1990 Islamabad, Pakistan</p>	<p>UNESCO</p>	<p>Mr D.E.F. Ferdinandez</p>

NATURAL RESOURCES ENERGY & SCIENCE AUTHORITY OF SRI LANKA

Balance sheet as at 31.12.90

As at 31.12.89						
5,727,014.59	Funds Employed					
<u>500,000.00</u>	NARESA FUND					
6,027,014.59	Add: Drawings from Treasury	800,000.00				
<u>3,335,172.29</u>						
2,691,842.00	Less: Excess of Expenditure over Income					853,281.74
2,864,628.75	Documentation Unit Capital Fund					
1,500,000.00	Add: Drawings from Treasury	1,500,000.00				
	Treasury Deposit					
	Funds received from UNESCO & SAREC	55,637.40				
<u>4,364,628.75</u>						
735,208.13	Less: Net Expenditure - Note 1.1					
3,629,420.62						4,512,214.40
4,434,790.21	Research Grant Fund					
<u>1,151,000.00</u>	Add: Drawings from Treasury	3,225,000.00				
	Funds received from other sources	125,000.00				
	Treasury Deposit					
<u>5,585,790.21</u>						
509,572.73	Less: Net Expenditure - Note 1.2					
5,076,417.48						8,426,417.48
1,573,796.23	Men & the Biosphere Fund					
200,000.00	Add: Drawings from Treasury	200,000.00				
	Funds received from other sources	23,038.80				
	Treasury Deposit					
<u>58,965.50</u>						
1,832,761.73	Less: Net Expenditure - Note 1.3					
<u>198,268.62</u>						
1,634,493.08	Total C/F					1,709,421.84
13,032,173.18						12,385,068.84

13,032,173.18	Total B/F				12,385,068.84
715,069.13	Miscellaneous Fund				
825,000.00	Add: Drawings from Treasury	645,292.49			
	Treasury Deposit	<u>675,000.00</u>			
1,540,069.13				1,320,292.49	
894,776.64	Less: Expenditure - Note 1.4			<u>656,158.47</u>	664,134.02
645,292.49	Scientific Manpower Project Fund				
153,497.94	Add: Drawings from Treasury	153,497.94			
	Treasury Deposit				
153,497.94	Less: Expenditure			<u>153,497.94</u>	153,497.94
153,497.94	Working Committee Fund				
901,366.26	Add: Drawings from Treasury	898,139.41			
290,000.00	Treasury Deposit	<u>225,000.00</u>			
1,191,366.26				1,123,139.41	
293,226.85	Less: Expenditure - Note 1.5			<u>232,056.09</u>	
898,139.41	Foreign Aid Fund				
25,897,867.23	Add: Drawings from Treasury	38,070,467.17			
9,040,909.10	Treasury Deposit				
8,986,103.55	Foreign Aid held by MARESA				
388,111.67	Funds received by other sources	<u>8,570,158.31</u>			
43,912,991.55	Less: Net Expenditure - Note 1.6			46,640,625.48	
5,842,524.38	Total C/F			<u>6,307,497.66</u>	40,333,127.82
38,070,467.17					54,426,911.94
52,799,570.19					

<p>Total B/F</p>			<p>54,426,911.94</p>
<p><u>Current Liabilities</u></p>			
<p>Creditors</p>		<p>323,405.23</p>	
<p>Accrued Charges</p>		<p>396,974.50</p>	
<p>Provisions</p>		<p>2,075,293.10</p>	
<p>Endowment Fund</p>		<p>31,603.80</p>	
<p>Refundable Deposit</p>		<p>50,000.00</p>	
<p>Store-Keepers Refundable Security Deposit</p>		<p>3,850.00</p>	
<p>Tender Deposit</p>		<p><u>16,500.00</u></p>	
			<p>2,897,626.63</p>
			<p><u>57,324,538.57</u></p>

NATURAL RESOURCES ENERGY & SCIENCE AUTHORITY OF SRI LANKA

Balance sheet as at 31st Dec. 1990

As at 31.12.89	Represented by	Cost as at 1.1.90	Additions/Disposals	Accumulated Depreciation	Net Balance
	<b>Fixed Assets</b>				
1,433,445.99	Buildings	2,738,771.49	123,599.62	1,448,444.50	1,413,926.61
770,696.03	Office Equipment & Furniture	2,554,190.03	1,103,912.00 (632,887.24)	2,270,109.00	1,387,993.03
1,870,370.50	Motor Vehicles	3,910,422.82	2,398,314.12	2,695,492.21	2,940,337.49
26,582.00	Motor Bicycles	96,415.00	119,724.18	106,872.00	109,267.18
1,267.00	Bicycles	6,710.00	-	6,710.00	-
-	Sports Equipment	1,504.00	(2,109.95)	1,504.00	-
46,344.59	Accessories & Miscellaneous	137,856.59	19,590.41 (1,957.50)	110,831.05	44,506.00
1,246,062.23	Library Books	1,246,062.23	65,294.43	-	1,309,399.16
13,569,615.74	Scientific & Laboratory equipment out on loan	24,204,697.24	2,104,035.69	13,098,826.50	13,209,906.43
1,887,136.22	Documentation Equipment	4,399,520.22	88,432.40	3,145,244.00	1,832,708.62
20,851,520.30	Telephone Installation	59,486,149.62	5,345,948.16	22,884,033.26	21,948,064.52
13,953.64	Work in Progress	-	-	-	13,953.64
<u>20,865,473.94</u>	<b>Current Assets</b>				
378,493.38	Stocks		566,869.86		
2,138,208.72	Debtors		2,582,351.98		
2,870,996.01	Prepayments		2,793,160.70		
77,539.45	Deposits		77,539.45		
26,056,403.36	Treasury Deposits		24,184,669.70		
(417,181.80)	Balance at Bank A/C No. 4530800224	3,572,243.15			
648,419.41	" " " " 4530800232	403,657.04			
10,000.00	Petty Cash	10,000.00			
3,242,580.17	Cash in Hand	1,136,574.73			
26,622.80	Fixed Deposit	31,603.80			
3,070.00	National Savings Bank A/C	3,850.00	5,157,928.72		
<u>35,035,156.50</u>					
55,900,630.44					<u>35,362,520.41</u>
					<u>57,324,538.57</u>

*[Signature]*  
 Director-General  
 Natural Resources, Energy &  
 Science Authority  
 47/3, Maitland F.

Prepared by: *[Signature]*  
 30/04/91

NATURAL RESOURCES ENERGY & SCIENCE AUTHORITY OF SRI LANKA

Income & Expenditure A/C for the year ended 31st December 1990

As at 31.12.89				
5,880,000.00	Drawings from Treasury			
	<u>Income for the year</u>			
32,596.17	Interest received	51,190.00		
19,440.95	Sundry Income	143,458.29		
101,587.26	Sale of Publications	71,203.16		
10,923.45	Photocopy receipts	5,686.05		
92,163.62	Receipts from printing out side jobs	41,584.26		
234,153.93	Profit on sale of fixed assets	485.00		
904,090.90	10% Foreign aid administration cost	1,110,266.00		
7,274,556.26	<u>Less: Expenditure for the year</u>			
	<u>Council Expenditure</u>			
24,419.00	Travelling & allowances for Authority Members	33,095.78		
14,880.65	Entertainment	16,351.45		
39,299.65				
4,084,142.32	Staff Emoluments	3,784,403.18		
591,987.65	Salaries & Allowances	559,074.78		
114,794.78	Employees Provident Fund	112,363.09		
9,630.00	Employees Trust Fund	218,972.50		
151,183.50	Retiring Gratuity	39,308.65		
75,778.73	Provisions for retiring gratuity	75,438.06		
	Overtime	1,800.00		
	Holiday payment			
5,027,516.98	<u>Office Administrations</u>	4,791,360.26		
3,492.92	Travelling (Official)	1,181.74		
302,872.61	Stationery & Consumables	357,914.60		
191,597.60	Electricity	200,000.00		
129,545.97	Telephone	196,126.23		
5,066,816.63	Total C/F	765,222.57		
		4,840,807.49		
				7,410,000.00
				1,423,872.76
				8,833,872.76

			8,833,872.76
5,066,816.63	Balance B/F	755,222.57	
57,854.14	Postage	57,876.65	
42,625.00	Audit Fees	42,735.00	
3,856.05	Bank Charges	5,837.75	
5,195.09	Medical Expenses	38,389.65	
104,165.00	Advertising	33,858.00	
121,474.54	Maintenance of Motor Vehicles	164,828.85	
71,568.67	Maintenance of Office Equipment Furniture	88,881.71	
255,668.19	Maintenance of Building	65,069.06	
5,000.00	Staff Welfare	5,000.00	
38,514.25	Insurance	100,343.90	
445.80	Water Consumption charges	5.90	
-	Bad Debts	1,040.08	
-	Provisions for doubtful debts	-	
-	Loss of Fixed Assets (trfd. to Univ. of Peradeniya)	439,188.13	
-	Loss of Stocks	-	
134,268.00	Security Services	150,354.00	
3,918,296.00	Depreciation	4,443,698.00	
47,990.55	Sundry Expenses	62,420.50	
-	Custom Duty & BTT	-	
6,159.82	SAREC/Gen. - Subsistence and Overtime	12,329.14	
90,682.22	Gym Udawa	70,842.29	
3,640.00	Jenassaviya	-	
10,601,688.85	CIDA/Gen, SAL/Gen, RG/AID/Gen, SAREC/19/Gen	-	
3,327,132.59	Excess of Expenditure over Income	57,037.02	
8,040.00	Add Prior Year adjustment (Net)	-	
<u>3,335,172.59</u>		<u>6,594,958.20</u>	<u>11,435,765.69</u>
			<u>(2,601,892.93)</u>
			<u>2,638,560.26</u>

NOTES ON ACCOUNTS - 1990

1. **General Accounting:** The financial statements have been prepared in accordance with generally accepted accounting principles on a historical cost basis. The fundamental accounting assumptions and policies relevant in accounting have been adhered to on a consistent basis as in the previous year.

The ten percent of foreign donor funds received, which is for covering overheads, has been taken credit in the Income and Expenditure statement.

1.1 Documentation Unit Capital Fund Expenditure

1.	SLSTIC	Equipment	32,795.00
2.	"	Maintenance & Repairs	126,939.30
3.	"	Books & Periodicals	354,845.53
4.	"	In House Printing & Binding	15,599.98
5.	"	Consumables	157,635.79
6.	"	Miscellaneous	2,222.00
7.	"	Services	11,830.00
8.	"	Publications & Publicity	<u>83,786.63</u>
			785,654.23
		<u>Less: Cost of Documentation equipment + Library books</u> (32,795.00 + 65,144.43)	<u>97,939.43</u>
			687,714.80
		<u>Less: Prior year adjustments</u>	<u>14,871.18</u>
			<u>672,843.62</u>

1.2 Research Grants Expenditure

		Actual Expenditure for the year	2,608,238.62
		<u>Less: Cost of Scientific Equip. acquired during the year</u>	<u>93,821.83</u>
			2,514,416.79
		<u>Add: Provisions for balance funds</u>	<u>616,761.38</u>
			3,131,178.17
		<u>Less: Prior year adjustments</u>	<u>14,911.55</u>
			<u>3,116,266.62</u>

1.3 Man & Biosphere Expenditure

1.	MAB/86/01	Rs.	53,017.06
2.	MAB/88/01		1,230.00
3.	MAB/UNESCO/1		47,006.01
4.	MAB/UNESCO/3		10,758.40
5.	MAB/UNESCO/4		12,531.57
6.	MAB/11/WWF		1,338.00
7.	MAB/85/02		16,095.10
	MAB National Committee		<u>8,693.90</u>
			150,670.04
	<u>Less: Prior year adjustments</u>		<u>2,540.00</u>
			<u>148,130.04</u>

1.4 Miscellaneous Fund Expenditure

1.	Awards for outstanding Research Work	Rs.	1,287.00
2.	Participation in International Scientific Work		31,483.10
3.	Seminars & Symposias		19,233.86
4.	Subscriptions to International Scientific Unions		512,135.33
5.	<u>Special Research Projects</u>		
	1. SAREC/11, & SAREC/11/ZSSL/2,3,4, & 8		16,521.81
	2. Mangrove Commission		<sup>3</sup> 3,333.74
6.	Janasaviya		<u>72,163.63</u>
			<u>656,158.47</u>

1.5 Working Committees Fund Expenditure

1.	Agriculture & Animal Husbandry W/C	Rs.	10,896.80
2.	Biological Sciences W/C		16,247.70
3.	Chemical Sciences W/C		8,445.50
4.	Editorial W/C		5,388.65
5.	Genetic Resources W/C		25,834.89
6.	Medical & Vet. Sciences W/C		9,103.50
7.	Natural Resources W/C		3,993.00
8.	Physical & Engineering Sciences W/C		22,745.35
9.	Social Science Research W/C		56,040.20
10.	Science Education Research W/C		26,597.75
11.	Science & Information W/C		35,795.99
12.	W/C on Energy		<u>5,856.00</u>
			<u>226,945.33</u>
	<u>Add Prior year adjustments</u>		<u>5,110.76</u>
			<u>232,056.09</u>

1.6	<u>Foreign Aid Expenditure</u>	
1.	Advisory & Buffalo Research	Rs. 16,933.00
2.	ACIAR Project Expenditure	154,337.24
3.	CIDA "	3,054,681.92
4.	RG AID "	1,679,449.63
5.	SAREC "	4,824,389.48
6.	Natural Resources Profile	319,197.99
7.	RG/87/Ag/03	251,003.41
8.	RG/MAN/UNESCO/Grants	155,381.32
9.	UNESCO/86/PP/01	225,297.07
10.	Publication of Sri Lanka Water Buffalo	<u>57,320.00</u>
		10,737,991.06
	<u>Less: Cost of Scientific Equipment &amp; Motor vehicles</u>	<u>4,488,252.16</u>
		6,249,738.90
	<u>Add: Prior year adjustments</u>	<u>57,758.76</u>
		<u>6,307,497.66</u>

2. Assets & the basis of their valuation

Depreciable assets & Depreciation:

Depreciation has been provided on original cost or at valuation on a straight line basis consistent with that of the previous years and is calculated to write off the assets over their estimated useful lives.

2.1 Debtors

Total Debtors	Rs. 2,608,129.55
<u>Less: Provision for doubtful debts</u>	<u>25,777.57</u>
	Rs. <u>2,582,351.98</u>

3. Liabilities

3.1 Creditors

Creditors amount to Rs. 323,405.23 represents monies held by NARESA on behalf of 10 projects given below:

1.	Sundry Creditors	Rs. 5,311.57
2.	Mini/Micro CDS/ISIS Workshop	9,408.00
3.	RG/89/IS/03	7,500.00
4.	RG/IS/02	31,642.00
5.	SLATAI	7,780.00
6.	Steering Committee	17,252.50
7.	Suspense A/C	1,406.55

.....Contd....

8. STEPAN Workshop	97,937.21
9. TWAS Contribution	860.00
10. UNILIST/ISIS	23,415.00
11. Workshop on Tropical Forests	16,077.40
12. Genetic Resources (CSC funds)	<u>104,815.00</u>
	<u>323,405.23</u>

These sums will be expended as the programme advances.

3.2 Employees' Benefit

All employees are covered by EPF and ETF except the National Apprenticeship Board Trainees. An approved medical scheme is provided in addition to the normal welfare facilities available.

3.3 Retiring Gratuity

Provision has been made in the accounts in respect of liability for retiring gratuity.

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දුරකථන අංකය  
Telephone

691151

මගේ අංකය  
අංකය  
My No.

EC/R/NARESA/AA/90

මගේ අංකය  
අංකය  
Your No.



විගණකාධිපති දෙපාර්තමේන්තුව  
නිදහස් වතුරඉය, කොළඹ 7, ශ්‍රී ලංකාව  
கணக்காய்வாளர் துறைமுக அறிவுறு திணைக்களம்,  
சுதந்திர கட்டிடம், கொழும்பு 7, இலங்கை.

AUDITOR-GENERAL'S DEPARTMENT  
INDEPENDENCE SQUARE, COLOMBO 7, SRI LANKA

June 30, 1992.

දිනය / திகதி / Date : .....

Director General,  
Natural Resources, Energy and  
Science Authority of Sri Lanka,  
No.47/5, Vidya Mawatha,  
Colombo 07.

Report of the Auditor General on the accounts of the  
Natural Resources, Energy and Science Authority of  
Sri Lanka for the year ended December 31, 1990 in terms  
of Section 14(2)(c) of the Finance Act, No.38 of 1971

The audit of the accounts of the Natural Resources, Energy and  
Science Authority of Sri Lanka for the year ended December 31, 1990  
was carried out under my direction in pursuance of provisions in  
Article 154(1) of the Constitution of the Democratic Socialist  
Republic of Sri Lanka read in conjunction with Section 13(1) of the  
Finance Act, No.38 of 1971. My observations which I consider should  
be published with the annual report of the Authority in terms of  
Section 14(2)(c) of the Finance Act appear in this report. A detailed  
report in terms of Section 13(7)(a) of the Finance Act was furnished  
to the Authority on March 04, 1992.

1:2 Scope of Audit

Audit opinion, comments and findings in this report are based on a  
review of the financial statements presented to audit and substantive  
tests of samples of transactions. The scope and extent of such  
review and tests were such as to enable as wide an audit coverage as  
possible within the limitations of staff, other resources and time  
available to me. Sub-sections (3) and (4) of Section 13 of the  
Finance Act give discretionary powers to the Auditor General to  
determine the scope and extent of the audit.

2. Accounts

2:1 Opinion

Subject to my comments in this report, I am of opinion that the accounts presented have been satisfactorily prepared on the basis of generally accepted accounting principles applied on a basis consistent with that adopted in the preceding year.

2:2 Financial Results

The activities of the Authority are operated under a General Fund and a Special Fund. According to the accounts presented, the operating result of the General Fund of the Authority for the year ended December 31, 1990 was a deficit of Rs.2,601,893 as compared with a corresponding deficit of Rs.3,327,133 for the preceding year. The operations under the Special Funds for the year under review had resulted in a surplus of Rs.3,465,901 as compared with a corresponding surplus of Rs.13,566,711 for the preceding year.

Contd..51/

2:2:1 General Fund

A summary of the financial results of the General Fund for the year under review and the preceding year is given below.

	<u>Year ended December 31,</u>			
		<u>1990</u>		<u>1989</u>
	Rs.	Rs.	Rs.	Rs.
<u>Income</u>				
Receipts on account of the Cost of Administration of Foreign Aid	1,110,266		904,091	
Sundry Income	143,459		19,441	
Sale of Publications	71,203		101,587	
Interest on Loans	51,190		32,596	
Provision of Printing Services to Outside Parties	41,584		92,164	
Photocopy Receipts	5,686		10,523	
Profit on Sale of Fixed Assets	<u>485</u>	1,423,873	<u>234,154</u>	1,394,556
<u>Less: Expenditure</u>				
Office Administration	6,594,959		5,534,872	
Staff Emoluments	4,791,360		5,027,517	
Council Expenditure	<u>49,447</u>	<u>11,435,766</u>	<u>39,300</u>	<u>10,601,689</u>
Deficit before Government Grant		(10,011,893)		(9,207,133)
Less: Government Grant for Recurrent Expenditure		<u>7,410,000</u>		<u>5,880,000</u>
Deficit		<u>(2,601,893)</u>		<u>(3,327,133)</u>

2:2:2 Special Funds

The following statement gives the financial results of each Special Fund for the year under review and the preceding year.

	<u>Year ended December 31,</u>			
	<u>1990</u>		<u>1989</u>	
	Rs.	Rs.	Rs.	Rs.
<u>Foreign Aid Fund</u>				
Government Contribution	8,112,113		9,040,909	
Receipts from other Sources	306,170		388,112	
Foreign Aid	151,875		-	
Treasury Deposits	-		<u>8,586,103</u>	
	<u>8,570,158</u>		18,015,124	
<u>Less: Expenditure</u>	<u>6,307,498</u>		<u>5,842,524</u>	
Surplus		2,262,660		12,172,600
 <u>Documentation Unit</u>				
<u>Capital Fund</u>				
Government Contribution	1,500,000		1,500,000	
UNESCO and SAREC Grants	<u>55,637</u>		-	
	1,555,637		1,500,000	
<u>Less: Expenditure</u>	<u>672,844</u>		<u>735,208</u>	
Surplus		882,793		764,792
 <u>Research Grant Fund</u>				
Government Contribution	3,225,000		1,151,000	
Receipts from Other Sources	<u>125,000</u>		-	
	3,350,000		1,151,000	
<u>Less: Expenditure</u>	<u>3,116,267</u>		<u>509,373</u>	
Surplus		233,733		641,627
 <u>Man and Biosphere Fund</u>				
Government Contribution	200,000		200,000	
Receipts from Other Sources	<u>23,059</u>		<u>58,963</u>	
	223,059		258,963	
<u>Less: Expenditure</u>	<u>148,130</u>		<u>198,268</u>	
Surplus		74,929		60,695

Miscellaneous Funds

Government Contribution	675,000	825,000
Less: Expenditure	<u>656,158</u>	<u>894,776</u>
Surplus/(Deficit)	18,842	(69,776)

Working Committee Fund

Government Contribution	225,000	290,000
Less: Expenditure	<u>232,056</u>	<u>293,227</u>
Deficit	<u>(7,056)</u>	<u>(3,227)</u>

Net Surplus from Special Funds	3,465,901	13,566,711
	=====	=====

2:3 Financial Structure

The financial structure of the Authority as at December 31, 1990 as compared with that as at December 31, 1989 is given below.

	<u>As at December 31,</u>	
	<u>1990</u>	<u>1989</u>
	Rs.	Rs.
<u>Resources</u>		
General Fund of the Authority	853,282	2,691,842
Special Funds :		
Foreign Aid Fund	40,333,127	38,070,467
Research Grants Fund	5,310,150	5,076,417
Documentation Unit Capital Fund	4,512,214	3,629,421
Man and Biosphere Fund	1,709,422	1,634,493
Working Committee Fund	891,083	898,139
Miscellaneous Fund:	664,134	645,293
Scientific Manpower Project Fund	<u>153,498</u>	<u>153,498</u>
	54,426,910	52,799,570
	=====	=====
<u>Utilisation</u>		
Fixed Assets (at written down value)	21,962,017	20,865,474
Net Current Assets	<u>32,464,893</u>	<u>31,934,096</u>
	54,426,910	52,799,570
	=====	=====

2:4 Source and Application of Funds

The following statement shows the source and application of funds of the Authority during the year under review.

	Rs.	Rs.	Rs.
<u>Source</u>			
Deficit for the year		(2,601,893)	
<u>Add: Profit from Sale of Fixed Assets</u>		<u>(485)</u>	
		(2,602,378)	
<u>Add: Adjustments in respect of the</u> <u>Preceding year</u>		<u>(36,667)</u>	
		(2,639,045)	
<u>Less: Adjustments in respect of items</u> <u>not involving movement of funds</u>			
Provision for depreciation	4,443,698		
Write off of assets handed over to Universities	<u>439,188</u>	<u>4,882,886</u>	
			2,243,841
<u>Other Sources</u>			
Government Grant for Capital Works	6,625,000		
Foreign Aid received for Research Works	8,112,113		
Other receipts for Research Works	<u>661,741</u>		15,398,854
Sale of Fixed Assets			<u>3,958</u>
			<u>17,646,653</u>
<u>Application</u>			
Purchase of Fixed Assets		5,982,903	
Expenditure on Research Works		<u>11,132,953</u>	<u>17,115,856</u>
Increase in Working Capital as analysed below			530,797 =====

Effect on Working Capital

	<u>Increase</u>	<u>Decrease</u>	
	Rs.	Rs.	Rs.
Bank Balance	3,744,662	-	
Accrued Expenses	575,839	-	
Debtors	444,143	-	
Stocks	188,371	-	
Creditors	58,057	-	
Fixed Deposits and Savings Deposits	5,761	-	
Cash Balance	-	2,106,005	
Treasury Deposits	-	1,871,734	
Provisions	-	420,501	
Pre payments	-	77,835	
Donations Fund	-	4,981	
Tender and Security Deposits	-	<u>4,980</u>	
	<u>5,016,833</u>	<u>4,486,036</u>	<u>530,797</u>

Note: 10 per cent of Foreign Aid received had been brought to account as income of the Authority.

2:5 Comments on Accounts

2:5:1 Omissions in the Accounts

- (a) The value of the land at 47/5, Vidya Mawatha, Maitland Place, Colombo 07, donated to the Authority by the Government, on which the Building of the Authority is situated had not been assessed and included in the accounts.
- (b) Balance as at the end of the year in respect of stock of publications valued at Rs.1,569,454 and the stock of stationery and consumables valued at Rs.4,055 had not been brought to account.
- (c) The value of the shortage of 364 books revealed at the annual verification of stocks had not been ascertained and brought to account.

2:5:2 Understatements and Overstatements

The stock of printing materials as at the end of the year and salaries and allowances had been overstated by Rs.4,000 and Rs.2,666 respectively whilst employee debtors, amount due from the Ministry of Science and Technology for services and supplies provided and provision for gratuity had been understated by Rs.2,666, Rs.24,809 and Rs.90,550 respectively.

2:5:3 Unreconciled Control Accounts

Balances in 02 control accounts aggregating Rs.24,221,247 had not been reconciled with the balances in the subsidiary ledgers aggregating Rs.21,911,520.

2:5:4 Unidentified Transactions

The opening balance of the Suspense Account amounting to Rs.778 had increased to Rs.1,407 as at the end of the year due to the crediting of unidentified transactions during the year amounting to Rs.629. These transactions had not been investigated, identified and adjusted in the accounts.

2:5:5 Lack of Evidence for Audit

Current assets valued at Rs.27,891,184 and current liabilities valued at Rs.822,334 could not be satisfactorily vouched or accepted in audit due to the non-availability of age analysis, confirmations, etc. where applicable.

2:5:6 Non-compliance with Laws, Rules, Regulations and Management Decisions

Instances of non-compliance with laws, rules, regulations and management decisions are given below:

<u>Reference to Laws, Rules Regulations, etc.</u>	<u>Requirement</u>	<u>Non-compliance</u>
(1) <u>Finance Act, No.38 of 1971</u>		
(a) Section 8(3)	The budget of a public Corporation to include a profit and loss account or an income and expenditure account and a projected balance sheet showing the position at the end of the year.	The budget for 1990 had not been prepared in that manner.
(b) Section 13(5)(d)	Authority to determine the minimum Internal Audit Programme in Consultation with the Auditor General.	This requirement had not been complied with.
(c) Public Administration Circular No. 289 of May 10, 1985.	The State Crest and the name of the institution to be stencilled on each vehicle other than those allowed by the Circular.	The State Crest and the name of the Authority had not been stencilled on any of the vehicles of the Authority.

3. Financial and Operating Review

3:1 Financial Result

According to the accounts, the deficit in the General Fund for the year under review amounted to Rs.2,601,893 as compared with a corresponding deficit of Rs.3,327,133 for the preceding year thus disclosing an improvement of Rs.725,240 in the financial results. This favourable variance can be analysed as follows:

	<u>Favourable</u>	<u>Adverse</u>	<u>Net Result</u>
	Rs.	Rs.	Rs.
<u>Income</u>			
in			
Increase/receipts on account			
of the cost of administration			
of Foreign Aid	206,175	-	
Increase in Sundry Income	124,018	-	
Increase in Interest on Loans	18,594	-	
Decrease in Profit from sale of			
Fixed Assets	-	233,669	
Decrease in Sale of Publications	-	30,384	
Decrease in Printing Services			
provided to Outside Parties	-	50,580	
Decrease in receipts from Photocopies	-	4,837	
	<u>348,787</u>	<u>319,470</u>	29,317
	=====	=====	
<u>Expenditure</u>			
Decrease in Staff Emoluments	236,157	-	
Increase in Council Expenditure	-	10,147	
Increase in Office Administration			
Expenditure	-	1,060,087	
	<u>236,157</u>	<u>1,070,234</u>	(834,077)
	=====	=====	
Adverse variance before Government Grant			(804,760)
Increase in Government Grant			<u>1,530,000</u>
Net Favourable variance			<u>725,240</u>
			=====

Contd...58/

3:2 Budgetary Control

Significant variances were observed between the estimated income and expenditure and the actual income and expenditure, thus showing that the budget had not been made use of as an instrument of control.

3:3 Idle Assets

A stocks of stationery and consumables valued at Rs.66,528 and a stock of letter heads and envelopes valued at Rs.3,642 had been idling for over three years.

3:4 Non-recovery of Research Advances

Action had not been taken for the recovery of balances amounting to Rs.9,142 out of advances granted to 02 Research Projects abandoned due to unsatisfactory conditions.

3:5 Under-recoveries

A sum of Rs.30,533 had been under-recovered in the recovery of dues from an employee who had vacated his post after availing of over 3½ years no-pay leave.

3:6 Exceptional Items

The following resources of the Authority had been released for use by the Ministry of Science and Technology.

<u>Item</u>	<u>Value</u> Rs.	<u>Observations</u>
i. 03 Motor Vehicles	1,540,353	The annual cost of insurance licence fees, repairs etc. had been met by the Authority.
ii. 03 Air-Conditioners	102,090	Maintenance cost had been met by the Authority.
iii. 09 Employees of the Authority	411,681	Salaries, overtime and other allowances of these employees had been met out of the funds of the Authority.

iv.	Office accommodation (about 5,520 square feet)	Not computed	First floor of the main building had been released for use by the Ministry free of charge.
v.	Electricity, Water ) Telephones and Building ) Maintenance Expenditure)	Not computed	The cost of these service utilised by the Ministry had been brought to account as expenditure of the Authority.

3:7 Transport Fleet

The Authority had a fleet of 10 vehicles during the year under review. Expenditure on fuel and repairs amounted to Rs.132,585 and Rs.238,493 respectively. Some of the significant data relating to the utilization of these vehicles are given below.

i.	Total distance performed	- Diesel Fuel	- Kilometres	77,382
		- Petrol	- Kilometres	24,799
ii.	Total quantity of fuel consumed	- Diesel Fuel	- Litres	6,589
		- Petrol	- Litres	1,864.5
iii.	Expenditure on fuel	- Diesel Fuel	Rs.	77,945
		- Petrol	Rs.	54,640
iv.	Average performance per litre	- Diesel Fuel	- Kilometres	11.7
		- Petrol	- Kilometres	13.3
v.	Average expenditure on fuel per Kilometre	- Diesel Fuel	Rs.	1.00
		- Petrol	Rs.	2.20
vi.	Average expenditure on repairs per Kilometre	- Diesel Fuel	Rs.	3.50
		- Petrol	Rs.	0.90

4. Systems and Controls

Deficiencies observed during the course of audit were brought to the notice of the Director General of the Authority by my detailed report in terms of Section 13(7)(a) of the Finance Act furnished on March 04, 1992. Special attention is needed in respect of the following areas of control.

- i. Cash Control
- ii. Stock Control
- iii. Accounting

Auditor General

Su/

Comments of the Authority on the Audit Report of the Accounts (year ended 31st Dec. 1990)

2:5:1 Omissions in the Accounts

- a. Land was valued and has been taken into our books of accounts in 1991.
- b. Publications: The closing stock of publications have not been shown in our accounts from the inception of our institution.
- In our 1991 accounts closing stock of publications was shown under notes on accounts.
- Banner R<sup>o</sup> 1625/- This has been accounted for in 1991.
- Correction tapes 2430/- This has been accounted for in 1991.
- R<sup>o</sup> 4055/-
- c. Library books shortage of 364 books To be rectified in 1992 accounts.

2:5:2: Understatements and Overstatements

Developer Printing

Rs. 4,000/= Corrected in 1991

Salaries & allowances

R<sup>o</sup>. 2,666/= Corrected in 1991

Employee debtors

R<sup>o</sup>. 2,666/= Accounted for in 1991

Ministry Debtors

R<sup>o</sup>. 24,809/= Accounted for in 1991

Gratuity

R<sup>o</sup>. 90,550/= i. Addl. DG - 78,000/= We have paid gratuity for Addl. DG in 1991

ii. Steno/Typist

Sinhala R<sup>o</sup> 12,550/= To be rectified in 1992 accounts.

2:5:3 Unreconciled Control Accounts

	<u>According to ledger figure</u>	<u>Reported figure</u>
Fuel	16550/=	56440/=
Sci. Equ. out on loan (opening balance)	<u>24204697/=</u> <u>24221247/=</u> <u>=====</u>	<u>21855080/=</u> <u>21911520/=</u> <u>=====</u>

The fixed asset register has been introduced in 1983. Prior to that only an inventory of the items purchased has been in use at this Authority. Value has not been stated in most of the items, in this inventory.

The reason for the difference in the opening balance is due to the reasons stated above.

From 1983 we have reconciled the purchases during the year with the Fixed Assets Register.

We do not maintain a subsidiary ledger for fuel charges.

Rs. 56,439.65 is the amount stated as outstanding in the Dec' 90 bill, we pay for the purchases every month. We have written to Felix Ferira & Son ref. this brought forward balance.

2:5:4 Unidentified Transactions

The amount unidentified in the suspense account is Rs. 9880/=. This is a foreign money order for which we cannot trace the remitter and the purpose. Action is being taken to trace the remitter.

2:5:5: Lack of Evidence for Audit

From inception of NARESA we have been obtaining confirmations for;

1. Cash Imprest
2. Sundry Debtors
3. Deposits
4. Treasury Deposits

5. Savings Bank
6. Fixed Deposit
7. Bank Accounts
8. Sundry Creditors

We have not been obtaining confirmation for

1. Accruals
2. Prepayments
3. Staff Loans
4. Refundable deposits - This has been totally refunded  
in 1991
5. Tender Deposit

All confirmations received are available with us.

Age analysis - Sundry Debtors } - We have prepared and submitted  
Cash Imprests & creditors } the age analysis for the auditors.

2:5:6: Non Compliance with Laws, Rules, Regulations and Management  
Decisions

1 Finance Act No. 38

a. Section 8(3)

We have not included a Income & Expenditure  
account or a <sup>projected</sup> balance sheet in the  
budget, from inception of NARESA.  
However it will be noted to prepare in  
the future.

b. Section 13(5)(d)

The matter to be taken up for a decision  
with the new Board of Management.

c. Public Administration  
circular no. 289 of  
May 10, 1985

Action has already been taken to  
print the logo and the name of the insti-  
tution in the office vehicle.

3:2 Budgetary Control

A government grant is received for our recurrent expenditure. As a  
practice we do not budget the Income. The budget is made use of  
as an instrument of control.

3:3

Idle Assets

Stationery & Consumable items      These will be made use of once a  
Rs. 66,528/=                              technician is recruited.

Letter Heads & envelopes

Rs. 3642/=

The letter heads are being used  
at present.

The Business Reply Envelopes were  
printed in connection with S.T.P.  
survey. These can be used whenever  
necessary.

3:4

Non recovery of Research Advances

Rs. 6,441.75 has been settled during 1991 out of the Rs. 9,141.75  
reported. We are in the process of taking legal action for the  
balance Rs. 2,700/=.

3:5

Under recoveries

This ex-employee has been granted 3½ years no-pay leave for studies.  
After the no-pay leave period he has served for 23 months and left  
the service. Accordingly he was requested to pay Rs. 40,972/=  
for the balance period of 61 months (from the total obligatory  
service of 84 months). Provisions of Establishment Code in connection  
with this matter are given below:

Sub Section 15.5 of Chapter XII

"The form to be used for the purpose of the Agreement should be that  
in Appendix 9. This form should not be amended without the prior  
approval of the Director of Establishments."

\* Appendix 9 is attached.

Sub Section 5.2 of Chapter XV

"The penalty for failure to discharge the period of obligatory  
service will be computed at one third of the officer's New  
consolidated monthly salary as at time of departure for each month  
of undischarged obligatory service, and this amount will be shown  
in the Agreement." (See Section 16 of Chapter XII)

\* Section 16 of Chapter XII is annexed.

3:6 Exceptional Items

1. Motor Vehicles We have made the payments for Insurance, Licence fee and repairs for motor vehicles on reimbursement basis.
2. Air Conditioners We have paid the maintenance charges on reimbursement basis.
3. Overtime, Subsistence & other allowances of NARESA employees We have paid these on reimbursement basis.

The Director General will discuss regarding salaries, office accommodation, electricity, water, telephone and building maintenance expenditure with the Secretary, Ministry of Science & Technology and a decision will be made accordingly.



Director General

NATURAL RESOURCES ENERGY & SCIENCE AUTHORITY